File No.NMEICT(MS)/PAB/26

Government of India
Ministry of Human Resource Development
Department of Higher Education

19th November, 2013

To,

All Members of the Project Approval Board
of National Mission on Education through Information
and Communication Technology.

Sub: Agenda for 26th Meeting of the Project Approval Board (PAB) of National Mission on Education through Information and Communication Technology.

Sir/Madam,

Enclosed please find Agenda papers for the 26th Meeting of the Project Approval Board of National Mission on Education through Information and Communication Technology **scheduled to be held on Thursday, 21st November, 2013 at 11.00 am** under the Chairmanship of Secretary (HE), Ministry of Human Resource Development, Government of India, New-Delhi at the following venue:

Conference Room No.112-C Wing (First Floor),
Department of Higher Education,
Ministry of Human Resource Development,
Shastri Bhavan,
Dr. Rajendra Prasad Road,
New Delhi

Kindly make it convenient to attend the meeting.

Yours faithfully,

(A. K. Singh)
Director (ICT) &
Nodal Officer (NMEICT)
Tel: 011-23384276

Copy to:

1.   PSO to Secretary (HE)

2.   PS to JS (TEL)

3.   PS to JA&FA

4.   US (TEL)

AGENDA FOR 26th MEETING OF PROJECT APPROVAL BOARD OF NATIONAL MISSION ON EDUCATION THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY TO BE HELD ON 21st NOVEMBER, 2013 AT 11.00 A.M. IN CONFERENCE ROOM NO.112-C-WING (FIRST FLOOR), SHASTRI BHAVAN, DR. RAJENDRA PRASAD ROAD, NEW DELHI.

Item No.1

The "**Minutes of the 25th Meeting of the Project Approval Board**" held on 6th November, 2012 are placed for perusal and confirmation please (**Appendix-I : Page No. 50 to 66).**

Item No.2

The "**Action Taken Report**" on the Minutes of the 25th Meeting of the Project Approval

Board held on 6th November, 2012, is placed at **Appendix-II (Page No. 67)** and also

reproduced below:

Sl. No.	Subject/Agenda item	Decision of PAB	Action Taken
1.	Financial due diligence of "Talk to teachers" Project.	Create a model which is self sustaining. For this , a meeting with UGC, AICTE,NCTE and other partners to be conducted.	A Model will be worked out after conducting meeting with UGC, AICTE, NCTE and will be put in next PAB meeting.
2.	Approval of Project related to e- content generation for 17 subjects in E&C by IIIT Hyderabad.	PAB approved the project with estimated amount of Rs 119 lakhs.	The first installment of Rs. 35.7 lakhs has been released to IIIT Hyderabad.
3.	Approval of Project related to developing suitable pedagogical methods of IIT Kharagpur.	PAB approved the project with estimated budget of Rs 16 Crores.	The first installment of Rs. 4.63 Crores has been released to IIT Kharagpur.
4.	Approval of Projects related to development of e-content related to geo informatics by IIT Mumbai.	PAB advised the along with the cost break up, project may be put for the examination in the next meeting.	Mission Secretariat will scrutinize the proposal and will put before the next PAB.
5.	Approval of Project related to setting up of teaching ends for creating content for 50 DTH channels at the leading institution of the country.	1 PAB approved the project in principle, however observed that money may be released only after obtaining the NOC. 2 SPV may be formed with consultation with UGC and AICTE.	Actions are being taken to obtain NOC for Ministry of I&B and other related organization and for forming SPV. PAB will be apprised about the outcome in the next meeting.

Item No. 3

3.1 *Proposal* : **Virtual Labs (Phase-II)**

    PI : **Ranjan Bose**

    Institute : **IIT Delhi**

1. Union Cabinet while approving the NMEICT Mission Document, made provision of Rs.200 crores for creating Virtual Laboratories for supporting e-learning.
2. Main anchor institution for this component of Mission has been IIT Delhi since the beginning. Three projects "Pilot project" with the estimate cost of Rs.22 crores and phase-I of Virtual Lab with the estimate cost of Rs.80.00 crores and "Remote triggered labs" with the estimate cost of Rs.22.68 crores have been approved under the Mission till now for IIT Delhi.
3. Following are the outcomes of the two sanctioned projects for creation of Virtual Labs :

Name of the project	Creations of Virtual Labs		
	Target	Achievement	
Pilot project	10	15	
Virtual Labs Phase-I	80	100	

4. Following is the detail of the financial expenditure of the two projects

Name of the project	Total amount sanctioned	Amount released	UC Submitted
Pilot project	22 crore	22 crore	
Virtual Labs Phase-I	80 crore	80 crore	

5. In phase-I, apart from creating labs, IIT Delhi has conducted workshops and created 65 nodal centers which are located in various engineering college to ensure that the Virtual labs are being used by these engineering colleges.
6. As there are 3400 no. of engineering colleges in India. There is need to create more nodal centers. As it is not possible to create nodal center in all engineering college, there is a need to create awareness and dissemination work for this project.
7. There is also need to maintain all the Remote labs as well as content which has been created till the end of the Mission.
8. Keeping the AICTE syllabus in mind, following is the status of Virtual labs created till now for Electronics and Communication Engineering, Computer Science Engineering, Electrical Engineering, Civil, Mechanical Engineering area:

Name of Disciplines	Number of Experiment Required	Number of Experiment which can be created**	Number of Experiment already created
Computer Science & Engineering	92	`	176
Electrical Engineering	180		144
Electronics & Communications	126		205
Mechanical Engineering	168		107
Civil Engineering	94		30

** Experiments can be created as per demand of user

9. Keeping above in mind, clearly there is a need to focus on the following in future:
   (a) Dissemination and the usage of already created Virtual Labs
   (b) Creation of more Virtual Labs
10. Therefore, Mission Secretariat requested IIT Delhi to prepare the Phase-II for addressing the above stated concern.
11. The overall budget for Phase II is given below:

S.No.	Items	Budget#		
		First Year (in Lakhs)	Second Year (in Lakhs)	Total (in Lakhs)
1	Cost of deployment	264.42	290.82	555.24
2	Cost of integration	194	210	404
3	Cost of maintenance	440.7	456.3	2821
4	Cost of development of new experiments (300 expt. x 3 Lakhs/expt.)*	300	300	600
5	Honoraria	34	34	68
6	Central integration and development	372	409.2	781.2
7	Data Center	53	53	106
8	Software License	200	0	200
9	Reviews / Mid-term evaluations	42	46	88
	Total	**1900.12**	**1799.32**	**5623.44**

12. Following are the main components of Phase II:
    (a) Dissemination
       (i) **Expected Outcome** :

Year	No. of Nodal Center	No. of Feedback Form
First	**200** (end of 1st year)	3,15,000 *
Second	**36** (new NCs added during 2nd year)	3,46,500 **
Total	**236** (end of 2nd year)	6,61,500

*feedback forms of 1st year (200 NCs)
** feedback forms of 2nd year [200(1st year NCs)+36(new NCs)].

Field Engineers will continue their visits to 200 NCs of 1st year and 36 new NCs will be inaugurated during 2nd year of field trials. So at the end of project we have 236 NCs and 6,61,500 feedback forms.

   (ii) **Costing** : Rs 555.24 Lakhs
   (iii) **Justification for the costing** :

5

(a) Justification of Budget for the Deployment of Virtual labs

FIRST YEAR

The calculation is shown for the collection of 3,15,000 feedback forms from 200 Nodal Centers (NCs) for 1st year and 3,46,500 feedback forms from 236 [200(1st year)+36(new NCs)] Nodal Centers for 2nd year. The deployment entails site visits to NCs by the field engineers. Here we assume that 30% (approx.) NCs will be within 50 Kms radius (local travel) and 70% (approx.) will be located at larger distances (>50 kms).

Salary (**Manpower required:** 40 Field Engineers)		
Annual Salary / Engineer	Number of Engineers	Total Annual Salary (Year 1)
Rs. 5 Lakhs	40	Rs. 200 Lakhs
Travel **Total NCs** (end of 1st year) = 200 / Each nodal center will have 2 visits per year		
NCs within 50 Km	Travel cost within 50 Km	Total travel cost within 50 Km
60	Rs. 2000	Rs. 2.40 Lakhs
NCs beyond 50 km	Travel cost beyond 50 Km	Total travel cost beyond 50 Km
140	Rs. 10,000	Rs. 28 Lakhs
Total Travel Cost	Rs. 2.40 Lakhs + Rs. 28 Lakhs	**Rs. 30.40 Lakhs**
Cost of Conducting Workshops		
Number of workshops	Cost per workshop	Total cost for workshops
22	Rs. 50,000	Rs. 11 Lakhs
Other Costs		
Consumables (Stationery/ Printing/ Publicity material)	Rs. 15 Lakhs	
Miscellaneous expenses	Rs. 8 Lakhs	
Total cost incurred for 3,15,000 Feedback forms	**Rs. 264.4 Lakhs** (approx.) = Manpower Cost+ Travel + Workshop Cost + Miscellaneous = 200+30.4+11+15+8	
Cost per Feedback form (Year 1)	**Rs. 83.93** = 264.4L/3.15L	

**SECOND YEAR**

Salary (**Manpower required:** 40 field engineers)		
Annual Salary / engineer	Number of engineers	Total annual salary (Year 1)
Rs. 5.50 Lakhs (10% increase)	40	Rs. 220 Lakhs
Travel **Total NCs** (end of 2nd year) = 236 (36 new NCs) / Each nodal center will have 2 visits per year		

Travel **Total NCs** (end of 2nd year) = 236 (36 new NCs) / Each nodal center will have 2 visits per year		
NCs within 50 Km	Travel cost within 50 Km	Total travel cost within 50 Km
70	Rs. 2000	Rs. 2.80 Lakhs
NCs beyond 50 km	Travel cost beyond 50 Km	Total travel cost beyond 50 Km
166	Rs. 10,000	Rs. 33.20 Lakhs
Total Travel Cost	Rs. 2.80 Lakhs + Rs. 33.20 Lakhs	**Rs. 36 Lakhs**
Cost of Conducting Workshops		
Number of workshops	Cost per workshop	Total cost for workshops
22	Rs. 50,000	Rs. 11 Lakhs
Other Costs		
Consumables (Stationery/ Printing/ Publicity material)	Rs. 15 Lakhs	
Miscellaneous expenses	Rs. 8.50 Lakhs	
Total cost incurred for 3,46,500 Feedback forms	**Rs. 290.5 Lakhs** (approx.) = Manpower Cost+ Travel + Workshop Cost + Miscellaneous = 220+36.4+11+15+8.5	
Cost per Feedback form (Year 2)	**Rs. 83.83** = 290.5L/3.465L	

(b)   Creation of new experiments
   (i) **Expected Outcome** : 100 experiments per year
   (ii) **Costing**   : Rs 600 Lakhs
   (iii) **Justification for the costing** :

Year	No. of Experiments*	Cost (in lakhs)
First	100	Rs 300
Second	100	Rs 300

*Cost of developing one experiment= Rs 3 Lakhs

(c) **Integration**

    (i) **Expected Outcome**: Integration of virtual labs already developed on a central server, Creating one central server and mirror servers at each of the other partner institutions and porting virtual labs on Aakash Tab

    Currently, labs have been developed in various institutes, on different platforms. Most of the labs are currently running on individual servers, or as standalone applications. Significant engineering effort is therefore needed to propel the Virtual Labs to the next level where (a) they run from a common web framework and runtime environment, (b) they provide the user with a rich virtual lab environment with support for account management, persistence, fast turn-around time on the web, polished user interfaces, localization, etc. required to integrate the use of Virtual Labs with the academic and learning processes at the colleges.

    (ii) **Costing** :

        The 'integration activities' will be carried out at two levels:

        a. Locally at each participating institute (Rs. 404 Lakhs)
        b. Central Integration. (Rs. 676.50 Lakhs)

    (iii) **Justification for the costing** :

    Maximum number of Engineer up to 14 labs= 2
    No, of Engineers beyond 14 labs is 1 Engineer per 7 labs
    Maximum number of total Engineers = 5

    Budget for Integration at Individual Institutes

    Integration Engineer (salary)   = Rs 5 Lakhs
    Misc.   = Rs 4 lakhs
    (admin support, travel, equipment, consumables, licensing cost, if applicable)
        Total   = Rs 9 lakhs

    Budget for central Integration and development
    Rs. 781.20 Lakhs (For details kindly refer DPR)

(d) **Maintenance**

    (i) Expected Outcome   : Up and running of virtual labs already created
    (ii) Costing   : Rs 2,821 Lakhs
    (iii) Justification for the costing :

    Justification of Budget for Maintenance
    *Maintenance budget includes funds for the new RT Labs, in addition to the existing labs
    *Cost of maintaining 1 Virtual Lab =
    (Salary + Website maintenance +Internet usage + Miscellaneous)
    = 11.3 Lakhs/year [in the 1st year]
    = 11.7 Lakhs/year [in the 2nd year]

    Maximum no. of total engineer = 39
    Manpower Required: 1 person per Lab. Total Labs 187

    1st year

Salary : Rs 4.8 Lakhs per annum per person
Total Salary Year 1 : Rs. 4.80 x 39 = Rs. 187.20 Lakhs
Website Maintenance : Rs 1.5 Lakhs
Internet Usage : Rs 4 Lakhs
Miscellaneous : Rs 1 Lakh
Other costs for maintaining 187 Labs = 187*6.50 = Rs. 1,215.50 Lakhs
Total Cost = Salary + Other costs = Rs. 1,402.7 Lakhs

2nd year

Salary : Rs. 5.2 Lakhs per annum per person
Total Salary = : Rs. 5.20 x 39 = Rs. 202.80 Lakhs
Website Maintenance : Rs 1.5 Lakhs
Internet Usage : Rs 4 Lakhs
Miscellaneous : Rs 1 Lakh
Other costs for maintaining 187 Labs = 187*6.50 = Rs. 1,215.50 Lakhs
Total Cost = Salary + Other costs = Rs. 1,418.30 Lakhs

No. of Labs	No. of Engineers	1st Year Maintenance (in Rs. Lakhs)	2nd Year Maintenance* (in Rs. Lakhs)	Total (in Rs. Lakhs)
187	**39**	1402.7	1418.3	2821

13. **Standing Committee recommendation**

"This project, coordinated by IIT Delhi has seven IITs and a few other educational institutions as collaborators.

In the first phase of virtual labs, as opposed to 80 labs, more than 100 have been completed. The PRSG has recommended the continuation of this project.

100 colleges are using virtual labs, the limit imposed by the PIs.

Scale-up requires Phase II funds.

Maintenance and outreach are some objectives. Development of further labs and the integration of the labs developed on disparate platforms is another requirement. The overall budget for the Phase II of this project is Rs. 11186.03 lakh.

To a question whether the coordinating institute, IIT Delhi, had received the source code developed in the virtual labs project from all partner institutes, the PI replied that all institutions except Amrita University had given the source code. Prof. Kamal Bijlani of Amrita University confirmed that Amrita University would also release the source code"

Pursuant to the data provided by the PI, Mission asked for further data and clarifications. The response from the PI are shown below:

1. As NMEICT is planning to spend Rs 200 Cr for setting up high end,high capacity servers, why should we invest in buying integration server and mirror servers?

   ANS: Eventually many Virtual Labs can be run from a cloud server. However, taking the labs from their current form to those that can be put on the server will take additional work. This is the purpose of the Integration (Phase II).

2. If we use the infrastructure created under Talk to Teacher project, will the cost per student for dissemination come down? If yes, why are we not thinking of using it?

   ANS: The cost per student will come down marginally. Actually, in order to initiate students and faculty to Virtual Labs, we need to interact face to face and give demos. Talk to the Teacher will increase the efficacy of these labs, rather than cut down the costs.

3. For Dissemination cost, is there any bench marking? (Comparison with any other similar projects)

   ANS: Currently we do not have data about dissemination cost of any similar project.

4. What % of the experiments can run on Aakash? What is the road Map?

   ANS: Currently, only a fraction of experiments run on Aakash. One of the objectives of Phase II is to make as many experiments as possible that can run on Aakash. This will require re-writing code for many of the experiments.

14. The Detailed Project Report is attached with the agenda item for the kind perusal and examination by the PAB (**Appendix - III - Page No. 68 to 163**).

   Item is placed before the PAB for approving Phase-II of Virtual labs projects with estimated cost of Rs. 5623.44 Lakhs.

3.2 *Proposal* : **E-Yantra Robot Enhanced Teaching in Engineering Colleges - Phase-II.**

PI : **Prof.Kavi Arya**

Institute : **KR 13200 99887**

Control No. : **IIT, Bombay**

1) Union Cabinet while approving the NMEICT Mission Document, made provision of Rs.50 Crores for Development of software controlled hardware programming for robotics & other crucial areas.

2) Mission has approved the following project:

   e-Yantra: Robot Enhanced Teaching in Engineering Colleges

   Main anchor institution for this component of Mission has been **IIT Bombay** since the beginning.

3) Following are the details of the funds received for the project:

e-Yantra	Total amount sanctioned (Rs./Lakhs)	Amount released (Rs./Lakhs)	Date released with Sanction Number: **F.16-42/2009-DL**	Date received at IITB
Pilot phase	**100.00**	50.00	Mar. 31, 2009	Jul. 31, 2009
		48.36	Feb. 10, 2010	Apr. 9, 2010
	Total received	**98.36**[1]		
Phase-1	**206.03**	61.80	Feb. 10, 2010	Mar. 31, 2011
		62.00	Mar. 27, 2012	Apr. 4, 2012
		61.62	Mar. 22, 2013	Apr. 2, 2013
	Total received	**185.42**[2]		
Total Grant received till date		**283.78**		

[1] Only 98.36 L out of 100 L sanctioned was received. Remaining amount is: **1.64 L.**

[2] Total of 185.42 L was received in 3 installments. This is **20.61 L** less than the amount sanctioned.

4) Following are the outcomes of **e-Yantra: Robot Enhanced Teaching in Engineering colleges – Phase 1**:

Name of Project	Outcome as per DPR Submitted	Outcome achieved so far	% achievement
e-Yantra Pilot phase	∗ Designing low cost robots ∗ Creating awareness amongst colleges through workshops ∗ Distributing robotic kits to colleges to seed robotic labs	1) Design for the low cost educational robots Spark 5 and Firebird were created. 2) Number of workshops conducted: 12 3) Number of robotic kits distributed: **60**	**>100%**

e-Yantra Phase 1	∗ Creating awareness amongst **students** through competitions
	
	∗ Training teachers both in theory and practical
	
	∗ Enabling infrastructure creation at **colleges** through **e-Yantra Lab Setup Initiative (eLSI)**
		1. **e-Yantra Robotics Competition (eYRC) – 2012:**
		  • Registrations: **4384**
		  • Number of teams: 131
		  • Number of Finalist teams: 20
		2. **e-Yantra Robotics Competition (eYRC)– 2013:**
		  • Registrations: **6324**
		  • Number of teams: 160
		  Currently running
		3. Robotic kits distributed: **291**
		
		1. Workshops conducted: 44
		2. Robotic kits distributed for participating in **e-Yantra Robotics Teacher Competition (eYRTC): 155**
		
		1. **eLSI** – Pilot: Robotic labs at 16 colleges under Mumbai University were inaugurated.
		2. **eLSI–regional (current)**: 6 regions identified with around 60 colleges participating to set up labs.
			>100%[1]

e-Yantra's goal is to provide a scalable solution for "*project-based learning*" bringing together students, teachers, and colleges. e-Yantra is poised to achieve its goal through the following:
- Platform for students to develop Robotic solutions to everyday problems
  - **e-Yantra Robotics Competition (eYRC)**
- Train teachers in Embedded systems concepts
  - **Workshops and e-Yantra Robotics Teacher Competition (eYRTC)**
- Enable colleges to set up Robotics labs + teachers trained with e-Yantra kit
  - **e-Yantra Lab Setup Initiative (eLSI)**
- Provide platform for sharing projects and best practices across colleges
  - **e-Yantra Symposium (eYS)**
- Provide projects and training modules in open source for colleges
  - **e-Yantra Content Creation (eYCC)**

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[1] As per PRSG minutes dated 7th Sept. 2012

Phase 1:

- **e-Yantra Robotics Competition (eYRC)**

  o e-Yantra conducted national level e-Yantra Robotics Competition (eYRC) in 2012 where 131 teams from all across the country participated in solving problems like pot-hole filling robot and room-cleaning robot.

  o The competition created awareness and provided motivation for students to take up projects in Embedded systems and Robotics.

  o The competition also served to identify talented students and colleges to distribute the Robotic kits (to seed Robotics labs in these colleges).

  o Simultaneously, a three-pronged approach to enabling lab set ups in engineering colleges was piloted in Mumbai region.

  o 16 (Sixteen) colleges under Mumbai University participated in the pilot phase of e-Yantra Lab Setup Initiative (eLSI).

- **e-Yantra Lab Setup Initiative (eLSI):**

  In eLSI the following model was tested which is both scalable and sustainable:

  o A meeting of College principals is called to create awareness about the need for hands on training and setting up of a Robotics lab.

  o Interested colleges sign up nominating a team of 4 teachers and invest funds to buy equipment to set up a lab – e-Yantra provides a Robotic kit to each college participating in this initiative to seed the lab.

  o Nominated team of teachers is trained through a two-day workshop.

  o Subsequently, the teams from the colleges participate in the e-Yantra Robotics Teacher Competition (eYRTC) where they are taken through the steps of implementing a project using the Robotic kit given to them.

  o The college initiates the purchase process during the 3-4 months period when their teachers are engaged in the hands-on training through eYRTC.

- **e-Yantra Robotic Teachers Competition (eYRTC):**

  o Finals of eYRTC and simultaneous virtual inaugurations of the labs are conducted as the grand finale.

  o This model ensures that when the teachers are ready to handle projects in Embedded systems and Robotics, their college is ready with a lab.

  o Thus, students can work on interesting problems in their college with guidance from their teachers.

  o eYRC-2013 is currently underway with 640 students participating in 160 teams of 4 students each – these students were selected from 6324 students who registered for the competition. Refer to figure for e-Yantra reach.

Phase 2

  ✓ Transitioning into Phase 2, e-Yantra has identified the first 5 regions in addition to Mumbai region to spread eLSI. These are:

  o (i) Delhi, (ii) Chandigarh, Punjab (iii) Ichalkaranji, Maharashtra (iv) Shimoga, Karnataka, and (v) Pune, Maharashtra

13

- ✓ 5 colleges, one in each region, are identified as Nodal Centers (NCs) to coordinate the activities of eLSI.
- ✓ Around 60 colleges from these regions are currently participating in eLSI.

5. Objectives and deliverables of Phase- 2

- ✓ **Current experience:**
  - o eYRC has proved to be an effective way to reach out to students across the country as the entire competition is managed and conducted online with a core team of 4-6 people.
  - o Around 60 colleges from 5 regions (in addition to 16 colleges in Mumbai) are currently participating in eLSI.
  - o By early 2014, there'll be over 75 colleges with eLSI established Robotics lab with a core team of trained teachers to impart Embedded systems and Robotics education.
  - o There are requests from 8-10 regions to participate in eLSI and many more expected to come forward as Robotics lab becomes an essential infrastructure required in **every** engineering college.

- ✓ **e-Yantra's target:**
  - o Set up Robotics labs and train teachers through eLSI : 500 colleges in 20-25 regions in 3 years.
  - o Encourage the use of the labs and provide platform for sharing best practices, student projects and research ideas.
  - o e-Yantra proposes to hold an annual e-Yantra Symposium (eYS) - this may be considered the maintenance phase for e-Yantra initiatives.
  - o Provide content in the form of advanced modules in Embedded system concepts and training material in newer technologies e-Yantra proposes to have e-Yantra Content Creation (eYCC) Unit. Also, this is an imperative to make all the content created through the competitions as eLSI become available in an organized form to all colleges in Open source.
  - o To create innovative themes for the competitions and to test advanced concepts through experimentation. e-Yantra proposes to create test-beds where prototypes developed as course projects are deployed through competitions that can be scaled up.

In summary, Phase 2 e-Yantra proposes to reach out to many more students, teachers, and colleges across the country to take the movement created in Phase 1, of hands-on training and innovative thinking, to another level – putting our country on the world map of innovative education in embedded systems through project-based learning.

Details of the budget (amounts specified in lakhs), along with the breakup based on activity is given below. The overall budget for 3 years is Rs.1709.59 lakhs.

Budget for e-Yantra activities (in lakhs)				
	Year 1	Year 2	Year 3	Total (Rs. Lakhs)
Activities of e-Yantra				
e-Yantra Robotics Competition (eYRC)[2]	54.2	98.0	124.0	**276.2**
e-Yantra Ideas Competition (eYIC)	5.9	8.0	10.0	**23.9**
Internships and Projects	6.3	10.6	15.9	**32.8**
Workshops	7.2	7.2	7.2	**21.6**
e-Yantra Lab setup Initiative (eLSI)[3]	49.5	99.0	99.0	**247.5**
e-Yantra Symposium (eYS)[4]	10.0	15.0	25.0	**50.0**
Testing concepts/technology/tools[5]	75.0	55.0	25.0	**155.0**
Content creation/Teaching modules[6]	150.0	50.0	50.0	**250.0**
Operating costs of e-Yantra				
Equipment	45.0	20.0	20.0	**85.0**
Salary	120.2	142.4	170.2	432.8
TA/DA	30.0	20.0	20.0	70.0
Consumables and Contingency	5.0	5.0	5.0	15.0
TOTAL	558.3	530.2	571.3	1659.8
PI consultancy (3%) of Total	16.8	15.9	17.1	49.8
GRAND TOTAL	575.1	546.1	588.4	1709.6

[2] Budget for 3 years = 276.2 L; Targeted number of students = 60,000
Number of robotic kits distributed = 650;
Cost of robotic kits = 162.5 L (@25K/kit inclusive of accessories and shipping); Cost of prizes = 7.08 L
Amount spent on conducting the competition = 276.2 -169.58 = 106.62 L
Cost/student reached = 106.62/.6 = Rs. 177.67

[3] Budget for 3 years = 247.5 L; Targeted number of colleges = 500
Number of teachers trained to be experts = 2000; Number of robotics kits dispatched = 500
Cost of robotic kits = 125 L (@25K/kit inclusive of accessories and shipping);
Cost of prizes for e-Yantra Robotics teacher competition = 9.5L
Cost of ELSI = 247.5 -125-9.5 = 113L
Cost/college = 113,00,000/500 = Rs. 22,600
Cost/teacher = 22,600/4 = Rs. 6,125

[4] Year 1 (budget – 75L) includes expenses related to travel and stay of invited speakers, dignitaries, and Nodal center Coordinators (NCCs)
Targeted number of teachers = 200; Targeted number of Nodal Centers = 10
Cost/teacher = 4,60,000/200 = Rs. 2300

[5] Year 1 (budget projected – 75L)
Creating Test beds (includes: Fabrication, Electronic components, Web technologies, PCB design and manufacturing, etc.): 22.44 L
Equipment: 30 L, Manpower (trainees, research assistants): 14.56 L), and Consumables (8L)

[6] Year 1 (budget projected – 120L)
Includes: Test module generation – 28L, Project conversion - 10L, Creation of Advanced modules– 50 L, Conferences – 20L , Postal campaign – 2L, Travel for dissemination – 10L

6   Standing Committee recommendation

The Standing Committee of NMEICT reviewed this project at it's meeting held on 19th Sept 2013 and commented as below:

"The targets of Phase I of this project have been achieved. 16 labs were set up in Mumbai university colleges, as a part of the first phase.

The PI asked the balance funds of Phase I (Rs. 20.61 lakh) to be released. The Nodal Officer of NMEICT mentioned that 90% amount is given and that the balance 10% amount will be released only after the completion of the project, on approval from the PAB. The Nodal Officer agreed to put up a request for the transfer of this amount to the PAB. The SC recommends the release of Rs. 20.61 lakh.

The target is to reach 500 labs in the second phase. In each college, the e-Yantra project will provide a robot worth Rs. 22,000 as their contribution The colleges in turn will invest Rs. 5 lakh, about a half of which will go into buying additional robots by the college.

In the second phase, the PIs proposed to do the following: 60,000 students will undergo e-Yantra robotics competition; 20,000 students will undergo e-Yantra ideas competition. 12,000 teachers will be trained, with 10,000 being trained through the 10,000 teacher training programme.

The cost per student trained works out to less than Rs. 200 per student. The cost per teacher comes to about Rs. 6,000 per teacher. This does not include the amount of Rs. 25 crore invested by the 500 colleges (not by NMEICT), on the basis of Rs. 5 lakh per college.

7   Further inputs

Pursuant to the data provided by the PI, Mission asked for further data and clarifications. The response from the PI are shown below:

a. Is there any bench marking for cost per participant for competition/conference (any other project of IIT Mumbai/UGC/AICTE). Is our cost more, less?

We have informally benchmarked ourselves against other NMEICT projects at IITB and find that our "cost of outreach" is comparable. However, typically at the pilot stage of the project the cost of "acquisition" of "customers" is higher but once the brand is established as it is now, the students and teachers proactively come to us. Witness how the competition this year was publicised mainly through social media and got 6500 participants. Now a lot of colleges themselves come to us to establish robotic labs and are willing to invest Rs.5L in infrastructure each to do so.

We can however loosely compare ourselves to the CDAC Embedded Systems & Design course costed at Rs.69k per head. We conservatively deliver a fourth to a third of the content of the course as part of the competition training experience. This means that as opposed to Rs.17k-Rs.23k per student of delivered value we are delivering at Rs.25k/4 which is Rs.6k per student (cost of robot / 4 participants). This robot is a capital asset that has a further life of 3-4 years in the college to which it is donated. The rest of the competition expense of Rs.177.67/student is the cost of popularising and creating awareness which reduces as the numbers increase.

16

b. How have we estimated the cost of software/package? Is it cost effective?

All the software we use is open source. The specs and design of the robot is open source. Whereas for the competition and the teacher training we purchase 1 robot per college, we expect each college to purchase Rs.5L worth of equipment for a robotics lab in their college - including at least 10 robots. This allows us to keep our robot purchase expense to the minimum whilst also creating a robot-ecosystem where we will encourage local manufacturing and support to emerge once the numbers get interesting.

c. What is the cost of the robot? How many such robots are we planning to procure and distribute during the project period?

The cost of the robot is currently Rs.25k fully accessorised. However, we have been sourcing these in quantities of 300 at a time for the basic bot for Rs.10,500 (at 2009 prices) - keeping our costs down. We typically purchase accessories separately (sensors and servos) for about Rs.5-6k per kit. Much to the credit of the quality of our sourcing, we have had few complaints since launching the project. We procure just enough robots to achieve our purpose - one per competition team and one per college for teacher training. Nodal Centres get 3 robots as an incentive.

In Summary:
==========
With each phase we have learnt a lot about the problem we are trying solve and the ways in which to solve them. At all times we are guided by a long term vision of creating a cadre of students trained with the skills of building complex machines to solve everyday problems. Our success is also evidenced by the large number of newspaper articles and column inches devoted to e-Yantra and NMEICT in National dailies. We are now in the process of publishing our work in peer reviewed journals. By the reactions of colleagues in the MOOC space from our visit to the UK we appear to be on the right track and they are interested in our model.

The Detailed Project Report is attached with the agenda item for the kind perusal and examination by the PAB (**Appendix- IV: Page 164 to 176**).

Item is placed before the PAB for approving Phase-II of E-Yantra project with an estimated cost of Rs. 1709.60 Lakhs

3.3   *Proposal*   :   **National Library and Information Services Infrastructure for Scholarly Content (N-LIST)-Phase II**

    PI   :   **Dr. Jagdish Arora,**

    Institute   :   **INFLIBNET, Ahmedabad**

1. The Union Cabinet while approving the NMEICT Mission document, made provision for Rs. 100 crores for providing access to electronic books and journals to Higher Education Institutions.

2. The project is jointly executed by the INFLIBNET Centre and IIT Delhi under the overall guidance of their joint National Steering Committees. While, IIT Delhi handles all activities related to technical institutions, INFLIBNET handles all activities related to universities and colleges.

3. During XI Plan Period, the project was funded under the Mission during the financial years 2009-10, 2010-2011 and 2011-2012. However, the funds could not be released to the project during the FY 2012-2013 because the project has already exhausted the entire allocation of Rs. 100.00 crores made for XI Plan Period.

4. The project was formally launched by the then Hon'ble Union Minister of HRD Shri Kapil Sibal on 4th May 2010. The programme, launched as a pilot, is highly successful.

5. The project provides for access to scholarly content to colleges, universities as well as centrally-funded technical institutions through its four distinct components, namely:

   i) Access to e-resources for Govt.-aided and non-aided colleges (Currently 3204 colleges);
   ii) Subscription to UGC-INFONET e-resources for centrally-funded technical institutions (IITs, IISc, IISERs, NITs, etc.) (Currently 55 CTIs);
   iii) Subscription to INDEST e-resources for universities (Currently 100 universities are getting access to Web of Science);
   iv) National Monitoring Agency at the INFLIBNET Centre to manage access, monitor, promote and impart training to promote optimal usage of e-resources and for monitoring all activities involved in the process of providing effective and efficient access to e-resources to colleges.

6. The project uses a highly innovative access model wherein one subscription is paid for 200 colleges. As such, 16 subscriptions are being paid for 3204 colleges (5,58,328 registered users) who have enrolled themselves for the NLIST Project. Access to e-resources is being provided through proxy server installed at the INFLIBNET Centre.

7. The current status of the NLIST Project is as follows:

Sl. No.	Category of Institutions	No. of Institutions	No. of Registered Users
1	Colleges	3204	5,58,328
2	Centrally Funded Technical Institutions	55	1,65,000
3	Universities	100	5,00,000

18

8. The project has since been honoured with three awards in the years 2010 and 2011, namely i) Jury Choice Award e-INDIA 2010; ii) The Manthan South Asia Award 2010 in Digital Learning Category for the year 2010; and iii) Skoch Digital Inclusion Award for Technology in Education for the year 2011.

9. The Evaluation Committee on NMEICT in their report submitted to the Ministry stated that "supporting INFLIBNET-INDEST consortia programmes through this Mission was a thoughtful endeavour and has greatly benefited to research community, teachers and learners". The Committee also recommended that "the present practice of providing support for subscription to e-journals/e-resources through the INFLIBNET-INDEST (IIT Delhi) activities should not only be continued but their budgetary allocation should be enhanced to keep up with the present and expected future requirements". The Committee also recommended that the coverage of institution needs to be augmented and may include private institutions also.

10. The Project is an ongoing activity. Subscription is to be renewed for the registered colleges, CTIs and Universities for the calendar year 2013. Moreover, the next year's subscription, i.e. for the year 2014 is also due. Further, additional colleges (beyond 3204) are also joining the project continuously. The Project proposal provides for joining of additional 800 colleges during the year 2014. It may be noted that funds could not be released to the project during the FY 2012-2013. As such, the project proposal has projected funds requirement for both the calendar years, i. e. 2013 and 2014.

11. Detailed usage of e-journals and e-books subscribed under the NLIST project is available at: http://nlist.inflibnet.ac.in/nlistmembersandusages.php

12. The cost-analysis of books and journals subscribed / purchased under the project for the year 2013 is as follows

Categories of Institutions	Number of college / Universities	Number of Journals /e books to be renewed	Total Cost (Rs. in Lakhs)	Cost per college (Rs. in Lakhs)	Cost Per College per Journal /Book (in Rupees)	Cost Per Student (in Rupees)
Colleges	3204	5000 Journals +	881.61	0.29	5.88	0.05
		87000 books (E-Library)	247.16	0.08	0.09	0.01
		9873 Books	1292.43	0.43	4.36	0.07
IIT+NIT+IISER	55	3400 Journals	1256.54	22.84	652.74	13.85
Universities	100	Web of Science	959.50	9.60	NA	1.92

13. The projected fund requirement for the N-LIST project for the financial years 2012-13 and 2013-14 is Rs. 9102.40 lakhs as per the break-up given below:

Sl. No.	Item	2013	2014	2013 & 2014
Expenditure: Grand Total				
		(Rs. in Lakhs)		
1	Renewal of Subscription to E-journals for Colleges	0	1170.68	
2	Purchase of E-books for all colleges	0	1317.42	
3	Subscription of Web of Science for 100 Universities	959.50	1007.48	
4	Subscription of INFLIBNET E-resources for CTIs	1256.54	1372.14	
5	Subscription of E-Resources for Engg. Colleges	0	0	
6	Subscription to Web of Science for NITs, New IIT, IISER	194.35	204.06	
7	Monitoring and Coordinating Activities @ INFLIBNET	0	120.23	
8	Purchase of New E-books for all Colleges	0	1500.00	
9	Subscription to E-resources for Open Universities	0	0.00	
	Grand Total	2410.30	6692.10	9102.40

14. **Justification of the Fund requirement for calendar year 2013**: The proposal projects fund requirement for renewal of subscription to e-resources for the year 2013 for number of institutions mentioned above which is now overdue on the basis of actual negotiated rates of subscription. It may be noted that the PI has excluded new resources that were proposed in pre-revised proposal. The total funds requirement for the year 2013 is Rs. 2410.30 lakhs. Appendix I provides detailed calculations for the year 2013.

15. **Justification of the Fund requirement for calendar year 2014**: The proposal projects fund requirement for renewal of subscription to e-resources for the year 2014 for number of institutions mentioned above on the basis of actual negotiated rates of subscription. It may be noted that the PI has not projected any new resources. However, fund requirement for additional 800 colleges who are likely to join the initiative during 2014 is projected. The total funds requirement for the year 2014 is Rs. 6692.10 lakhs includes fund require for travel, awareness programmes, contingencies, consumables etc. (See Appendix II). Appendix I provides detailed calculations for the year 2014.

20

16. Considering the facts that the project has successfully completed its pilot phase and has established itself as a success model that can cater to information requirement of a large number of colleges, universities and centrally-funded technical institutions and the NMEICT Evaluation Committee has recommended its continuation beyond pilot period, it is recommended that the project may be continued for a period of two years, i.e. 2012-13 and 2013-14. However since the allocated NMEICT budget of Rs. 100 Crore in XIth plan for providing access to electronic books to Higher Education institution is already exhausted, the funding for continuation for this project has to be arranged through one of the two possible modes:

 i). Seeking Cabinet's approval for continuation of this project in XIIth plan at an additional allocation of Rs. 500 Crores.

 ii). Recommending to PAB of RUSA for approval of this project for continuation in XIIth plan for the institutions already be in service.

The detailed project report is attached with the agenda item for kind perusal and examination by the PAB (**Appendix – V : Page – 177 to 179**).

The item is placed before the PAB for a decision on one of the two modes for funding, mentioned above.

3.4   *Proposal*   :   **NMEICT Dissemination & Publicity Campaign**

   PI   :   **Mr. N. V. Reddy**,

   Department   :   **DAVP**

NMEICT has been envisaged as a Centrally Sponsored Scheme to leverage the potential of ICT, in providing high quality personalized and interactive knowledge modules over the internet/intranet for all the learners in Higher Education Institutions in any- time, any- where mode. The Mission has two major components viz., (a) content generation and (b) connectivity along with provision for access devices for institutions and learners.

The Mission ha**s** made significant progress since its inception in 2009 – particularly in providing connectivity, creating e-Content, and coming out with Aakash tablet, as the low cost access device. Considerable amount of e-Content through NPTEL in various disciplines in engineering and science have been generated. E-content for UG subjects are being generated by the CEC in collaboration with its media centers. Over 125 Virtual Labs in 9 Engineering & Science disciplines are currently ready for use and available at one common website. "Talk to a Teacher" program is being deployed successfully for synchronous training of over 10,000 participants. 1500 Spoken Tutorials are available on line. Various other projects pertaining to pedagogy and teacher empowerment are in progress.

With the successful portfolio of NMEICT projects having reached a "critical mass" the stage has now come for making the end users sensitized and more aware of the ready projects and significant progress made by the Mission so that the intended usage by the target beneficiaries increases in proportion to the financial outlays. There is a need for a systematic publicity and awareness campaign to be launched by the Mission for making its outcomes reach the far nook and corners of the country. NMEICT Mission Document had envisaged a total budget of Rs. 50 crores for publicity and awareness activity.

DAVP was approached to propose a media plan for popularizing the NMEICT modules available among the primary beneficiaries who are the students of higher educational institutions and their teachers. DAVP has proposed the following roadmap to be followed for the publicity campaign:

1) To engage research agencies for conducting a survey to assess the level of information available with the students about the resources available in the mission;
2) To produce spots and launch a publicity campaign through TV media;
3) To put up hoardings in every higher educational institution in the country;
4) To use the popular websites for popularizing the mission.

To implement the above roadmap, DAVP has proposed the budgetary estimates as follows:

i)   For the assessment survey approximately Rs. 30.0 lakh
ii) For TV campaign of three weeks duration Rs. 20.0 crores
iii) For setting up hoardings approximately Rs. 20,000/= per college (per month)
iv) For using the websites Rs. 30.0 lakhs

DAVP has further requested the Ministry of HRD to consider the above road map and convey approval for initiating the process of launching the publicity campaign by them.

Out of above 4 cost heads given by DAVP, items i), II), and iv) are lump sum estimates. However for item iii), they have given only the unit cost per college per month.

To start with, we may ask DAVP to engage research agencies for conducting a survey to assess the level of information available with the students about the resources available in the mission, and carry on setting up hoardings in 527 connected universities (NMEICT and NKN connected universities) in 2013-14 and 2014-15. In addition, DAVP may also use the popular websites for popularizing the mission as proposed by them.

Thus, based on the cost estimates provided by DAVP and considering coverage of initial 527 connected Universities only for setting up hoardings, the total cost estimates for initial 3 recommended activities comes out to be:

i) For the assessment survey: Rs.   30.0 lakh

ii) For setting up hoardings at 527 Universities for 12 months   Rs. 1264.8 lakh

iii) For using the websites   Rs.   30.0 lakh

                              Total: **Rs. 1324.8 lakh**

It is felt that activity of assessment survey through engaging research agencies to assess the level of information available with the students about the resources available in the Mission -- should get started immediately along with setting up hoardings for 12 months and using the popular websites for popularizing the mission. Depending on the outcome of the assessment survey, DAVP will be able to finalize the detailed working proposal and implementation schedule for producing and launching a publicity campaign through TV media.

PAB may please consider sanction of Rs.1324.8 lakhs to DAVP for 3 activities during remaining part of 2013-14 and 2014-15 for approval.

3.5	*Proposal*	:	**NMEICT Dissemination and Awareness Activity through Deployment of Mobile e-learning Terminals (MeLT)-Phase: II.**
	PI	:	**Dr. Vinod Kumar**
	Lead Institution	:	**IIT, Roorkee**

NMEICT has been envisaged as a Centrally Sponsored Scheme to leverage the potential of ICT, in providing high quality personalized and interactive knowledge modules over the internet/intranet for all the learners in Higher Education Institutions in any- time, any- where mode. The Mission has two major components viz., (a) content generation and (b) connectivity along with provision for access devices for institutions and learners.

The Mission ha**s** made significant progress since its inception in 2009. Considerable amount of e-Content through NPTEL in various disciplines in engineering and science have been generated. E-content for UG subjects are being generated by the CEC in collaboration with its media centers. Over 125 Virtual Labs in 9 Engineering & Science disciplines are currently ready for use. "Talk to a Teacher" program is being deployed successfully for synchronous training of over 10,000 participants. 1500 Spoken Tutorials are available on line. Various other projects pertaining to pedagogy and teacher empowerment are in progress.

However, no amount of hardware, software, e-content, access devices and connectivity networks is going to help unless the real user is able to derive benefit from the opportunities being presented to him / her through application of ICT to education. With the successful portfolio of NMEICT projects having reached a significant "critical mass", the stage has now come for accelerating the activity of making the end users sensitized and more aware of the ready projects and progress made by the Mission so that the intended usage by the target beneficiaries increases in proportion to the financial outlays.

NMEICT Mission Document had envisaged a total budget of Rs. 50 crores for Publicity and awareness activity as well as training of motivators to ensure full utilization of the systems by institutions & students. Apart from a systematic publicity and awareness campaign proposed to be launched by the Mission through DAVP, the sensitization, training, and empowerment of the target groups of learners to use the NMEICT facilities is also envisaged in the Mission Document. The present proposal submitted by IIT Roorkee is the second proposal pertaining to the Dissemination and Awareness Activity (other than DAVP proposal) and it proposes Deployment of Mobile e-Learning Terminals (MeLT) as Phase II of their earlier completed project.

Phase I of the Project was completed by IIT Roorkee along with associated network of Institutes, at a cost of Rs. 3 Crores and had the following objectives:

1. To make available to the students e-lectures and knowledge e-contents of their interest free-of-cost using VSAT-Enabled Mobile e-Learning Terminals (MeLTs).
2. The prime target of the project was the school and college students living in remote areas where data connectivity is unsatisfactory in terms of bandwidth and / or reliability.

The scope of the work completed in phase I was:

1. Design and development of prototype mobile e-learning terminal.
2. Identification of hub earth-stations and acquiring bandwidths.
3. Identification and classification of the sources of e-lectures and knowledge e-contents.
4. Procurement of 12 vans/buses with custom-designed body and interior. (Out of these 2 vans are lying with Mission Secretariat at IGNOU premises and 10 are at IIT Roorkee.)
5. Equipping vehicles to convert into MeLTs.
6. Selection and training of operators for MeLTs.
7. Deployment of MeLTs in the remote areas.
8. Collection of feedback and preparation of DPR.
9. Impact analysis

Phase I of the project was based on a need assessment survey done by all the 8 networking institutes including IIT Roorkee, by visiting various institutes i.e. 515 schools/colleges in 22 districts of 5 states. Most of the institutes covered were at secondary/senior secondary schools, inter colleges, degree colleges & polytechnics which were located at remote locations in Uttarakhand, HP, J&K, Rajasthan, etc to make available to the students knowledge e-contents of their interest free-of-cost, which is not possible normally in such remote locations with relatively poor ICT infrastructure. The Education Management Department of NITTTR Chandigarh did the Evaluation of the Effectiveness of MeLT project and had concluded that the overall impact of dissemination of e-contents through MeLT to all was very useful.

The MeLT vehicles with equipment procured and tested in phase I of the project can now be effectively deployed and put in operation. In continuation of phase I of the project, PI (Dr Vinod Kumar) from IIT Roorkee has now proposed in Phase II for deploying usefully the vans and MeLT equipment for the following objectives:

1. To familiarize and train Engineering students and faculty to use e-Contents developed under NMEICT projects
2. To provide access to resources available under N-List project of UGC
3. Use of Internet in research (Information literacy programme)
4. To hold workshops to train faculty coordinators of networking institutions

For popularization, PI has indicated that,

• It is planned to have a website of this project. Activities of all the Networking institutes will be put on the website.
• A user group will be created to exchange the views and lesson learned including difficulties faced.
• Leaflets and handouts will be printed and circulated to all institutes to cover a larger population.
• MeLT vans have body printed with project title.
• Efforts will be made to use keywords such that the project website is displayed prominently during search on google.
• Information of interest to students and links to other websites will be provided on MeLT website

In his presentation to SC on 19.09.13, PI had asked for the following:

1. A recurring budget of Rs. 45 lakh p.a. (research & Project staff, contingency/ meetings, Misc. expenditure of honorarium, coordination fees, etc and impact assessment) for 2 years.
2. The running cost of 10 MeLT vans for 2 years as Rs. 2.30 crores

The Budget break-up of costs under various heads provided later by PI is as follows:

A. Recurring budget for coordinating Centre, IIT Roorkee

Sl. No.	Items	Amount Per year in INR (Lakhs)	Total in INR (Lakhs) 2 yrs
1.	Research & Project Staff • Project officer (Technical) (Rs. 40,000/- pm) • Project officer/ Liaison officer for managing the coordinating centers (Rs. 35,000/- pm)	Rs. 9.00 Lakhs	Rs. 18.00 Lakhs
2.	Contingency / Workshops/ Meetings • 3-4 workshops per year for the training and feedback from the coordinating and participating institutes (about 100 participants for each workshops) Rs. 3.0 Lakhs / Workshop.	Rs. 9.00 Lakhs	Rs. 18.00 Lakhs
3.	Miscellaneous (Honorarium, Auditor's fee, website development & Coordination fee etc.) • Honorarium to experts attending the workshop (Rs. 1500/-per participant) (Rs. 4.00 Lakhs) • Auditor's Fee (Rs. 1.00 Lakh) • Website & interactive application development (Rs. 2.00 Lakhs) • Honorarium for the Coordinators (Rs. 3.00 Lakhs) • Miscellaneous (Rs. 2.00 Lakhs)	Rs. 12.00 Lakhs	Rs. 24.00 Lakhs
4.	Impact Assessment, Printing of instruction material, maintenance of website • Fee for getting the impact analysis (Rs. 6.00 Lakhs) • Printing of Instructional material (Rs. 7.00 Lakhs) • Maintenance of website/servers/antivirus/ etc (Rs. 2.00 Lakhs)	Rs. 15.00 Lakhs	Rs. 30.00 Lakhs
	Total	Rs. 45.00 Lakhs	Rs. 90.00 Lakhs

B. The running cost for 10 MeLTs for 24 months

Sl. No.	Item	INR in Lakhs		
		Cost for 12 months	Cost for 10 MeLTs *	Cost for 2 years
1.	Payment to 1 driver and 2 technicians • Driver (one) + Technicians (Two) @ 10,000/-pm	Rs. 3.5 Lakhs	Rs. 35.00 Lakhs	Rs.70.00 Lakhs
2.	Fuel cost + Logistics • Rs. 5000/-pm approx fuel cost • Rs. 20000/-pm for making arrangements in the institutes (3-4 in one month) for demonstration & hands-on practice	Rs. 3.00 Lakhs	Rs.30.00 Lakhs	60.00 Lakhs
3.	Maintenance of vehicle and equipment, Insurance • Services of Vehicles (Rs. 20,000/- yr) • Insurance for Vehicles (Rs. 15,000/- yr) • Maintenance of Laptops/ Servers/Antivirus (Rs. 45,000/- yr) • Paint on Vehicles etc. (Rs. 20,000/- yr)	Rs. 1.00 Lakhs	Rs. 10.00 Lakhs	Rs.20.00 Lakhs
4.	Miscellaneous / Contingent Expenses • Replacement of Batteries for Vehicles & Laptops, updation of memory etc. (Rs. 1,00,000/- yr) • Office Miscellaneous (Rs. 100,000/- yr)	Rs. 2.0 Lakhs	Rs. 20.00 Lakhs	Rs. 40.00 Lakhs
5.	Honorarium to faculty / staff • Honorarium to Faculty coordinator (Rs. 1,00,000/- yr) • Honorarium to Faculty involved in doing demos (Rs. 1,00,000/- yr)@ Rs 1500/- Visit	Rs. 2.00 Lakhs	Rs. 20.00 Lakhs	Rs. 40.00 Lakhs
	Total	Rs.11.50 Lakhs	Rs.115.00 Lakhs	Rs. 230.00 Lakhs

The SC in their meeting held on 12.09.13 recommended the proposal. However SC also wanted the PI to take up the two vans with the laptops given to the Mission Secretariat also to be put to use. So, the total vans will be 12 and additional cost to use these vans will be Rs. 46.00 lakhs.

Regarding the outcome of phase II, PI states that each networking institute will cover three/four institutes / colleges in a month. In each institute/college, awareness and training to use e – contents will be provided to cover at least 750-1000 persons (students & faculty). During a visit to an institute/college MeLT vans will be available in the institutes for 3-4 days. It means that coverage by each networking institute in a year will be:

➢ No. of Institutes to be covered in an year by each Van : 30
➢ No. of Student & Faculty /institute : 750- 1000
➢ Total Students & Faculty trained /Van : 25,000
➢ Total no. of Students & Faculty trained by 12 vans in 1 year : 12 x 25,000 = 300,000
➢ Total no. of students & faculty trained in two years : 2 x 300,000 = 600,000
➢ Total Budget proposed : Rs 366 lakhs

➢ Thus the Cost / person of training is only : **Rs.61/person approx**

Impact analysis of this project is planned to be done by PI after a period of 3, 12 and 18 months. On the basis of this analysis and feedback from networking institutes and the coordinating centers, a master plan to scale up will be made and submitted later by PI for scale-up.

In total, PI has demanded Rs. 366 lakhs (Rs. 90 lakhs for Coordinating Centre and Rs. 276 lakhs for running of 12 MeLT Vans for 2 years to train about 6 lakhs students and faculty.

PAB may please consider the above proposal for approval.

3.6   *Proposal*   :   **Report on Aakash**

        PI   :   **Prof. D. B. Pathak**

        Lead Institution   :   **IIT, Bombay**

1. A provision of rupees 700.00 Crores exists under NMEICT (as sanctioned for XI Plan) for providing 100 Personal Computers (PCs) in institutions of higher learning at the rate of 1 per faculty member on 50:50 cost sharing basis between the Central Government and the institution concerned. Experimentation and development of ultra Low Cost Access Device (LCAD) and field trials to enable wider coverage of learners also has a separate provision of rupees 25.00 crores.

2. Ministry released a total of Rs.47.72 crores towards these projects to IIT Rajasthan, of which Rs.25.00 crores was meant for testing and development of LCAD and Rs.22.72 crores towards teacher empowerment 'A' which included procurement of 1 lakh low cost access devices. These devices were to be distributed to teachers for their field trial.

3. IIT Rajasthan followed an open tender process and placed an order for 100,000 devices.

4. However, due to some intractable problems between the vendor and IIT Rajasthan and based on a request from Director, IIT Rajasthan, the PAB in its 23rd meeting held on 28th February, 2012 transferred the project to IIT Bombay

5. IIT Bombay was entrusted with the responsibility of executing the Aakash project, in March/April 2012. Funds were transferred in May 2012.

6. The main objective was to empower college teachers in the country to provide quality education, to millions of Indian students. This objective was to be achieved by procuring 1 lakh tablets, developing appropriate applications, content, and methods for their effective educational use, and by deploying these in our colleges. A pilot for schools was also planned.

7. IIT Bombay renegotiated the technical specifications prescribed earlier, to obtain a better performing Aakash tablet. Procurement of 1 lakh tablets has been completed.

8. Many useful educational applications and content were initially developed by IIT Bombay, to kick-start the deployment of tablets in educational Institutions.

9. For field testing, IIT Bombay has selected about 300 colleges in the country, called Aakash Project Centres. Tablets have been supplied to these centres for use in classroom teaching, and for further application development through final year projects. Additionally, Aakash Application Development Labs have been set up by IIT Madras, at five sister IITs.

10. The tablets are also being used in the large-scale teacher training program 'T10KT', being conducted by IIT Bombay and IIT Kharagpur. The results of this field testing are positive and very encouraging. The school pilot has also been deployed recently in 4 schools.

11. IIT Bombay has trained over 10,000 teachers on the use of Aakash in education, and about 13,000 students in developing applications for Aakash on the Android platform. Contests have been organized as an incentive to get more focused work done.

12. The Ministry requested IIT Bombay to prepare and submit a comprehensive report on the Aakash devices based on their Lab and Field testing. Prof. Phatak, the PI of the Aakash project at IIT Bombay submitted the report to ES on July 30th, 2013. A copy of this report is attached with the agenda item (**Appendix-VI : Page 180 to 396**).

13. Thereafter, in September 2013, the Ministry requested Prof. Phatak of IIT Bombay to summarise his findings. The summary of the findings of Prof. Phatak's in question and answer form is as follows :

S.No	Issue/ Subject/ Question	Observation/ Answer/ Reply	Evidence(Field test/laboratory test) to substitute Answer / Reply (Column 3)
(1)	(2)	(3)	(4)
1.	Weather the physical and technological features of the device is sufficient for engineering college student to make use of it for his Information and Communication Technology (ICT) requirements for different subjects in engineering collages.	Yes	Over 10,000 teachers in 300 Engineering collages, have been given an orientation training on using Aakash for education. Students of these collages are already these tablets for studying various subjects. Several new application and contents have been developed by these students and teacher. A large number of such educational applications and contents have been developed by IIT Bombay itself. All these are released in open source, for all students and teachers of the country to benefit from this collaborative effort. The entire effort, and the successful results have been detailed in the status report [chapters 6,7 and 8; pages 65 to 166]. Additionally , five other IIT's have also contributed to new projects [Chapter 9, pages 167 to 187] CDAC has done lab testing of samples from different lots, and has given a satisfactory report. [Chapter 5, pages 36 to 64]
2.	Weather the device is robust enough to work in remote rural areas of our country	Yes	As a part of the pilot for schools. These tablets have been deployed in 4 village schools near the town of Pandharpur. Students of class 9 in these village schools are using the tablets successfully for learning science and maths in their local language as also in English. The devices have been found rebust enough to work in villages.

S.No	Issue/ Subject/ Question	Observation/ Answer/ Reply	Evidence(Field test/laboratory test) to substitute Answer / Reply (Column 3)
(1)	(2)	(3)	(4)
3.	Whether the procurement and delivery process followed in the project is recommendable for large scale procurement of devies.	No	It was never envisaged to do large scale procurement using the approach followed in the project. The present project is an R&D project. A rigorous process based on a global tender was followed, but the procurement was exempt from custom/excise duties due to its R&D nature and the relevant notification available with the IIT Bombay. This will not be valid for any commercial procurement
			A new method of procurement through DGS & D rate contract with multiple vendors, has been proposed and accepted by an inter-ministerial group, which is charged with the responsibility of doing continuous R&D on Aakash. This method is recommended for future procurement.
4.	Based on laboratory test report weather the large scale procurement of this devise is recommended or not.	Yes	The laboratory tests have confirmed that the device performs satisfactorily. The feedback on some short-comings, such as need for large capacity battery, and large memory, have been taken into account by the inter-ministerial committee, which has recommended further upgrades to specifications. These specifications were notified for public comments, and have been factored in to the final specifications. These specifications have been approved in a meeting attended by secretaries of MHRD, MOC and DEiTY.
			It is important to note that the specifications of such devices are never fixed, but evolve. Even during our R&D project, the specifications were upgraded twice, before finalizing the present model. The specs approved by the inter-ministerial committee, is a further improvement. This process will continue in future years.
			Large scale procurement as per the approved specifications is strongly recommended.
5.	Whether the functionality of the device used by the students is commensurate to the price of the device.	Yes	The tablets under the project are comparable in technical specification and functionality, to those available present in the market for the prices ranging between Rs. 5,000 and 7,000. The prices of comparable tablets were in the range of Rs. 10,000 to Rs. 12,000 in May-June 2012. By pegging the procurement price for Aakash lablet at Rs 2,263, Government of India can certainly take partial credit for anchoring the price of the tablets in the global market at a lower level.

S.No	Issue/ Subject/ Question	Observation/ Answer/ Reply	Evidence(Field test/laboratory test) to substitute Answer / Reply (Column 3)
(1)	(2)	(3)	(4)
6.	Whether the project has resulted in to development of applications which was commensurate with the cost of the device.		The large number of applications development developed, are referred to in 1(4) above, it may be noted that due to the adoption of the standard Android operating system. All other applications which run on similar commercial products will also run on Aakash. It is also be noted that IIT Bombay has succeeded in porting Linux operating system on Aakash. This has made it possible to use Aakash as a programming device like a computer, while most other tablets running Android, can only be used as a access device. These facts together clearly mark Aakash as one of the richest in its application portfolio. The project has established that Aakash is globally the most affordable tablet, capable of running the broadest set of applications.

14. **The issue of accepting the Report of IIT Mumbai is placed before the PAB for examination and necessary action.**

Item No. 4 : Approval for the release of final installments of the projects already sanctioned under NMEICT.

In the following projects, after the project is approved by PAB, installments upto 90% of the project cost has been released on the recommendations of the Standing Committee and approval by IFD.   IFD has suggested that the final installments may be released only after the project is appraised by the PAB, finds the projects satisfactory and recommends release of final installments.   Further IFD has suggested that it would be in the fitness of things to give a feedback to the PAB on the projects it approved for implementation.

Accordingly, brief statuses of the projects in which final installments are pending have been summarized below:

4.1   Project   : National Programme on Technology Enhanced Learning (NPTEL)

     Co-PI   : Prof. Mangal Sunder, Institute

     Institute   : IIT Madras.

     Deliverables as per DPR:

(i)   **600 course** in science, engineering and humanities with text /video as the main quadrant and with problems, links and graphics/animation, student interactions through question/answer forums etc. Covering other quadrants.
(ii)   A large number of faculties participating in workshops (about 300 one to three day workshops scheduled for the period 2009-2014).
(iii)   Setting up of state-of-the-art Video studios in all eight partner institutions for HD recording.
(iv)   Conversion of all videos into compressed and streaming formats, format for downloads (about 400-450 courses, each of forty lecture duration to be created as streaming and downloadable media).
(v)   Distribution of NPTEL content freely to all academic institutions running engineering programme free of charge and collecting feedback from users.

     Achievement so far:

(i)   390 courses already uploaded, about 150 courses are under review at various stages and about 250 more courses between 25%-75 percent completion.

     % Achievement:

(i)   **Course content creation:** Between 70 and 85 percent towards completion. Target set now for at least 100 more courses than 600 to be made available by March 31, 2014.

(ii)   **Setting up of studios** (HD Recording facility for state-of-the-art content ready for satellite transmission) 14 Studios have been set up and are functioning; two more studios under completion and expected to function by January 2014.

(iii)   **Running workshops:** Between 25 to 50 workshops running for two or three days already conducted across IITs; more subject-specific workshops are being arranged.

(iv) **600 one day workshops** have been completed across all states of India with a reasonable geographical distribution of institutions where NPTEL awareness workshops were chosen to be conducted for faculty in those and nearby 10-15 institutions. The coordinator (KMS) himself has conducted more than 60 workshops in the last three years in Tamil Nadu and Andhra Pradesh in which more than 10000 faculty members have so far participated.

(v) **Distribution of NPTEL Content:** Nearly 800 institutions (AICTE approved) have taken NPTEL contents. By the end of this year this number will likely grow to 1000, covering 20 percent of all technical institutions in India. Efforts are underway to provide copies to all AICTE and UGC approved institutions in the next few months. DVD sets for video courses are made available to users for a fee of Rs. 200 + postage. Covering all disciplines, more than 45000 sets have been distributed so far. The current student population interested in competitive examinations and postgraduate admission is a serious user of NPTEL content.

(vi) Feedback is being collected from users online and also through a very detailed survey that has been designed by a team of experts consisting of Dr. Jayanti Ravi, I. A. S., Chairperson for Technical Education Gujarat, faculty from Sardar Vallabhai Patel University and IIT Delhi. So far 6000 feedback reports have been received on long survey containing more than 75 questions. They are direct indicators to the usefulness and value of NPTEL content. In addition, **YouTube has a Channel view recorded for NPTEL site as approximately 98 million** in the last six years making this the **largest technical education content free and online in the globe.** (http://www.youtube.com/iit).

(vii) **Text of all videos (**more than 14000 recorded so far and likely to become 20,000 by the end of the current phase) has been initiated and more than 7000 have been completed. **They are time coded for easy indexing and searching the videos through keywords and meta data.** Otherwise searching videos become impossible since English in India is non-standard. A large number of these have also been incorporated through technology as English subtitles accompanying the video to facilitate vernacular translation in the future. The sister site http://textofvideo.nptel.iitm.ac.in keeps updating text content and had had more than 400 comments since this was launched a few months ago.

Total Fund approved by PAB : **Rs 96.00 Crores.**

Fund Released till now : **Rs.86.35 Crores**
 (*As concurred by IFD, release of Rs.6.00 Crore is under process)

Fund Proposed to be released : **Rs.3.65 Crores.**

4.2   Project   : Virtual Lab (Remote Triggered Labs).

Co-PI   : Prof. Rajan Bose.

Institute   : IIT Delhi.

Deliverables as per DPR:

    (i)   Field Trials of the virtual labs developed during the Pilot Phase (ECE, Mechanical and Applied sciences Verticals).

    (ii)   Field Trials of some of the virtual Labs developed during the Main Phase (CSE Vertical).

    (iii)   Development of 37 additional Remote Triggered Labs.

Achievements so far:

    (i)   36 New RT Labs developed.

Percentage (%) Achievement   : 95 %

Total Fund approved by PAB   : Rs 22.68 Crores.

Fund Released till now   : Rs.15.60 Crores .
        (* As concurred by IFD, release of Rs.1.00 crore is under process)

Fund Proposed to be released : Rs.5.8 Crores.

4.3   Project   : E-Yantra: Robot Enhanced Teaching of subjects in Engineering Colleges.

PI   : Prof. Kavi Arya.

Institute   : IIT Bombay.

Deliverables as per DPR:

    (i)   12 Workshops every year (total of 24 in the next two years).
    (ii)   Evolution & Robot development.
    (iii)   Website content: Assignments, Manuals, Experiments, Research resources.
    (iv)   Every workshop in a month: 10 institutes will participate.
    (v)   Every year: 120 institutes are to be covered.
    (vi)   Every institute: 2 robots to be deployed.

Achievements so far:

    (i)   **E-Yantra Robotics Competition** (eYRC) – 2012: Registrations: **4384,** Number of teams: 131, Number of Finalist teams: 20.

    (ii)   **E-Yantra Robotics Competition** (eYRC) – 2013: Registrations: **6324,** Number of teams: 160, currently running.

    (iii)   Robotic kits distributed: **291.**

    (iv)   Workshops conducted: 44.

    (v)   Robotic kits distributed for participating in **e-Yantra Robotics Teacher Competition** (eYRTC): **155.**

    (vi)   eLSI – Pilot: Robotic labs at 16 colleges under Mumbai University were inaugurated.

    (vii)   eLSI– regional (current): 6 regions identified with around 60 colleges participating to set up labs.

Percentage (%) Achievement   : 100 %

Total Fund approved by PAB   : Rs 2.0603 Crores.

Fund Released till now   : Rs.1.85 Crores.

Fund Proposed to be released : Rs.0.2061 Crores.

4.4   **Project**   **:**   **FOSSEE: Assimilation of Open Source Software in Science and Engineering Education.**

   PI   **:**   **Prof. Prabhu Ramachandran.**

   Institute   **:**   **IIT Bombay**

Deliverables as per DPR:

Item	2010	2011	2012	Total
Video Courses	1.5	2.5	4	8
E-Books	0	1	2	3
Workshop	1	3	4	8
Conferences	1	1	1	3

Achievements so far:

- (i)   55 Live Workshops 117
- (ii)   100 Textbook Companions * 261
- (iii)   40 Spoken Tutorials * 77
- (iv)   6 Conférences
- (v)   5 Course Conversions * 5
- (vi)   Lab Migration * 10 –
- (vii)   SELF Workshops * 780
       (* Not present in original DPR; proposed during SC meeting held in February 2012)

Percentage (%) Achievement   **: More than 100%**

Total Fund approved by PAB   **: Rs 3.1850 Crores.**

Fund Released till now   **: Rs. 2.55 Crores.**

Fund Proposed to be released **: Rs. 0.6350 Crores.**

4.5   Project   :   e-kalpa: Creating Digital Environment for Design in India.

PI   :   Prof. Ravi Poovaiah.

Institute   :   IIT Bombay.

Deliverables as per DPR:

(i)   Digital on line content for learning design with distance e-learning.
(ii)   Social networking for higher learning with collaborative learning space for design for synchronous & Asynchronous interaction.
(iii)   Digital design resource database including the craft sector.
(iv)   Design inputs for products of national mission in education through ICT.

Providing digital online content for design and a social networking environment for design and higher learning. Creating a digital resource database on design and providing design inputs for various products developed under this Mission.

The Overall objective is the creation and development of new learning environments related to design that will provide greater access and enhancement to acquisition of critical   knowledge, skills, and abilities for economic and social development.

Achievements so far:

(i)   All the contents aimed for in the committed duration of December 2010 to March 2013 have been met   and the content uploaded at the following website. Name of Website: WWW.Dsource.in.

➢ It was launched 18 months back
➢ 15.0GB of content has been uploaded
➢ The site has 10000 page views per day
➢ Approximating 300,000 page views per month
➢ With 30% return viewers
➢ The viewer spends an average of 10 minutes
➢ There are 1600 face book fans.

(ii)   Contents: The site contains

➢ 60 Courses on Design Learning in different domains (additional 30 courses to be added soon)
➢ 180 Resources in the form of fine examples of Design and crafts.
➢ 70 Case studies of Design Projects undertaken by professionals and design students.
➢ 35 Video lectures and presentations by subjects experts
➢ 420 case examples of a visual Gallery that has documented works of the rich tradition of art and design seen across different regions of India.

% Achievement:

a. Design Courses.	60 Courses	90 Courses (150%)
b. Resource documentation of fine examples of Design, crafts and arts + Workshops with Experts.	120 topics	150 topics (125%)
c. Video Lectures of eminent designers and case studies.	40 lectures	40 lectures (100%)
d. Case Studies of good design projects by professions and students.	70 topics	70 topics (100%)
e. Documentation of design process and examples of design from around the country each in 12 images x12 words.	240 topics	360 topics (150%)

Total Fund approved by PAB   : Rs 8.48 Crores.

Fund Released till now   : Rs. 6.00 Crores.

Fund Proposed to be released : Rs. 2.48 Crores.

4.6   Project   :   E-content generation and e-skilled test in specialized area of Information Technology.

PI   :   Sri V. K. Sharma.

Institute   :   C-DAC, NOIDA.

Deliverables as per DPR:

(i)   The main objective of the project is Development of e-content (26 courses) and e-skill test for the following specialized programme of information technology :

➢ Geographical Information Systems & Remote Sensing (GIS & RS)

➢ Advanced Software Design and Development (ASDD)

➢ Systems & Database Administration (SDA)

➢ Information Security Application Development (ISAD).

Achievements so far:

(i)   Curriculum Development and review of 26 courses completed and hosted on the project portal.

(ii)   13 courses developed and released to the public.

(iii)   Remaining 13 courses are in different stages of development.

Percentage (%) Achievement   : 100%

Total Fund approved by PAB   : Rs 1.82 Crores.

Fund Released till now   : Rs. 1.644 Crores.

Fund Proposed to be released : Rs. 0.18 Crores.

4.7   Project   :   Benchmarking of ICT Modules in Physics & Chemistry.

PI   :   Prof. R. K. Thareja,
Prof. G Ramanathan.

Institute   :   IIT Kanpur.

Deliverables as per DPR:

(i)   Under NMEICT 4 quadrant approach (4Q-approach) has been envisaged to integrate the various disjointed but successful efforts across the country by building synergies between them. To meet this objective, the project proposes a concept map for creation of all the four quadrants to provide for benchmarks in the subjects of Physics and Chemistry. The proposal intend to integrate various methods such as the NPTEL, Online Classrooms, Web content generation, virtual classrooms, simulations, guest lectures besides conventional blackboard teaching, and provide benchmarking standards that will help in sharing and exchange of all material these across the country on a common platform.

Achievements so far:

(i)   17 courses in Physics and 13 courses in Chemistry.

(ii)   The PPTs reflecting the notes in Quadrant 1 are hyperlinked to wikitext at appropriate places. Similarly, quadrant 3 and 4 are included as per the requirement of particular course. After uploading on the wiki, the content is being sent to reviewers to ensure that content should be at PG level and should be among the taught courses at universities. It is ensured that the course structure and evolution is logical. Following this procedure, the contents for seven courses in Physics and three in Chemistry have been completed in all respect.

(iii)   The project website is now in public domain on following link http://ictwiki.iitk.ernet.in/wiki/index.php/Main Page, where all the content is accessible to interested ones.

Total Fund approved by PAB   : Rs 2.02 Crores.

Fund Released till now   : Rs. 1.01 Crores.

Fund Proposed to be released : Rs. 1.01 Crores.

Item No.5

Budget Estimate for TSG-EdCIL & Mission Secretariat of NMEICT for the Financial Year 2013-14.

The Department of Higher Education, Ministry of HRD has entered into a Service Agreement with EdCIL (INDIA) Limited to establish & maintain a Mission Secretariat for the National Mission on Education through Information and Communication Technology (NMEICT). The Mission Secretariat comprises of a Technical Support Group (TSG-EdCIL), Consultants and the Support Staff dedicated to the Scheme.

The TSG-EdCIL has engaged Consultants and dedicated Support Staffs for the Mission Secretariat to facilitate the Bureau of Department of Higher Education, MHRD for implementation of the Scheme. These Consultants of Mission Secretariat provides technical support to the Bureau.

The TSG-EdCIL maintains and supports the Mission Secretariat besides also facilitates to organize Dissemination Workshops & meetings viz. *National Apex Committee, Project Approval Board, Standing Committee, DTH Committee, Implementation-cum-Monitoring Committee & all other meetings under NMEICT Scheme* and also makes on the spot payments for Travelling Allowance/ Honorarium to the members/invitees/experts/participants of these workshops/ meetings.

The Budget Estimate for the TSG-EdCIL & Mission Secretariat of NMEICT for the year 2013-14 has been estimated out through a consultative process for a total amount of ₹ 367.09 lakhs including Non-recurring Expenditure of ₹ 31.53 lakhs, Recurring Expenditure of ₹ 250.06 lakhs and EdCIL's overhead & Service Charges of ₹ 40.12 lakhs, except relocation of office premises, refurbishing, renovation, rental, security, electricity, water charges maintenance, housekeeping for the proposed new office premises of Mission Secretariat, etc as per the details enclosed at Appendix. At present, Service Tax is @12.36% on total expenditure (non-recurring, recurring & EdCIL's overhead & Service Charges). Service Tax will be leviable at the applicable rates, on actual total expenditure.

For the NMEICT, the Service Agreement between Department of Higher Education, MHRD & EdCIL (India) Limited is different from the Service Agreement of other TSG's supported by EdCIL [Sarva Shiksha Abhiyan (SSA), Rastriya Madhtyamik Shiksha Abhiyan (RMSA), Mid-day Meals (MDM), Teachers Education (TE) & National Literacy Mission Authority (NLMA) & National Project Implementation Unit (NPIU)]. In case of present Service Agreement between Department of Higher Education, MHRD & EdCIL (India) Limited for NMEICT Project, the salary and allowance of EdCIL's TSG is being loaded to the Project with 5 % Service Charges on all the other expenditure. The reason for this arrangement was anticipation of higher turnover for the TSG-NMEICT. Since inception, NMEICT posted turnover of ₹ 83.55 lakhs for 2009-10, ₹ 1.59 crores for 2010-11, ₹ 1.64 crores for 2011-12 and ₹ 2.02 crores for 2012-13. Also, the present Service Agreement has no validity period and certain aspects need review on account of audit observation during the years. These aspects were also brought to the notice of Mission Bureau from time to time by EdCIL.

The Service Agreement of other similar TSGs both under School Education (Sarva Shiksha Abhiyan (SSA), Rastriya Madhtyamik Shiksha Abhiyan (RMSA), Mid-day Meals (MDM), Teachers Education (TE), National Literacy Mission Authority (NLMA) & Higher Education National Project Implementation Unit (NPIU) supported by EdCIL have undergone revisions from time to time. During the year 2013-14, all the service Agreements are being revised based on the new Service charges payable to EdCIL as concurred by IFD, MHRD. As there is a need to synchronize EdCIL's Service Charges for all MHRD projects and also to bring clarity on certain aspects of agreement clauses, a revised Agreement in line with other TSG have been proposed to the Mission Director (NMEICT) on 5th September, 2013.

The proposed Service Agreement for NMEICT with revised fee structure has been drafted on the lines of existing TSG-Teacher's Education, which has been duly vetted and signed by MHRD. The proposed Agreement does not load the salaries of EdCIL's TSG-NMEICT Staff on the Project and as such synchronized Service Charges has been adopted in the Budget Estimate.

Permission is also sought in respect of re-allocation of expenditure under the budgeted heads of the aforesaid Budget Estimate.

The un-utilized funds, if any, will be carried over to the next financial year to meet the expenses on activities of TSG –EdCIL & Mission Secretariat of NMEICT.

The Budget proposed for the year 2013-14 for the TSG-EdCIL & Mission Secretariat of NMEICT is well within the overall ceiling of 1% of the total outlay fixed for the Project.

The Project Approval Board (PAB) is requested to ratify the "Budget Estimate" of ₹ 367.09 lakhs for the Mission Secretariat for the year 2013-14 as the same has been approved by Secretary, HE & Chairman, PAB and consider to release 1st installment of ₹ 183.55 lakhs (being 50% of the total Budget) after adjusting the unspent amount available with EdCIL.

Budget Estimate for TSG-EdCIL/Mission Secretariat of NMEICT for the Financial Year 2013-14.

S. No.	Description of the Item	Total Cost (₹ In lakhs)
I)	**NON-RECURRING EXPENDITURE**	
Office Expenses		
A	Office Expenses - Procurement of IT items & Mobile Phones	15.65
B	Office Expenses - Procurement of Softwares	2.00
C	Office Expenses - Procurement of Office Equipment	4.20
D	Office Expenses - Procurement of Furniture	9.68
	Sub-total *(Non-recurring expenditure)*	**31.53** ....(I)
II)	**RECURRING EXPENDITURE**	
A	Professional Services- Recruitment of Consultants & Support Staff	8.00
B	Salary & Wages	34.96
C	Over Time Allowance	1.50
D	Professional Services	59.20
E	Domestic Travel Expenses	41.50
F	Other Administrative Expenses	52.50
G	Publications	25.00
H	Office Expenses	27.40
	Sub-total *(Recurring expenditure)*	**250.06** ....(II)
	Total *[Non- recurring expenditure(₹31.53)+Recurring expenditure (₹ 250.06)]*	**281.59** ....(a)
	Lumpsump Provisions Contingency on (a)	5.00
	Total	**286.59** ....(b)
	EdCIL's Overheads & Service Charges @14% on (b)	40.12
	Total Expenditure	**326.71** ....(c)
	Add; Service Charges @12.36% on (c)	40.38
	Grand Total	**367.09**

Detailed Budget Estimate for TSG-EdCIL & Mission Secretariat of the NMEICT for Financial Year 2013-14.

S.No.	Description of Item	Qty. (Nos.)	Unit Cost	Total Cost (₹ In lakhs)
I)	**NON-RECURRING EXPENDITURE**			
A	**Office Expenses**			
1	Computer Desktops	10.00	0.50	5.00
2	Laptops [*Intel Xeon 3.0 GHz 5450 Processor (server for connectivity with computers & laptops for accessing Internet & for back-up data, etc*] & Mobile Phones.	5.00	0.61	3.05
3	Hard-disk to maintain backup support	5.00	0.10	0.50
4	Modem for internet connection	2.00	0.05	0.10
5	Networking for 48 Ports / LAN Cabling, Switches, Rack other related work for Computers, Servers, etc.	1.00	2.00	2.00
6	UPS 1/5 KVA for Power Back-up for Computers & Printers, etc.	10.00	0.08	0.80
7	**Office Expenses** - Procurement of Printers			
i)	Network Printer (Heavy Duty)	6.00	0.45	2.70
ii)	Black & White Laser Jet Printer	6.00	0.25	1.50
	Sub-total			**15.65**
	..........C/o to I (A) of Appendix			
B.	**Office Expenses** - Procurement of Softwares			
1	Server 2008, MS Office 2007 & Anti Virus 40 users, etc.	L.S.	L.S.	2.00
	Sub-total			**2.00**
	............C/o to I (B) of Appendix			
C	**Office Expenses** - Procurement of Office Equipment			
1	EPABX System	1.00	1.50	1.50
2	ADF Scanner [HP/Samsung]	3.00	0.40	1.20
3	Shredders	2.00	0.25	0.50
4	Fax Machine	2.00	0.50	1.00
	Sub-total			**4.20**
	............C/o to I (C) of Appendix			
D.	**Office Expenses** - Procurement of Furniture			
1	Executive Tables	2.00	0.20	0.40
2	Standard Tables	5.00	0.12	0.60
3	Executive Chairs	6.00	0.08	0.48
4	Staff Chairs	6.00	0.06	0.36
5	Visitor Chairs	2.00	0.05	0.10
6	Conference Table & Chairs	L.S.	L.S.	2.00
7	Heat Convectors	2.00	0.02	0.04
8	Refrigerator	1.00	0.20	0.20
9	Sofa Sets & Central Table	2.00	0.25	0.50
10	Canteen Items (Crockery & Utensils)	L.S.	L.S.	0.50
11	Video Conferencing Facility	1.00	3.00	3.00
12	Carpets	L.S.	L.S.	0.50
13	Internal Furnishings including Curtains, other items as per requirement on finalization of office accommodation.	L.S.	L.S.	1.00
	Sub-total			**9.68**
	........C/o to I (D) of Appendix			
	Total *(Non-Recurring Expenditure)*			**31.53**
	.... (I)			

S.No.	Description of Item	Qty. (Nos.)	Unit Cost	Total Cost (₹ In lakhs)
II)	**RECURRING EXPENDITURE**			
A.	**Professional Services-** Recruitment of Consultants & Support Staff			
1	Release of recruitment advertisement on All India basis in leading dailies.	L.S.	L.S.	5.00
2	Expert Fee/Honorarium for Resource persons for the Interview, travel expenses of the applicants & local conveyance etc.	L.S.	L.S.	3.00
	Sub-total (A)			**8.00**
	...........C/o to II (A) of Appendix			
B.	**Salary & Wages**			
	Salary & Wages Support Staff Category-I, II & III for the Bureau, Mission Secretariat.	-	-	34.96
	Sub-total (B)			**34.96**
	...........C/o to II (B) of Appendix			
C.	**Over Time Allowance**	L.S.	L.S.	1.50
	Sub-total (C)			**1.50**
	...........C/o to II (C) of Appendix			
D.	**Professional Services** - Mission Secretariat			
	Professional Services for Mission Secretariat- Senior Consultants/ Consultants/Junior Consultants for the Bureau, Mission Secretariat & TSG-EdCIL.	-	-	59.20
	Sub-total (D)			**59.20**
	...........C/o to II (D) of Appendix			
E.	**Domestic Travel Expenses**			
	Domestic Travel Expenses - Travel Expenses, Conveyance Allowance during tour, Boarding, Lodging, Resource Persons, Experts, Bureau Officials & TSG-EdCIL Official/Staff for Visit / Field Visit, etc.	100	0.40	40.00
	Local conveyance, etc. for Consultants/ Support Staff, Sakshat Portal Team & TSG-EdCIL as per applicability	L.S.	L.S.	1.50
	Sub-total (E)			**41.50**
	...........C/o to II (E) of Appendix			
F.	**Other Administrative Expenses**			
	Meetings/Seminars/Workshops including venue expenses, videography/ photography, etc as per requirement.	15.00	3.50	52.50
	Sub-total (F)			**52.50**
	...........C/o to II (F) of Appendix			
G.	**Publications**			
1	Printing of Brochures/Reports/ Newsletter/ Leaflets/Flyers & other printing jobs viz. letter heads, visiting cards& other document	L.S.	L.S.	25.00
	Sub-total (G)			**25.00**
	...........C/o to II (G) of Appendix			
H.	**Office Expenses**			
1	Pantry Services	L.S.	L.S.	0.50
2	Electricity & Water Charges	L.S.	L.S.	2.00

S.No.	Description of Item	Qty. (Nos.)	Unit Cost	Total Cost (₹ In lakhs)
3	Telephone, Fax & Internet charges including Data Card & DTH Connections	L.S.	L.S.	3.00
4	Office Stationery (consumables)	L.S.	L.S.	3.00
5	Postal charges	L.S.	L.S.	3.00
6	Newspaper, Magazine, CD, etc.	L.S.	L.S.	2.00
7	Photocopying & Binding charges	L.S.	L.S.	2.00
8	Legal & Audit Expenses	L.S.	L.S.	0.50
9	Vehicles for Bureau, Mission Secretariat & TSG-EdCIL for NMEICT activities (Innova/Swift/Indigo/Indica, etc. – average hiring charges on monthly basis)	2.00	0.35	8.40
10	Repair & Maintenance expenses including AMC charges	L.S.	L.S.	3.00
	Sub-total (H)			**27.40**
			..........C/o to II (H) of Appendix	
	Total *(Recurring Expenditure)*			**250.06** .....(II)
	Total *[Non- recurring expenditure(₹31.53)+Recurring expenditure (₹ 250.06)]*			**281.59** .....(a)
	Lumpsump Provisions Contingency on (a) above			5.00
	Total			**286.59** ......(b)
	EdCIL's Overheads & Service Charges @ 14% on (b)			40.12
	Total Expenditure			**326.71** ......(c)
	Add : Service Tax @12.36 on (c)			40.38
	Grand Total			**367.09**

Item No.6

Amendments to the Budget Estimate of Mission Secretariat of NMEICT for the financial year 2012-13 of NMEICT.

The "Budget Estimate" for the financial year 2012-13 for TSG/Mission Secretariat of NMEICT as proposed & put up for consideration by Project Manager (NMEICT) on 07.05.2012, for which concurrence was accorded by then Additional Secretary (TEL) & Mission Director (NMEICT) on 18.05.2012 (Page: 11/F-A) and presented as an Agenda Item for its approval to Project Approval Board (PAB) in its 24th meeting held on 04.10.2012 was for ₹ **391.81 lakhs** [*Non-recurring expenditure: ₹ 54.01 lakhs + Recurring expenditure : ₹ 319.14 lakhs = ₹ 373.15 lakhs + EdCIL's Overhead & Service Charges @ 5% = ₹ 18.66 lakhs = ₹ 391.81 lakhs*].

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The intent was to seek approval of the Budget Estimates for 2012-13 for TSG/Mission Secretariat of NMEICT for ₹ **3.91 crores**, however due to inadvertent typographical slippage, the same was typed as ₹ **3.19 crores**, erroneously in the Minutes of 24th meeting of Project Approval Board (PAB) held on 04.10.2012.

It is proposed that the said amendments to the Budget Estimate in the form of Corrigendum (Annexure - III) be uploaded on Sakshat Portal along with the Minutes of 24th meeting of the Project Approval Board (PAB), as all the Minutes of NMEICT Project including that of Project Approval Board (PAB) are available (uploaded) on Sakshat Portal (http://sakshat.ac.in/).

Submitted for favour of information of PAB.

CORRIGENDUM

To 24th Minutes of the Project Approval Board of NMEICT held on 04.10.2012.

Item No.	Typed As	To be Read As
11.	**Budget Estimate for 2012-13 TSG/Mission Secretariat of NMEICT** The PAB members were informed that the Budget proposed on this for the year 2012-13 for the Mission Secretariat is well within the overall ceiling of 1% of the total outlay fixed for the project. It was also informed that funds on this are released on EdCIL on actual expenditure basis. The PAB approved overall budget expenditure of up to ₹ **3.19 crore** for the Mission Secretariat for the year 2012-13 as per budget estimates provided.	**Budget Estimate for 2012-13 TSG/Mission Secretariat of NMEICT** The PAB members were informed that the Budget proposed on this for the year 2012-13 for the Mission Secretariat is well within the overall ceiling of 1% of the total outlay fixed for the project. It was also informed that funds on this are released on EdCIL on actual expenditure basis. The PAB approved overall budget expenditure of up to ₹ **3.91 crore** for the Mission Secretariat for the year 2012-13 as per budget estimates provided.

49

File No.NMEICT(MS)/PAB/25
Government of India
Ministry of Human Resource Development
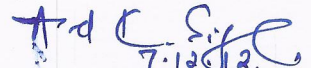Department of Higher Education

Dated the 7th December, 2012

To

All Members of the Project Approval Board
 of National Mission on Education through Information
& Communication Technology

Subject: Minutes of 25th meeting of the Project Approval Board (PAB) of NMEICT held on 6th November, 2012

Sir/Madam,

Enclosed please find Minutes of 25th meeting of the Project Approval Board of NMEICT held on 6th November, 2012 at 3:00 P.M. at Shastri Bhawan, New Delhi under the Chairmanship of Secretary (HE), Ministry of Human Resource Development, Government of India, New Delhi for necessary action.

Yours faithfully,

(A.K. Singh)
Director (ICT) &
Nodal Officer (NMEICT)
Tel # 011- 2338 4276

Encl :aa

Copy to:

1. PSO to Secretary (HE)

2. PS to AS(TEL)

3. PS to JS&FA

4. US(TEL)

50

Project Approval Board of National Mission on Education through Information and Communication Technology (NMEICT)
List of Members

S.No	Name, Designation and Address
1.	Secretary, Department of Higher Education, Ministry of Human Resource Development, Shastri Bhawan, New Delhi **Chairperson**
2.	JS & Financial Adviser, Department of Higher Education, Ministry of Human Resource Development, Shastri Bhawan, New Delhi
3.	Secretary, Planning Commission, Yojana Bhawan, New Delhi-110001
4.	Secretary, Department of Telecommunications, Sanchar Bhawan, New Delhi-110001
5.	Secretary, Department of Information Technology, Ministry of Communication and Information Technology, CGO Complex, Lodhi Road, New Delhi-110001
6.	Secretary, Department of Space, Lok Nayak Bhawan New Delhi-110001
7.	Dr. A.Mukhopadhyay Adviser/Scientist 'G', SERC Division, M/o Science & Technology, D/o Science & Technology, Technology Bhawan, New Delhi-110016
8.	Director, Indian Institute of Technology, Powai, Mumbai - 400076
9.	Director, Indian Institute of Technology, Roorkee-247667 Uttrakhand
10.	Director, Indian Institute of Technology, North Guwahati Guwahati-781039 Assam

S.No.	Name, Designation and Address
11.	Director, Indian Institute of Technology, P.O. Kharagpur -721302
12.	Director, Indian Institute of Technology, P.O. IIT Chennai Chennai -600036
13.	Director, Indian Institute of Technology, Kanpur-208016 UP
14.	Director, Indian Institute of Science, Bangalore-560012 Karnataka
15.	Director, Indian Institute of Technology, Hauz Khas New Delhi-110016
16.	Vice-Chancellor, Indira Gandhi National Open University (IGNOU), Maidan Garhi, New Delhi
17.	Vice-Chancellor, North Eastern Hill University (NEHU), Shillong
18.	Vice-Chancellor, Visvesvarya Technological University, Belgaum- 590018
19.	Shri R.P. Agrawal 31 Greenwood Society Phase-II Sector –Omega I Pocket P-2 Greater Noida-201308
20.	Prof. U.B.Desai Director IIT Hyderabad Ordnance Factory Estate, Yeddumailaram- 502205 Hyderabad Andhra Pradesh
21.	Prof. M.K.Surappa Director IIT Ropar Nangal Road, Rupnagar (Ropar) Punjab 140001

S.No.	Name, Designation and Address
22.	Prof. Sudhir K. Jain Director **Indian Institute of Technology Gandhinagar** Vishwakarma Government Engineering College Complex, Chandkheda, Visat-Gandhinagar Highway, Ahmedabad -382424 (Gujarat)
23.	Prof.Prem K. Kalra Director IIT Rajasthan **IIT Rajasthan Camp Office** **Department of Computer Science & Engineering** **MBM Engineering College** **JODHPUR - 342 011**
24.	Prof. Madhusudan Chakraborty Director, IIT Bhubaneshwar Office of the Director Indian Institute of Technology Bhubaneswar Samantapuri (Rearside of Hotel Swosti Plaza) Nandan Kanan Road Bhubaneswar-751 013
25.	Prof. Anil.K.Bhowmik Indian Institute of Technology Patna Navin Government Polytechnic Campus Patliputra Colony Patna 800 013
26.	Shri Pramod Bhasin Chairman, National Association of Software and Services Companies (NASSCOM), International Youth Centre Teen Murti Marg Chanakyapuri New Delhi 110 021
27.	Dr. Ajay Khare Director School of Planning & Architecture, Transit Campus: Sports Complex, MANIT, Bhopal-462051
28.	Prof. S.G.Deshmukh Director IIIT Gwalior Morena Link Road, Gwalior 474 010
29.	Dr. M.D.Tiwari Director IIIT Allahabad Deoghat, Jhalwa Allahabad

MINUTES OF THE 25TH MEETING OF PROJECT APPROVAL BOARD OF NATIONAL MISSION ON EDUCATION THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY (NMEICT) HELD ON 6TH NOVEMBER 2012 AT 3.00 P.M. IN CONFERENCE ROOM (FIRST FLOOR), CSL LIBRARY BUILDING, SHASTRI BHAWAN, OLD RAJENDRA PRASAD ROAD, NEW DELHI

The 25th Meeting of the Empowered Committee of Experts (Project Approval Board) (PAB) of National Mission on Education through Information and Communication Technology (NMEICT) was held on 6th November, 2012 at 3.00 p.m. in Conference Room, Central Secretariat Library (CSL) Building, Shastri Bhawan, New Delhi under the Chairmanship of Secretary, Department of Higher Education, Ministry of HRD.

The list of participants is at **Annexure.**

Additional Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB welcomed all the participants. Thereafter agenda items were discussed and following decisions were reached:

Item No.1
Confirmation of the Minutes of the 24th Meeting of Project Approval Board

Additional Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB, invited observations from the members on the "Minutes of the 24th Meeting of the PAB." Since no observations on the same were received, the "Minutes of the 24th Meeting of the Project Approval Board held on 4th October, 2012" were confirmed.

54

Item No.2

"Action Taken Report" on the Minutes of the 24th Meeting of PAB

Additional Secretary (TEL) and Mission Director (NMEICT) & Member Secretary requested all the members to give their observations and comments on the "Action Taken Report" on the Minutes of the 24th Meeting of the Project Approval Board held on 4th October, 2012.

Additional Secretary (TEL) and Mission Director (NMEICT) & Member Secretary mentioned that Study Centers of Open Universities should be similar to what we had considered for the Regional Centers and should be in conformity with the Madhav Menon Committee Report. The centers where actually some teaching is taking place should get the connectivity of 10Mbps. Due Diligence shall be done to identify 100 centers. It was further mentioned that as per the criteria, the strength of the students in those centers should be 5000 or more student's enrollment.

He apprised that for many of the projects not considered in the last meeting and requiring thorough consideration, financial due diligence has now been done. Thereafter, the said "Action Taken Report" was noted by PAB.

Item No.3
Intimation of "Financial Due Diligence of projects" earlier approved by PAB:
Talk to a Teacher (also known as Teachers empowerment, students empowerment, and integration of tools for empowerment – synchronous delivery) – Phase 2, PI: Kannan Moudgalya, D. B. Phatak and Somnath Sengupta Inst.: IIT Bombay and IIT Kharagpur

Additional Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB informed the members/participants that during the last PAB Meeting, the PAB had considered and approved the Talk to a Teacher project submitted by IIT Bombay. It was apprised that this project has a target of training at least 1,50,000

technical teachers in the country in a 3-year time-frame. At that time, members had agreed that this project has good deliverables and had requested PI to deliver the same in the shortest possible time.

Members had suggested that a financial due diligence should be done to ensure that the estimates were in order. It was brought to the notice of the PAB that for similar programs, AICTE provides (for 2 weeks training course) for each of the participants, a cost that is about 2.5 times higher than the cost indicated by PI for this project. Subsequently, PI had detailed discussions with IFD and Mission Secretariat. AS (TEL) also informed the PAB that during the discussions with IFD, it was found that the average cost per participant for a two weeks course in this project is estimated to be Rs. 6,500/- per teacher, out of which around Rs.4,000/- is for boarding/lodging, TA etc., the normative rates of which are fixed by Govt. of India. He also explained in depth that the Committee found that it was difficult to further compress the cost.

Additional Secretary (TEL) & Mission Director (NMEICT) further mentioned that as the milestones are reached in this project, funds will be released in phases as this is 3 years long project. It is estimated that for training 1,50,000 teachers over 3 year's period, it shall need 15 mega workshop of 10,000 teachers each. Since the workshops of this project would occupy the infrastructure for about 15 months out of three years, the infrastructure would be available for other programs for the balance time. It was suggested that as the methodology, the hub and spoke model and fully equipped remote centers would be available; other programs could make use of it. That way the fixed cost could be amortized over a wider base. But for this, boarding, lodging etc. will have to be borne by the university or UGC whoever is utilizing this training facility. It was also pointed out that the money that has been sanctioned is not going to the PI but to the IITs and will be spent as per the control systems in place at the IIT.

Additional Secretary (TEL) & Mission Director (NMEICT) informed that IIT Bombay should be requested to go ahead with the project as the job of teacher training is

important. Replying to a query he intimated that there is Project Review & Monitoring Committee which is constituted now almost for all the projects.

On the query regarding review of 10,000 Teachers programme, Prof. Kannan Moudgalya apprised the PAB that IIT Bombay has tied up with ISTE. There is a definite procedure that is being followed to evaluate the deliverables of the project. Cost comparison is made with QIP Programme of AICTE for training of teachers to teach a course. He further apprised that IIT Bombay had already conducted courses for training 10,000 teachers simultaneously. In first phase, they have trained 12,000 teachers and 1,50,000 teachers will be trained in the second phase. Prof. Kannan pointed out that it has been observed that this method allows women to participate in large numbers. He further informed that IIT Kharagpur has joined as a Partner and also stated that they were trying to develop ten nodal centers equivalent to the level of IITs for training infrastructure for conducting the programme.

Additional Secretary (TEL) & Mission Director (NMEICT) stated that it was needed to train all the technical teachers in the country and also said that we do not have enough resources to spend large amount of money to train each and every teacher in the country using conventional techniques. If others could join, they were welcome to contribute.

Chairman, PAB apprised the members that all the issues being discussed were discussed in the last PAB meeting itself, and after a long discussion the project was approved. He stressed upon the need to use the created infrastructure effectively.

PAB further deliberated and opined that it is a good programme; it should be monitored and popularized properly. Report should be submitted to the PAB from time to time as to know what is going on in this programme.

57

Additional Secretary (TEL) & Mission Director (NMEICT) also stressed the need to ensure optimal utilization of the infrastructure. He suggested that we should try and synergize with National Teachers Training Mission. PAB further observed that after training teachers we should have mechanisms to test whether they have become more effective or not.

Chairman, PAB reiterated that in the long run we need to develop a model which is self-sustaining through a corpus created from the savings accruing to the organizations carrying teachers training programs by adopting this technique. A separate meeting in this regard required to be done with UGC, AICTE, NCTE, National Mission on Teachers and Training and other partners. Chairman PAB also said that the funds should be released depending upon the progress of the Project.

PAB noted that the project stood approved with the modified budget of Rs. 192 Crores.

Item No.4

4.1   E-content generation in 17 subjects in Electronics and Communication using Learning-by-doing (or 'butterfly') model by Prof. Sandhya Kode and Prof. Kannan Srinathan, IIIT Hyderabad.

PI of the Project Prof. Sandhya Kode intimated the PAB that they, the PIs have executed the pilot project for 3 courses. These courses have been used by 150 teachers who are trained and it has been received well by the teachers. Those Teachers had gone back and were training students also. All this was through learning by doing mode in which the idea was that concepts were to be learnt by doing rather than by simply spending a lot of time on lectures only. In the proposed project, PI proposed to take up 17 courses.

58

Prof. Mangal Sunder, IIT Madras explained how these courses were different from NPTEL programme. He apprised that these were complimentary learning models and both NPTEL and these models could co-exist nicely. Different models of learning need to be built at the same time keeping in view the strength of students in the technical education. There were sufficient learning materials for every learner in both the models. The members were informed that through NPTEL model teachers are offered lectures; while on the other hand, learning by doing would be a self-sustaining programme.

The PI of the Project Prof. Sandhya Kode informed that the Washington Accord requires certain setting of objectives on which lessons shall be mostly built and on this the PI shall co-ordinate with Prof. Ray to bring in the pedagogy while creating the Courses.

Prof. Mangal Sunder further informed that there was a larger number of under graduates and post graduates students who chose different styles of learning. Those who wanted to learn by examples might pick up this model and those who were interested in learning quickly through lectures might go to NPTEL or any other site. There is sufficient learning for every level of cognitive ability of student.

After detailed deliberation PAB opined that alternative should be made available to the students. Some students might like to approach the subject through learning by doing and some other students may listen to the lecture and also benefit out of it. Since the PI would be creating an alternative for the students, it must be welcomed. But at the same time, it must be ensured that the PI was not repeating the same Courses as already undertaken by the NPTEL. PI should ensure that the work done under this project is synergized with NPTEL. Retired people who are academically good should be roped into the project, so that the country benefits; further the 17 subject proposed to be developed should cover entire gamut of the subject.

59

Based on the recommendations of the Standing Committee, the PAB approved this project at an estimated amount of Rs.119 Lakhs for development of 17 courses and suggested that the PI should ensure not to repeat the NPTEL course. The uniqueness proposed in this course should be maintained.

4.2. Developing suitable Pedagogical methods for various classes, Intellectual Calibers and Research in e-learning, PI: Prof. Anup K Ray, Anchor Institution: IIT Kharagpur, Control No: ARE 04061212597

Prof. A.K. Ray, PI of the project made a detailed presentation on the project developing suitable pedagogical methods. PAB was apprized that in this project curriculum content was being re-written keeping in view the changing 21st century needs. Queries were raised by the member participants about its linkages to NPTEL/Washington Accord and the rates at which that was to be done. It was clarified by the PI that every course had a learning strategy. NPTEL is one good course material; there are other course materials also. The PI added that there are 200 UG level courses, two to three faculties (teaching these courses) and 2 reviewers are involved. On a specific query, the PI clarified that there is a Contract Document signed by the faculty that they (faculty) are not violating any of the IPRs.

The PAB told the PI that pedagogy is important but at the same time as an outcome of this project benefit to the learners at the Government institutions and other educational institutions specially the technical ones should be kept in mind. Washington Accord is also equally important for us to get in, so we should involve NBA and Washington Accord people also so that they also offer their comments on it. Prof Ray assured that he will follow on this.

After detailed deliberation, PAB approved this project and the budget of Rs.16.00 Crores based on the recommendation submitted by the Standing Committee, NMEICT.

60

4.3   E-Resources for Geo-Informatics Applications, Education and Training, PI: Prof. Mrs. Venkatachalam, Head, CSRE, IIT Bombay with several Co-PIs, Inst: IIT Bombay representing 12 institutions, Control no: HE-11081011220

In the absence of the prospective PI, Prof. Kannan, IIT Bombay explained the rationale behind the project. The financial cost breakups were sought for the project, but it they were not available readily. Chairman, PAB expressed his strong displeasure for not reflecting the cost breakups for the project. Chairman, PAB categorically stated that financial cost breakups should be put up cogently, whenever new proposals are presented for approval to PAB. Chairman, PAB also advised more details should be provided for the new proposals being put up for consideration of PAB.

PAB advised that the cost breakups for this project be presented in its next meeting.

4.4.   Digital Literacy and Empowerment of Teachers in ICT PI: Dr. Abhijeet Singh, Banaras Hindu University, (Control No. DMI04091212722)

The proposal could not be discussed since the Project Investigator (PI) was not present in the meeting.

Item No.5

Setting up of Teaching ends at leading Institutes in the Country for generation of Content for 50 DTH Educational Channels under NME-ICT

The PAB noted the progress on the DTH Project, that has taken place under the Chairmanship of Prof. S.V. Raghavan, Scientific Secretary, office of the Principal Scientific Adviser to the Government of India, and the 8th DTH meeting held on October 25, 2012, wherein a summary Proposal received from Director, IIT

61

Madras, for creating 153 Teaching Ends (TEs) on 24X7 basis to support 50 DTH channels, under NMEICT was discussed and a modified proposal on this was submitted to the PAB.

PAB noted the Non-Recurring budget requirement on account of establishment of 153 TEs etc., at various leading institutes in the country, from where (from each TE), on an average about 2 Hours and 40 minutes a day, live lectures with live interactivity shall be generated and for this an amount of Rs.197.77 Crores shall be required for the remaining 4 years of the XIIth Plan.

The Board also noted the Recurring budget requirement on account of Generation of Live Content & Live interactivity from the students across the country etc., and for this an amount of Rs.374.96 Crores shall be requires for remaining the 4 years of the XIIth Plan, wherein approximately 7300 Courses shall be generated.

The PAB deliberated and in principle approved the Recurring & Non-Recurring budget proposed for running a **'Pilot Project for running 50 DTH Channels'**, however the funds on this can be released only on receipt of the NoC from MI&B which could lead to WPC/NOCC/SACFA clearances from Ministry of Communication and IT is to uplink the DTH signals by the MHRD institutions.

The Members deliberated and felt that since the MHRD DTH project is required to involve a large number of institutions on a regular basis and further software and hardware networking on a large scale is required, it was recommended that for all this a Special Purpose vehicle (SPV) shall be required and in the first instance we may find out an existing institute that shall act as SPV for DTH, however in case an existing institution(s) is/are not able to take up the activities, we may in that case create a SPV for the DTH.

Chairman, PAB stressed that there was a need to have discussion with UGC and AICTE, for the suggested framework by which all the institutions will be in a position to work together. Additional Secretary (TEL) and Mission Director

62

(NMEICT) & Member Secretary, PAB mentioned that PAB would be informed about its institutionalization. All these will be subject to clearance of our license by the Ministry of I&B.   Unless we have the license there is no point in investing money. The PAB meanwhile felt other activities on DTH programme should continue as per DTH Committee recommendations

Item No.6
Re-constitution of Standing Committee

PAB authorized the Chairman to take decision in the matter.

Presentation:

Server Committee

Prof.Huzur Saran of IIT Delhi gave a presentation on the Server Committee.

Table Agenda
List of sanctioned projects where Progress is Slow

The list of sanctioned projects where progress is slow was noted by PAB.

The meeting ended with a Vote of Thanks to the Chair.

ATTENDANCE OF THE 25ᵗʰ MEETING OF PROJECT APPROVAL BOARD OF NATIONAL MISSION ON EDUCATION THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY HELD ON 6ᵀᴴ NOVEMBER 2012 AT 3.00 P.M. IN CONFERENCE ROOM (FIRST FLOOR), CSL LIBRARY, SHASTRI BHAVAN, DR. RAJENDRA PRASAD ROAD, NEW DELHI

S.No.	Name, Designation and Address	Phone No., Fax and Email
1.	Shri Ashok Thakur Secretary (HE) MHRD, Shastri Bhawan, **Chairperson** New Delhi	
2.	Shri. N.K.Sinha Additional Secretary(TEL) & Mission Director (NMEICT) Department of Higher Education, MHRD, Shastri Bhawan, New Delhi	23387781 nksinha.edu@nic.in
3.	Shri A.K. Singh Director (ICT) Ministry of Human Resource Development, Department of Higher Education, Shastri Bhawan New Delhi	anandsingh.edu@nic.in
4.	Shri Ashok Nakra Director-Technical Room No.1004, Sanchar Bhawan, New Delhi	011-23372575 9013137711 dirt_dot@nic.in
5.	Ms. P. Uma Lakshmi Deputy Manager-BSNL BSNL Bhawan, Janpath, New Delhi	011-23734029 9868272344 pumalakshmi2@gmail.com
6.	Prof. Uma Kanjilal Director, ACIL, IGNOU, New Delhi	011-29571716 9810488895 ukanjilal@ignou.ac.in
7.	Shri G. Panda Deputy Director IIT, Bhubaneshwar	09437048906 gpanda@iitbbs.ac.in
8.	Prof. Anil K. Bhowmick Director IIT, Patna	09771435882 director@iitp.ac.in

64

9.	Shri M.K. Surappa Director IIT, Ropar	
10.	Shri A.K. Arora Scientist `F' Deity, New Delhi	011-24363077 9968663077 arora@mit.gov.in
11.	Shri V.M. Gupta Scientist `D' NKNDW, Deity, New Delhi	011-24362115 Vm.gupta@nic.in
12.	Dr. Archana Thakur Deputy Secretary UGC, New Delhi	011-23236977 archana@ugc.ac.in
13.	Prof. Kannan Moudgalya IIT-Bombay Mumbai- 400076	09869326979 022-25767213 kannan@iitb.ac.in
14.	Prof. M.S. Ananth IISc., Bangalore	080-22933114 09008020743 ananth@iitm.ac.in
15.	Prof. S.V. Raghavan, Scientific Secretary, Office of the Principal Scientific Adviser to the Govt. of India	
16.	Shri Navin Soi Director (Finance) MHRD, Shastri Bhawan, New Delhi	
17.	Prof. Anup Kumar Ray IIT, Kharagpur	03222-282116 09434753375 09932675583 anuptng@gmail.com akray@cet.iitkgp.ernet.in
18.	Dr. C.S. Arora Senior Consultant, NMEICT	011-23389093 cs.arora@nmeict.ac.in
19.	Shri Sushil Prakash Senior Consultant – NMEICT	sushil.prakash@nmeict.ac.in 9212102222
20.	Shri Pradeep Kaul Senior Consultant, NMEICT	9868274690 kaulp@rediffmail.com
21.	Prof. K. Mangala Sunder Chemistry Department IIT-Madras Chennai – 600036	09444008706 mangal@iitm.ac.in

60

22.	Satyaki Roy Associate Professor Design Programme & Media Technology IIT, Kanpur Kanpur – 208016	0512-2594060 09793000770 satyaki@iitk.ac.in
23.	Dr. Surya Kiran Reddy Progamme Manager IIIT, Hyderabad Gachibowli, Hyderabad	09882009202 suryakiran@research.iiit.ac.in
24.	Dr. Sandhya Kode IIIT, Hyderabad Gachibowli, Hyderabad	09618945633 Sandhya.kode@gmail.com
25.	Shri Huzur Saran IIT, Delhi	9810111788
26.	Shri R.S. Mani Senior Technical Director NIC, A-Block, CGO Complex, New Delhi	011-24361609 9868209134 rsm@nic.in
27.	Shri Sunil Bareja Under Secretary Department of Higher Education MHRD, Shastri Bhawan, New Delhi	9838146060

Sl. No.	Subject/Agenda item	Decision of PAB	Action Taken
1.	Financial due diligence of "Talk to teachers" Project.	Create a model which is self sustaining. For this, a meeting with UGC, AICTE,NCTE and other partners to be conducted.	A Model will be worked out after conducting meeting with UGC, AICTE, NCTE and will be put in next PAB meeting.
2.	Approval of Project related to e- content generation for 17 subjects in E&C by IIIT Hyderabad.	PAB approved the project with estimated amount of Rs 119 lakhs.	The first instalment of Rs. 35.7 lakhs has been released to IIIT Hyderabad.
3.	Approval of Project related to developing suitable pedagogical methods of IIT Kharagpur.	PAB approved the project with estimated budget of Rs 16 Crores.	The first instalment of Rs. 4.63 Crores has been released to IIT Kharagpur.
4.	Approval of Projects related to development of e-content related to geo informatics by IIT Mumbai.	PAB advised the along with the cost break up, project may be put for the examination in the next meeting.	Mission Secretariat will scrutinize the proposal and will put before the next PAB.
5.	Approval of Project related to setting up of teaching ends for creating content for 50 DTH channels at the leading institution of the country.	1 PAB approved the project in principle, however observed that money may be released only after obtaining the NOC. 2 SPV may be formed with consultation with UGC and AICTE.	Actions are being taken to obtain NOC for Ministry of I&B and other related organization and for forming SPV. PAB will be apprised about the outcome in the next meeting.

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Appendix –III

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MISSION PROJECT

Deployment and Maintenance of Virtual labs

PART-I

Information relating to department/Institute

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1.	Name of Institute with complete address	:	Indian Institute of Technology, Delhi
2.	Title of the Research Project	:	Deployment and Maintenance of Virtual Labs
3.	Department/Broad Area	:	Inter-disciplinary (Science and Engineering)
4.	Major areas of research in the Department	:	The Participating Institutes cover most of the major areas of research in Science and Engineering.

5.   Names & Designation of Principal Researchers
in the major areas and list of publication during last
five years based on work done in the Department   :   Please see Annexure I

6.   Is it Inter-disciplinary Project ?   :   Yes

7.   Is it Inter-Institutional Project ?   :   Yes

8.   Is any Industry/User agency participating ?   :   No

9.   Brief of completed and or ongoing research projects supported by MHRD/AICTE in the
Department during last 5 years.   :   Please see Annexure I

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68

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PART-II

Information relating to department/Institute

10. PRINCIPAL INVESTIGATOR

a.	*Name*	:	*R. K. Shevgaonkar*
b.	Designation	:	Director, IIT Delhi
c.	Age	:	
d.	Educational Qualification	:	Ph.D.
e.	Areas of specialization	:	Signal Processing, Communications
f.	Experience (Teaching & Research)	:	Please see Annexure I
g.	Selected list of papers published	:	Please see Annexure I

CO-INVESTIGATOR

a.	*Name*	:	*Ranjan Bose*
b.	Designation	:	Professor, EE Department, IIT Delhi
c.	Age	:	42 Years
d.	Educational Qualification	:	Ph.D.
e.	Areas of specialization	:	Wireless communications
f.	Experience (Teaching & Research)	:	Please see Annexure I
g.	Selected list of papers published	:	Please see Annexure I

11. **In case it is a joint project with other Institution, research labs and industries, name(s) of participating investigators.**

The following is the list of participating investigators (see Annexure I for further details):

(a) Ranjan Bose	IIT Delhi	rbose@ee.iitd.ac.in
(b) Kantesh Balani	IIT Kanpur	kbalani@iitk.ac.in
(c) Santosh Noronha	IIT Bombay	noronha@che.iitb.ac.in
(d) P. Sriram	IIT Madras	sriram@ae.iitm.ac.in
(e) C.S. Kumar	IIT Kharagpur	kumar@mech.iitkgp.ernet.in
(f) Ratnajit Bhattacharjee	IIT Guwahati	ratnajit@iitg.ernet.in
(g) Vinod Kumar	IIT Roorkee	vinodfee@iitr.ernet.in
(h) Jayanthi Sivaswamy	IIIT Hyderabad	jsivaswamy@iiit.ac.in
(i) Krishnashree Achuthan	AmritaUniversity	krishna@amrita.edu
(j) Soami Satsanghi	Dayalbagh University	deiusic@gmail.com
(k) K V Gangadharan	NITK Suratkal	kvganga@nitk.ac.in
(l) Sudhir Agashe	COE Pune	sda.instru@coep.ac.in

12. **In case industry/user agency is participating, whether a MOU has been signed or letter of intent given.**
Not applicable

13. **Present commitments of the Principal Investigator:** Please see Annexure I.

14. **Other members of the Research Group to work on proposed Projects:**

Different faculty members from all the participating institutes will be involved for the development of the Virtual Labs

PART-III
About the Research Project

15. (a) Summary of the project (in brief)

Good lab facilities and updated lab experiments are critical for any engineering college. Physical distances and the lack of resources often make it difficult to perform experiments, especially when they involve sophisticated instruments. Also, good teachers are always a scarce resource. The Virtual Labs project addresses this issue of lack of good lab facilities, as well as trained teachers, by making remote experimentation possible. With the present day internet and computer technologies, these limitations no longer hamper students and researchers in enhancing their skills and knowledge. Also, in a country such as ours, costly instruments and equipment need to be shared with fellow researchers to the extent possible. Yet another objective is to arouse the curiosity of the students and permit them to learn at their own pace. This facilitates the absorption of basic and advanced concepts through remote experimentation. Internet based experimentation further permits use of resources – knowledge, software, and data available on the web, apart from encouraging skilful experiments being simultaneously performed at points separated in space. Specifically, the Virtual labs developed already provide the following:

(a) Access to quality labs to those engineering colleges that lack these lab facilities.
(b) Access to quality labs as a complementary facility to those colleges that already have labs
(c) A complete Learning management System around these labs
(d) Teacher-training and skill-set augmentation through workshops and on-site training.

In the First Phase of the Virtual Labs project, web-enabled experiments have been designed for remote operation and viewing. Over 50,000 students, (in approximately 150 colleges) have used the Virtual Labs and have provided user-feedback. The primary focus of the Second Phase of the Virtual Labs project is to reach out all potential users of Virtual Labs, in order to address the following issues:

- Lack of lab infrastructure in several engineering institutes and universities across the country
- Lack of equipments in institutes and universities
- Lack of quality engineering labs and lab experiments
- Lack of trained faculty members and manpower to conduct lab classes
- Inaccessibility of quality labs in rural parts of India
- Lack of a mechanism to centrally add or up-grade lab experiments

(b) Justification, importance of project, etc.

Over 100 Virtual Labs have already been developed and many of them are being used by various colleges. It is important to keep these labs in 'up and running' condition. Usage pattern of these labs show that these labs are increasingly used 'outside' the lab hours, which was one of the original motivations for this project. Based on the user-feedback, bugs need to be fixed. Currently, labs are undergoing extensive field testing.   'Limited deployment' of many of the virtual labs have also been carried out, where they are regularly used by colleges. The next logical step is to deploy these labs at a national level so that they reach all the engineering colleges that will benefit from them. This would mean taking the labs to the colleges present in urban areas as well as the rural region in India.   Based on the user-feedback, gap areas need to be identified and further virtual labs and lab experiments will have to be developed.   Currently, Virtual Labs have been developed in various institutes, on different platforms. Most of the labs are currently running on individual servers, or as standalone applications. Engineering effort is needed to propel the Virtual Labs to the next level where (a) they run from a common web framework and runtime environment, (b) they provide the user with a rich virtual lab environment with support for account management, persistence, fast turn-around time on the web, user-friendly interfaces, localization, etc. required to integrate the use of Virtual Labs with the academic and learning processes at the colleges.

(c) Details of the work already done by Principal Investigator in this area :

Please see Annexure I.

16.   **Total amount required:**   **Rs.** Fifty Six Crore, Twenty Three Lakh, and Forty Four Thousand (**Rs.56,23,44,000)**

17.   **Budget of the proposal along with item-wise breakup**

The item-wise break-up of the budget is given in Table 1. The proposed budget is for **three years** from the date of receipt of funds.

TABLE 1. OVERALL BUDGET BREAKUP

S.N.	Items	Budget[#]		
		First Year (in Lakhs)	**Second Year (in Lakhs)**	**Total (in Lakhs)**
1	Cost of deployment	264.42	290.82	555.24
2	Cost of integration	194	210	404
3	Cost of maintenance	1402.7	1418.3	2821
4	Cost of development of new experiments (300 expt. x 3 Lakhs/expt.)*	300	300	600
5	Honoraria	34	34	68
6	Central integration and development	372	409.2	781.2
7	Data Center	53	53	106
8	Software License	200	0	200
9	Reviews / Mid-term evaluations	42	46	88
	Total	**2862.12**	**2761.32**	**5623.44**

[#]Detailed justification for the budget is provided in the subsequent tables.
 *Roughly 100 experiments will be developed every year.

18.   Summary sheet: Given on the following page

SUMMARY SHEET

1.   Name of the Institution: Indian Institute of Technology, Delhi

2.   Title of the Project: Deployment and Maintenance of Virtual Labs

3.   Name of the Department: This is a joint project of 12 participating institutes

4.   Cost of the Project: **Rs. Fifty six Crore, Twenty Three Lakh,**
                                          and Forty Four Thousand (Rs.56,23,44,000)

5.   Amount released earlier if any: None

6.   Utilization position in respect of grants released earlier for various projects
      (Details to be given project-wise)

      (i) Fully spent   UC attached

      (ii) Unspent, proposal to utilize it   UC attached

7.   Reasons for unspent balance: N/A

8.   Name of the Principal Investigator responsible for implementation of the Project:

                                                          Director, IIT Delhi

                            (NAME & SIGNATURE OF THE PRINCIAPAL INVESTIGATOR)

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1. Name of the Area :

2. Recommendations:

   ➢ Approved
   ➢ Not approved
   ➢ Deferred Amount (Rs._____ in lakhs)
   ➢ Transferred to area

3. Remarks, if any

   (common for all the 3 schemes)

4. **Certificate**

1. Certified

   (i)   that the Principal Investigator is due to retirement during the currency of this project.

   (ii)   that the Principal Investigator is a regular employee of this Institution. However in case he/she proceeds sabbatical/resigns/proceeds VRS etc., the Institute will ensure to replace PI by a compatible academician to ensure that without any brake whatsoever, project will be completed within the stipulated period of 2 years.

   (iii)   that it will be ensured that the implementation will be carried out on mission mode with no time or cost overrun and we are aware that ministry will neither provide any extension of time nor additional funding.

   (iv)   that no over heads will be charges by the Institution for this project and all facilitation including other essential/infrastructure support like air-conditioning etc. will be provided by the Institution.

Seal of the Institution   Signature of Head of the
                                                              Institution (Name)

Detailed Project Report

DEPLOYMENT AND MAINTENANCE OF VIRTUAL LABS

1. BACKGROUND AND MOTIVATION

Good lab facilities and updated lab experiments are critical for any engineering college. Physical distances and the lack of resources often make it difficult to perform experiments, especially when they involve sophisticated instruments. Also, good teachers are always a scarce resource. The Virtual Labs project addresses this issue of lack of good lab facilities, as well as trained teachers, by making remote experimentation possible. With the present day internet and computer technologies, these limitations no longer hamper students and researchers in enhancing their skills and knowledge. Also, in a country such as ours, costly instruments and equipment need to be shared with fellow researchers to the extent possible. Yet another objective is to arouse the curiosity of the students and permit them to learn at their own pace. This facilitates the absorption of basic and advanced concepts through remote experimentation.   Internet based experimentation further permits use of resources – knowledge, software, and data available on the web, apart from encouraging skilful experiments being simultaneously performed at points separated in space. Specifically, the Virtual Labs project addresses the following:

(a) Access to quality labs to those engineering colleges that lack these lab facilities.
(b) Access to quality labs as a complementary facility to those colleges that already have labs
(c) A complete Learning management System around these labs
(d) Teacher-training and skill-set augmentation through workshops and on-site training.

In the First Phase of the Virtual Labs project, web-enabled experiments have been designed for remote operation and viewing. Over 50,000 students, (in approximately 150 colleges) have used the Virtual Labs and have provided user-feedback.   The primary focus of the Second Phase of the Virtual Labs project is to maintain the labs already developed and reach out to all potential users of Virtual Labs, in order to address the following issues:

- Lack of lab infrastructure in several engineering institutes and universities across the country
- Lack of equipments in institutes and universities
- Lack of quality engineering labs and lab experiments
- Lack of trained faculty members and manpower to conduct lab classes
- Inaccessibility of quality labs in rural parts of India
- Lack of a mechanism to centrally add or up-grade lab experiments

2. OBJECTIVES OF THE PROJECT

The main objectives of this project are listed below.

(a) The maintenance of the Virtual Labs already developed

Over 100 Virtual Labs have already been developed and many of them are being used by various colleges. It is important to keep these labs in 'up and running' condition. Usage pattern of these labs show that these labs are increasingly used 'outside' the lab hours, which was one of the original motivations for this project. The maintenance of the labs will include man power that will be responsible for the back-end server related issues, as well as, the software/hardware up-gradation as and when required. Based on the user-feedback, bugs will be identified and fixed. The maintenance of labs would be done at the institute level so as to maintain the quality of the labs.

(b) Deployment and outreach of Virtual Labs

Currently, labs are undergoing extensive field testing. 'Limited deployment' of many of the virtual labs have also been carried out, where they are regularly used by colleges. Our focus will be to deploy these labs at a national level so that they reach all the engineering colleges that will benefit from them. This would mean taking the labs to the colleges present in urban areas as well as the rural region in India. Regular workshops and teacher-training would also form a part of this activity.

(c) Development of Labs/Experiments as per user-need

Regular evaluations by subject experts and user-feedback form an integral part of the project. Additionally, an ecosystem has been created which includes the developer community and the user community. Based on the user-feedback, gap areas will be identified and further virtual labs and lab experiments will be developed. Faculty members of various institutions/colleges would be encouraged to contribute in this effort.

(d) Integration/ Engineering of Virtual Labs

Currently, labs have been developed in various institutes, on different platforms. Most of the labs are currently running on individual servers, or as standalone applications. Significant engineering effort is therefore needed to propel the Virtual Labs to the next

level where (a) they run from a common web framework and runtime environment, (b) they provide the user with a rich virtual lab environment with support for account management, persistence, fast turn-around time on the web, polished user interfaces, localization, etc. required to integrate the use of Virtual Labs with the academic and learning processes at the colleges.

3. METHODOLOGY

(a)   **Methodology for maintenance of Virtual Labs already developed**

A Virtual Labs Maintenance team will be established at *each* participating institute. This team will be responsible for keeping the labs 'up and running'. Additionally, they will fix any bugs/errors that are reported. The team will also use the domain expertise of the faculty lab developer in order to carry out continuous improvement of the lab. The maintenance team will fix bugs, make changes in the contents whenever required, add new experiments, and keep all labs online.

(b)   **Methodology for Deployment and Outreach of Virtual Labs**

Exhaustive field trials are being carried out on the labs already developed. The user community is made to feel a part of the development process, as their feedback is used to improve and augment the labs under development. The process of field trials and limited deployment has been standardized, and is depicted in Fig. 1. The process starts with a workshop, which explains the concept of the Virtual Labs project and provides an overview. Demonstrations are invariably given to showcase the power of Virtual Labs. After the workshop, an expression of interest is sought. This is done to ensure a basic level of commitment. Those who qualify are declared Nodal Centers, and two Nodal Center Coordinators are selected as liaison persons. This is followed by extensive on-site training and on-site workshops. The exchange of ideas and discussions take place during the Nodal Center Coordinators' meetings, which are held regularly. Regular workshops and teacher-training would also form a part of this activity. A team of Field Engineers will conduct the workshop and provide hands on session for the experiments under all the labs.
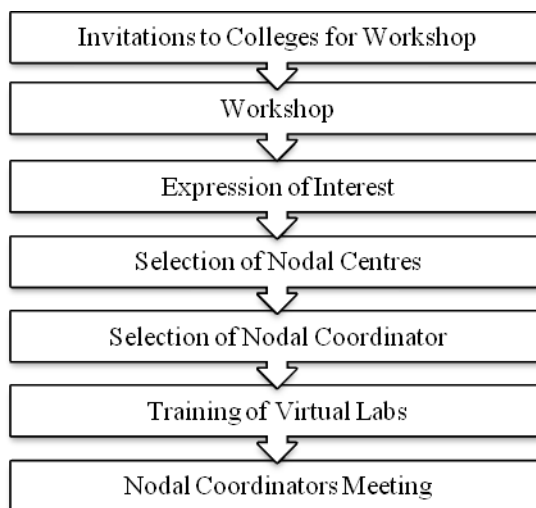
Fig. 1. The Flowchart for the selection of Nodal Centres.

(c) **Methodology for Development of Labs/Experiments as per user-need**

Development of Virtual Labs is continuous process. The feedback of the user-community will be taken so as to fill-up the gap areas where Virtual Labs / Lab experiments are missing. Different institutes will be encouraged to participate in the development activity. Once a new lab/experiment is developed, it will undergo the standard evaluation prior to being hosted on the Virtual Labs website. The mid-term evaluations are carried out by the Discipline-wise National Coordinators. Over 50 subject experts, mainly from the different IITs, have been involved at various stages for the technical evaluations of Virtual Labs. The evaluation process has been standardized in order to ensure basic quality. There is a standard evaluation form and the evaluations are demo-based. Cross-pollination of ideas and sharing of best practices occur during the mid-term evaluations. Virtual labs developers will be encouraged to develop experiments using open source software.

(d) **Methodology for Integration/ Engineering of Virtual Labs**

The 'integration activities' will be carried out at two levels:

(i) Locally at each participating institute

(j) Central Integration.

A 'Local Virtual Labs Engineering and Integration team' will be established at each participating institute. This team will consist of software and systems engineers supervised by a faculty member. The responsibility of the engineering and integration team is to carry out the integration of the labs to the framework. The local integration team will interface with the central integration team. Outreach will rely on engineering support for a variety of activities: first and foremost, existing labs will need to be brought into a formal developmental life cycle. Framework to support newer platforms and services will need to be developed. Existing labs will then need to be integrated to these new frameworks. The central integration team will interface with the local integration team towards this goal. The central integration activity will be coordinated by the Virtual Labs Integration Coordinator (VLIC).

A Virtual Lab is ultimately a web application. A standard software application development model incorporates automatic versioning, software issue-tracking, testing, licensing and release management. Sustaining Virtual Labs will require long term and continuous development of the lab software. For this to happen, a proper software development process model is a sine qua non. The following tasks will be undertaken as a part of the engineering/integration of Virtual labs:

Versioning: Automatic versioning allows improvement and modification of the lab's content and the software in a controlled manner by maintaining a history of all past revisions. Carrying out development under a version control regime is also critical for issue tracking and release management (described further below).

Issue-tracking: While the content and software developed for the Virtual Labs has undergone review by experts, errors in the content and bugs in the software are likely to persist beyond the release of the lab. An issue tracking system is a systematic way of cataloguing bugs reported by users and thus a crucial part of managing the lab's software development process.

Release Management: Selecting a particular version of the labware and readying it so that it can be deployed on a central platform is called release management. Release management involves a protocol where the lab developer needs to mark a particular version of the labware for release, verify that the particular release matches quality standards(both for content and the software), and hands over a lab deliverable to the deployer.

80

Licensing: The running of a Virtual lab depends on various types of software applications with different licensing schemes. A proper mechanism for verifying that the labs are using licensed software in the correct manner without violating any copyright issues is essential since these labs will be available as a public URL. Support for a wide range of development frameworks Since there has been no standard framework defined for development, Virtual Labs developed so far have used a wide array of development frameworks, depending on the ease of development of the developer. Unifying these will require considerable engineering expertise to ensure uniformity across all developmental platforms to provide a similar outcome.

Acceptance Process: The purpose of the acceptance process is to ensure a Virtual Lab follows a minimum standard of quality. There are several quality parameters, including conformance to a presentation structure (introductory and experiment sections, quizzes, reference material, etc.), verifying that any copyrighted material is properly licensed and acknowledged, ensuring that all end-user license agreements for any software being used to run the lab are in compliance, and making sure that well defined process exist for bug fixing.

Lab Integration Levels

To achieve quality in the development process, we propose a series of integration levels that each lab will go through in its development. Each integration level is a checkpoint that captures a milestone towards the development and the hosting of the virtual lab. We have defined the initial set of integration levels. Each integration level comes with a series of acceptance criteria for the lab (Details are along the lines of the terms of association document.)

Level	Sources Versioned	Build Procedure	Deployment Location	Deployment Procedure
0	No	Manual	Developer	Manual
1	Yes	Manual	Developer	Manual
2	Yes	Auto	Developer	Manual
3	Yes	Auto	Test Server	Manual
4	Yes	Auto	Deploy Server	Manual
5	Yes	Auto	Deploy Server	Automated

BasicWeb Security Compliance: Each virtual lab is essentially a web application and accessible as a public URL. It is therefore a prestigious target for attack from malicious users. In order to prevent security breach of the data centre and a compromise of user data, the data centre and virtual lab will need to be fortified at several levels: network, OS, web server, web application, and browser.

Software code quality: Each virtual lab will need to comply with coding, testing and documentation standards which would be defined by central integration team. These specifications can be refined based on new inputs received and insight gained during the course of the project.

Lab performance: A virtual-lab is expected to utlize resources fairly and under some expected limits. For example a lab should avoid serving Full-HD (1080p) videos where a normal 480p video quality serves the purpose. This reduces load on Internet bandwidth, storage and processing for both the data-center and the user, which is necessary for scaling to support large number of users.

Acceptance Criteria for hosting virtual lab on data centre

The virtual labs will be hosted on a data centre in a phased manner based on the compliance with the integration levels and checkpoints.

4. CURRENT STATUS

The Pilot Phase of the Virtual Labs project started in April 2009 under the National Mission through ICT. During this phase, approximately twenty labs were developed as proof of concept. The Main Phase began in April 2010. Currently, the New RT Labs project is underway, in which approximately 30 remote-triggered labs are being developed. There are twelve participating institutes: IIT Delhi (coordinating institute), IIT Kanpur, IIT Bombay, IIT Madras, IIT Kharagpur, IIT Guwahati, IIT Roorkee, IIIT Hyderabad, Amrita University, Dayalbagh University, NITK Surathkal, COE Pune.

Virtual labs have provided both the students and teachers the access to quality labs in a wide range of topics, spanning different branches of science and engineering. Over 100 Virtual Labs have been developed. The importance and effectiveness of these Virtual Labs can be estimated from the user feedback (see Fig. 2). The labs are also being used outside the labs hours, and also on weekend, as depicted by Figs. 3 and 4.

BROAD AREAS OF VIRTUAL LABS

1. Electronics and communication Engineering
2. Computer Science and Engineering
3. Electrical Engineering
4. Mechanical Engineering
5. Chemical Engineering
6. Biotechnology and Biomedical Engineering
7. Civil Engineering
8. Physical Sciences
9. Chemical Sciences

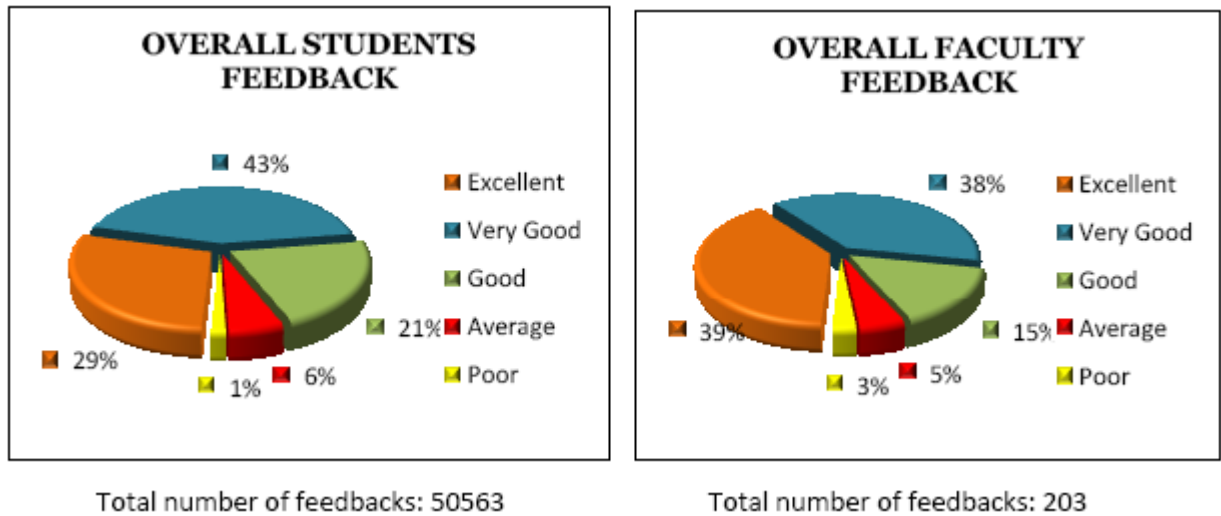Details regarding the labs under each discipline are provided in Annexure II.

Fig. 2: Feedback of the students and faculty members who have used Virtual Labs to conduct experiments remotely.
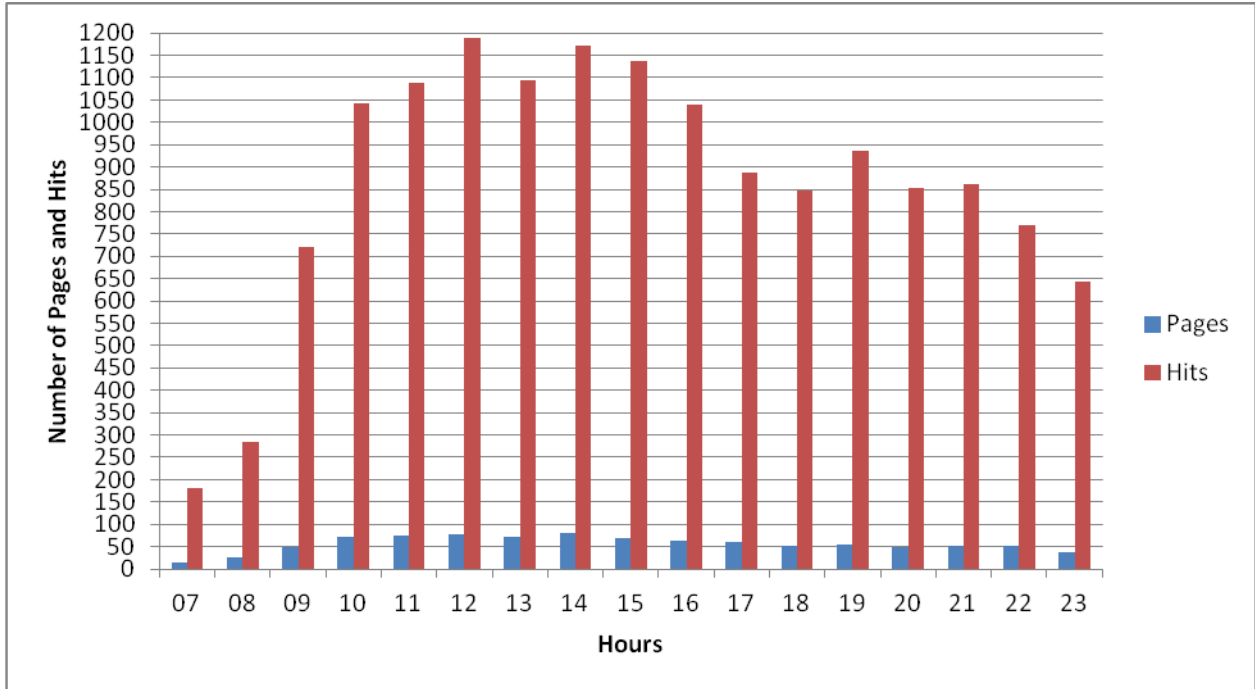
Fig. 3: The numbers of hits on the website and numbers of pages visited by the user on hourly basis (Dec 2012).
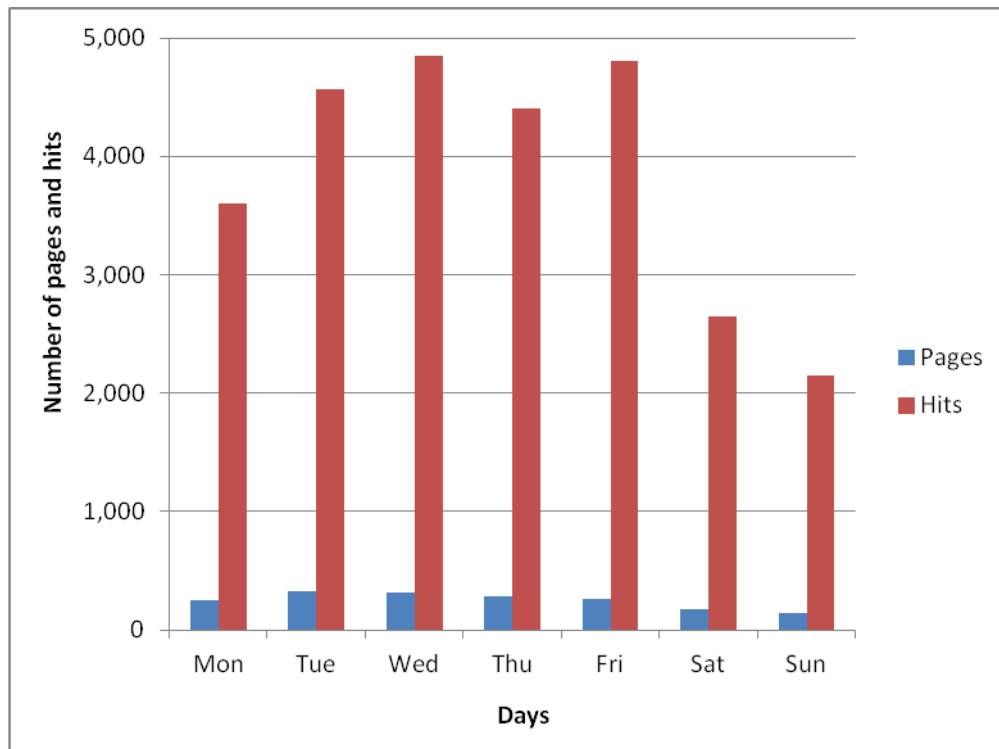

Fig. 4: The number of hits on the website and numbers of pages visited by the user on weekly basis (Dec 2012).

Current Status of Outreach of Virtual Labs

a. Geographical Coverage

Virtual Labs was dedicated to the Nation on 23 February 2012. Virtual Labs are being used in engineering colleges in various parts of the country. The area wise details are given below:

(i) National Capital Region (NCR)

(ii) Northern India
- Panipat
- Meerut
- Karnal
- Jalandhar
- Baddi
- Dehradun
- Jaipur
- Gwalior
- Bhopal
- Lucknow
- Alwar
- Kurushetra
-

(iii) Southern India
- Amritapuri
- Bangalore
- Coimbatore
- Kottam
- Hyderabad
- Thiruvananthpuram
- Chennai
- Surathkal

(iv) Eastern India
- Guwahati
- Kharagpur
- Durgapur

(v)   Western India

- Ahemdabad
- Pune
- Mumbai
- Nagpur
- Nashik

b. Potential beneficiaries of the project

The intended beneficiaries of the projects are:

- All students and Faculty Members of Science and Engineering Colleges who do not have access to good lab-facilities.

- High-school students, whose inquisitiveness will be triggered, possibly motivating them to take up higher-studies.

- Researchers in different institutes who can collaborate / share equipment and resources.

- Different engineering colleges, who can benefit from the content and related teaching resources.

The project has completely fulfilled the requirements of the targeted beneficiaries (and even gone beyond). An eco-system has evolved around Virtual Labs, where the community has become involved in evolving and benefitting from the project.

c. Salient Features

(i) Common website for all Virtual labs

All Virtual Labs can be accessed through a common website: www.vlab.co.in

At the user end, a PC and broadband connectivity enables the user to access Virtual Labs.

(ii) Front-end

All users see a common web-based front-end which has been designed for ease of use. The Virtual Labs have standardized look and feel. All web pages are icon based.

86

(iii) Back-end

The back-end is completely computer-driven. Virtual Labs will provide to the students the result of an experiment by one of the following methods (or possibly a combination):

- Modeling the physical phenomenon by a set of equations and carrying out simulations to yield the result of the particular experiment.
- Providing a corresponding measurement data for the Virtual Lab experiment based previously carried out measurements on an actual system.
- Remotely triggering an experiment in an actual lab and providing the student the result of the experiment through the computer interface.

(iv) Learning Management System (LMS)

Virtual Lab project provides a complete Leaning Management System. For most users, Virtual Lab provides all the relevant material at one place including the Objectives of the Experiment, Procedure, Lab manual, Pre- and Post-experiment quizzes, additional Lab resources, in addition to the Virtual Lab experiment. Most labs also have an associated question bank.

(v) Standardization and best practices

The following standard process development and sharing of best practices have been carried out within the project

- Development of a standard process for Quality Control

- Development of a standard process for Field Trails.

- Development of a standard process for obtaining user Feedback.

- Development of a standard process for obtaining Feedback of subject experts.

- Continuous Evaluations by Subject Experts, thereby permitting mid-term corrections.

- Use of a standard collaborative platform

- Repository of all project related documents available on a common server

- Virtual Lab provides all the relevant material at one place including the Objectives of the Experiment, Procedure, Lab manual, Pre- and Post-experiment quizzes, additional Lab resources, in addition to the Virtual Lab experiment.

- Wiki and Developer forum

- Standard Administrative Website for all labs

d. Summary of Field Trials

The Field trials of Virtual labs were conducted in 42 Engineering Institutions around 16 universities comprising of Delhi &NCR, Haryana, Himachal Pradesh, Gujarat, Punjab, Rajasthan, Madhya Pradesh, Uttarakhand and Uttar Pradesh states in June-December 2012 session. Over **200** faculty feedback forms were and over **50,000** student feedback forms have been collected so far. Over 1000 faculty members have been trained on the Virtual Labs platform.

Methodology of Field Trial

(i)   The Virtual labs team conducted a workshop on Virtual labs for ECE, CSE and Applied Science disciplines in the designated nodal centers.

(ii) The demonstration was given on Virtual labs in each session for one lecture in a classroom.

(iii) The labs chosen for demonstration belonged to the syllabus of the on-going semester.

(iv) The faculty members responsible for the labs/subjects were present during the demonstration.

(v)   After the demo of virtual labs, hands on practice sessions were conducted.

(vi) Upon completion of the demo and hands-on experimentation, the faculty members and students submitted the hard copy of the feedback forms to Virtual labs team members.

(vii) These forms were compiled and analyzed. The bugs/shortcomings were duly reported to the respective virtual labs developers for improvement.

e. National Impact

Field trials were conducted in over 150 colleges and around 36 workshops were conducted in various colleges of several states (Fig. 5). More than 1,000 faculty members and over 50,000 students were trained during these field trials. Students, all over India, are now taking advantage of Virtual Labs in order to get the feel of actual lab experimentation.

Fig 5: National Impact of Virtual Labs.

5. DELIVERABLES OF PROJECT

1st year [1st Installment: release of 50% of approved budget]

       Nodal Centers using Virtual Labs (end of 1st year) = 200

       No. of Feedback forms for 1st year = 3,15,000

       Review by an expert panel

2nd year [2nd Installment: release of 50% of approved budget]

       New Nodal Centers added to Virtual Labs (during 2nd year) = 36

       Total number of Nodal Centers (end of 2nd year) = 200(1st Year) + 36(new)

                           = 236

       No. of Feedback forms for 2nd year= 3,46,500

       Total number of feedback forms =1st year feedback forms + 2nd year feedback forms

                         = 3,15,000 + 3,46,500

                         =6,61,500

       Review by an expert panel

6. BUDGET AND TIME LINE

TABLE 2. OVERALL BUDGET

S.N.	Items	Budget[#]		
		First Year (in Lakhs)	Second Year (in Lakhs)	Total (in Lakhs)
1	Cost of deployment	264.42	290.82	555.24
2	Cost of integration	194	210	404
3	Cost of maintenance	1402.7	1418.3	2821
4	Cost of development of new experiments (300 expt. x 3 Lakhs/expt.)*	300	300	600
5	Honoraria	34	34	68
6	Central integration and development	372	409.2	781.2
7	Data Center	53	53	106
8	Software License	200	0	200
9	Reviews / Mid-term evaluations	42	46	88
	Total	**2862.12**	**2761.32**	**5623.44**

[#]Detailed justification for the budget is provided in the subsequent tables.
*Roughly 100 experiments will be developed every year.

TABLE 2. BUDGET FOR DEPLOYMENT

Name of the Institute	No. of Field Engineers	1st year Deployment (in Lakhs)	2nd year Deployment (in Lakhs)	Total
IIT Delhi	18	110.2	123.4	233.6
IIT Bombay	2	14.02	15.22	29.24
IIT Kanpur	2	14.02	15.22	29.24
IIT Kharagpur	2	14.02	15.22	29.24
IIT Madras	0	0	0	0
IIT Roorkee	2	14.02	15.22	29.24
IIT Guwahati	2	14.02	15.22	29.24
IIIT Hyderabad	2	14.02	15.22	29.24
Amrita University	4	28.04	30.44	58.48
Dayalbagh University	2	14.02	15.22	29.24
NITK Surathkal	2	14.02	15.22	29.24
COE Pune	2	14.02	15.22	29.24
TOTAL	**40**	**264.42**	**290.82**	**555.24**

TABLE 3. BUDGET FOR DEPLOYMENT OF VIRTUAL LABS

Name of the Institute	First Year			Second Year		
	Feedback forms	Workshops	Budget (Lakhs)	Feedback forms	Workshops	Budget (Lakhs)
IIT Delhi	150000 (90 NCs)	2	110.2	165000 (115 NCs)	2	123.4
IIT Bombay	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
IIT Kanpur	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
IIT Kharagpur	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
IIT Madras	0	0	0	0	0	0
IIT Roorkee	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
IIT Guwahati	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
IIIT Hyderabad	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
Amrita University	30000 (20 NCs)	2	28.04	33000 (22 NCs)	2	30.44
Dayalbagh University	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
NITK Surathkal	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
COE Pune	15000 (10 NCs)	2	14.02	16500 (11 NCs)	2	15.22
Total	**315000**** **(200 NCs)**	**22**	**264.42**	**346500***** **(236* NCs)**	**22**	**290.82**

*36 new nodal centers will be added during 2nd year [200 (1st year)+36(new) = 236]

**Feedback forms of 1st year

***Feedback forms of 2nd year

NCs: Nodal Centers

Cost of obtaining 1 feedback form

First Year=Rs 83.93 (approximately)

Second Year=Rs. 83.83 (approximately)

JUSTIFICATION OF BUDGET FOR THE DEPLOYMENT OF VIRTUAL LABS

The calculation is shown for the collection of 3,15,000 feedback forms from 200 Nodal Centers (NCs) for 1st year and 3,46,500 feedback forms from 236 [200(1st year)+36(new NCs)] Nodal Centers for 2nd year. The deployment entails site visits to NCs by the field engineers. Here we assume that 30% (approx.) NCs will be within 50 Kms radius (local travel) and 70% (approx.) will be located at larger distances (>50 kms)

FIRST YEAR
Manpower required: 40 field engineers

Salary : Rs 5 Lakhs per annum per person

$$= 5 \text{ L} \times 40 \text{ (persons)}$$

$$= \textbf{Rs 200 Lakhs}$$

Travel

Total NCs (end of 1st year) = 200

➔ Within 50 km : Assumption Rs 2000/-(per Nodal Centre)
For **60 NCs** : 2000 x 60 x 2
= Rs 2, 40,000/-

➔ Outside 50 km : Assumption Rs 10,000/-(per Nodal Centre)
For **140 NCs** : 10,000 x 140 x 2
= Rs 28, 00,000/-

Total Travel Expenses: Rs 28, 00,000 + Rs 2, 40,000

$$= \textbf{Rs 30.4 lakhs}$$

Cost of conducting Workshops = 22 workshops x 50,000/workshop

$$= \textbf{Rs. 11 Lakhs}$$

Consumables (Stationery/ Printing/ Publicity material)

$$= \textbf{15 Lakhs}$$

Miscellaneous expenses

= **Rs. 8 Lakhs**

Total cost incurred for 3,15,000 Feedback forms

= Manpower Cost+ Travel + Workshop Cost + Miscellaneous

= 200+30.4+11+15+8

= **Rs. 264.4 Lakhs** (approx.)

Total cost incurred per Feedback forms (1st year)= 264.4L/3.15L

= **Rs 83.93**

SECOND YEAR

Manpower required: 40 field engineers

Salary : Rs 5.5 Lakhs per annum per person (10% increase of 1st year)

= 5.5 L x 40 (persons)

= **Rs 220 Lakhs**

Travel

Total NCs (end of year)= 236

➔ Within 50 km : Assumption Rs 2000/-(per Nodal Centre)
For 70 NCs : 2000 x 70 x 2
= Rs 2, 80,000/-

➔ Outside 50 km : Assumption Rs 10,000/-(per Nodal Centre)
For 166 NCs : 10,000 x 166 x 2
= Rs 33, 20,000/-

Total Travel Expenses: Rs 33, 20,000 + Rs 2, 80,000

= **Rs 36 lakhs**

Cost of conducting Workshops = 22 workshops x 50,000/workshop

= **Rs. 11 Lakh**

Consumables (Stationery/ Printing/ Publicity material)

= **15 Lakhs**

Miscellaneous expenses

= **Rs. 8.5 Lakhs**

Total cost incurred for 3,46,500 Feedback forms

= Manpower Cost+ Travel + Workshop Cost + Miscellaneous

= 220+36+11+15+8.5

= **Rs. 290.5 Lakhs** (approx.)

Total cost incurred per Feedback forms (2nd year)= 290.5L/3.465L

= **Rs 83.83**

TABLE 4. BUDGET FOR INTEGRATION

Name of the Institute	No. of Labs	No. of Engineers	1st Year Integration (in Lakhs)	2nd Year Integration (in Lakhs)	Total
IIT Delhi	8	2	14	15	29
IIT Bombay	15	2	14	15	29
IIT Kanpur	5	2	14	15	29
IIT Kharagpur	29	4	24	26	50
IIT Madras	0	0	0	0	0
IIT Roorkee	4	2	14	15	29
IIT Guwahati	18	2	14	15	29
IIIT Hyderabad	36	5	29	32	61
Amrita University	43	5	29	32	61
Dayalbagh University	8	2	14	15	29
NITK Surathkal	7	2	14	15	29
COE Pune	13	2	14	15	29
TOTAL	**186**	**30**	**194**	**210**	**404**

Maximum number of Engineer up to 14 labs= 2

No, of Engineers beyond 14 labs is 1 Engineer per 7 labs

Maximum number of total Engineers = 5

<u>**JUSTIFICATION FOR INTEGRATION AT INDIVIDUAL INSTITUTES**</u>

Integration engineer (salary)

= **Rs 5 Lakhs**

Misc. (admin support, travel, equipment, consumables, licensing cost, if applicable)

= **Rs 4 lakhs**

Total = **Rs 9 lakhs**

TABLE 5. BUDGET FOR MAINTENANCE

Name of the Institute	No. of Labs	No. of Engineers	1st Year Maintenance (in Lakhs)	2nd Year Maintenance* (in Lakhs)	Total
IIT Delhi	8	2	61.6	62.4	124
IIT Bombay	15	3	111.9	113.1	225
IIT Kanpur	5	1	37.3	37.7	75
IIT Kharagpur	29	6	217.3	219.7	437
IIT Madras	1	1	11.3	11.7	23
IIT Roorkee	4	1	30.8	31.2	62
IIT Guwahati	18	4	136.2	137.8	274
IIIT Hyderabad	36	7	267.6	270.4	538
Amrita University	43	7	313.1	315.9	629
Dayalbagh University	8	2	61.6	62.4	124
NITK Surathkal	7	2	55.1	55.9	111
COE Pune	13	3	98.9	100.1	199
TOTAL	**187**	**39**	1402.7	1418.3	2821

*Maintenance budget includes funds for the new RT Labs, in addition to the existing labs

***Cost of maintaining Virtual Labs per institute**=

[Salary x no. of engineer + (Website maintenance +Internet usage + Miscellaneous) x no. of labs]

Number of Engineer up to 5 labs= 1
Number of Engineers beyond 5 labs is 1 Engineer per 5 labs
Maximum no. of total engineer = 7

JUSTIFICATION OF BUDGET FOR MAINTENANCE

 Manpower Required: 39 Engineers

1st year

Salary   **:** Rs 4.8 Lakhs per annum per person

                           4.8 x 39 = 187.2 Lakhs

Other costs for 1 lab:- website maintenance + Internet Usage + Miscellaneous = **6.5 Lakhs/lab**

        Website Maintenance: Rs 1.5 Lakhs
        Internet Usage   : Rs 4 Lakhs
        Miscellaneous   **:** Rs 1 Lakh

Total Labs = 187

Other Costs for maintaining 187 labs = 187 x 6.5 = 1215.5 Lakhs

Total Cost = salary + Other Costs = 187.2 + 1215.5

                           = **1402.7 Lakhs**

2nd year

        Salary   **:** Rs 5.2 Lakhs per annum per person

                           5.2 x 39 = 202.8 Lakhs

Other costs for 1 lab:- website maintenance + Internet Usage + Miscellaneous = **6.5 Lakhs/lab**

        Website Maintenance: Rs 1.5 Lakhs
        Internet Usage   : Rs 4 Lakhs
        Miscellaneous   **:** Rs 1 Lakh

Total Labs = 187

Other Costs for maintaining 187 labs = 187 x 6.5 = 1215.5 Lakhs

Total Cost = salary + Other Costs = 202.8 + 1215.5

                           = **1418.3 Lakhs**

TABLE 6: BUDGET FOR CENTRAL INTEGRATION

Items	Budget (in Lakhs)	
	First Year	**Second Year**
Salary	234	258
Equipment	15	16.5
Consumables	07	08
Travel and Events	24	26
Contingency	42	46
Total	**322**	**354.5**

Deployment and Maintenance of Virtual Labs

JUSTIFICATION FOR CENTRAL INTEGRATION

Table 7: Manpower cost per year

Items	Cost (in Lakhs)	Nos.	Total (in Lakhs)
Sr. Project Consultant	12	1	12
Project Consultant	10	2	20
Sr. Project Engineer/Scientist	6	2	12
Project Engineer plus assisting staff	10	19	190
Total			**234**

Table 8: Equipments, Consumables and Travel & events

Items	Cost (in Lakhs)	Justification
Equipment	15	servers, storage, ram, cpu, etc. averaged over 2 years
Consumables	07	5L for 8mbps enterprise ISP link plus 2L for office consumables (stationery, printing of publicity material, paper, cartridges)
Travel and events	24	See Table for Travel and events
TOTAL	46	Non-manpower costs

Table 9: Budget for Travel and Events

Items	Cost per instance (in Lakh Rs.)	No. instances	Total cost (in Lakh Rs.)
Sprints	0.6	30	18
Workshops	2.4	2	4.8
Expert reviews	1.4	1	1.4
Total			24.2

No. of Engineer for sprint=4

Cost of travel per Engineer= 15000

total cost per sprint=4 x 15000= **Rs.60,000**

Workshops

Budget for 4 days workshop

No. of participants 40

Cost per workshop per participant = Rs.6000

Total = **Rs. 2.4 Lakhs**

Table 10: Budget per participant per workshop

Items	Per unit cost	No.	Total (Rs.)	Remarks
Travel	5000	1	5000	Covered by participant's institute
Accommodation	1000 per day	5	5000	
Food	100 per day	5	500	
Misc	100 per day	5	500	
Total			**6000**	4 day workshop with 5 day stay

Table 11: Budget per expert review meeting consisting of 5 reviewers

Items	Per unit cost (x 1000 Rs.)
Travel per expert	20
Honorarium	4
Lodging	4
Total per expert	28
No. of experts	5
Total	**140**

Table 12: Project Engineer plus assisting staff

Items	Cost (in Lakhs Rs.)
Project Engineer	5
Sr. Project Asst. (1)	3
Jr. Project Attendant (3)	1.8
Total	9.8
Rounded Total	**10**

TABLE 13: BUDGET FOR CENTRAL INTEGRATION AND DEVELOPMENT

Items	Budget (in Lakhs)	
	First Year	**Second Year**
Central Integration	322	354.5
Development	50	55
Total	**372**	**409.2**

We propose that the virtual-labs be tested through all the integration levels before they are migrated in a phased manner to a public cloud based data center. As part of the development 25 virtual-labs would be redesigned for use from Aakash platform.

JUSTIFICATION FOR CENTRAL INTEGRATION AND DEVELOPMENT

> **Manpower required**: 8 Engineers
> **Salary**: Rs. 5 Lakhs per annum per person
> =5L x 8 (Engineers)
> = **40 Lakhs**

> Cost for Developer's Conference = Rs. 5 Lakhs
> Cost for development of 3D experiments = Rs. 5 lakhs
> Total cost = 40 + 5 + 5 = **Rs. 50 Lakhs**

BUDGET FOR DEVELOPMENT OF NEW EXPERIMENTS (SIMULATION LAB)

Cost for developing one experiment: Rs 3 Lakhs

(Based on a domain expert being employed for 4- 6 months, depending on the expertise/experiment)

BUDGET FOR REVIEWS / MID TERM EVALUATIONS

Travel of experts (Rs 20,000 x 5 experts) = Rs 1,00,000

Honoraria of experts (Rs 4,000 x 5 experts) = Rs. 20,000

Lodging (Rs 3,000 x 5 experts) = Rs. 15,000

Total = Rs. 1,35,000 / discipline (for 5 experts)

Total for 9 disciplines = 12,15,000 (One review per year)

Travel for Lab developers (Rs.20,000 x 150) = Rs. 30,00,000 (including old and new labs)

Total (experts for 9 discipline + ALL lab developers) = Rs. 42,15,000 / year

Annexure I: Brief CVs of PI and Institute Coordinators

Dr. Raghunath K. Shevgaonkar

Director, IIT Delhi and **Ex-Vice Chancellor, University of Pune**

Indian Institute of Technology Delhi, INDIA

Phone # 011-2659-1701 (Off), 011-2659-1801 (Res), Mobile: 9818001702

Email: rks@iitd.ac.in, rks@ee.iitb.ac.in

Present Address I.I.T. Delhi, Hauz Khas, New Delhi 110016

Permanent Address   Department of Electrical Engineering

I.I.T, Bombay, Mumbai - 400 076 INDIA

Education

1985   **Doctor of Philosophy** (Ph.D.) in Electrical Engineering from I. I. T., Bombay/

Indian Institute of Astrophysics/Raman Research Institute, Bangalore on   Maximum Entropy Restoration of Astronomical Images.

1977   **Master of Technology** (M.Tech) in Electrical Engineering from I. I. T., Kanpur   with   specialization   in Electromagnetics and Optical fibres.

1975   **Bachelor of Engineering** (BE) in Electronics Engineering from Jiwaji University, Gwalior. **Gold Medallist**.

2007   **Executive Development Program**, Kellogg School of Management, Northwestern University, Chicago, USA

Research Interests

Fiber Optic Communication, Photonics, Non-linear fiber optics, Electromagnetic Waves, Computational Electromagnetics, Antennas, Image Processing, Radio Astronomy.

Academic Positions held:

1990-to date: **Professor** of Electrical Engineering at I. I. T., Bombay, Job : Teaching and Research in Photonics, Fiber optics, Image processing, Printed antennas, Optically controlled microwave devices.

2009: **Visiting Professor**, Institute Superior de Electronics de Paris, France**.**

2005: **Visiting Professor**, High Frequency Institute, ETH, Zurich, Switzerland**.**

2000-2001: Visiting Professor, Computer and Electronics Engineering   University of Nebraska, Lincoln, USA (on Sabbatical leave) Job: Teaching and research in Telecommunication.

1987-1990: Assistant Professor at Department of Electrical Engineering, I. I. T., Bombay. Job : Research in Image processing and Photonics.

1986-1987: Faculty Research Associate at University of Maryland, College Park, U.S.A. Job : Solar and Stellar radio astronomy with the VLA.

1985 - 1986   Reader at Indian Institute of Astrophysics, Bangalore Job : Study of Galactic radio sources at decametre wavelength. Image processing of radio images to correct for atmospheric distortion.

1982-1984: Faculty Research Associate at University of Maryland, U. S. A. Job : Microwave radio astronomy with Very Large Array, New Mexico.

1978-1982: Electronics engineer at Indian Institute of Astrophysics /Raman Research Institute, Bangalore. Job : Design, Installation of a large Decametre array used for radio astronomy at Gauribidnur, India.

Administrative Positions held:

2010-2011: Vice Chancellor, University of Pune

2008-2010: Deputy Director (Finance and External Affairs), IIT Bombay.

2005-2008: Dean, Resource Mobilization, IIT, Bombay.

108

2005-2006: Registrar, IIT, Bombay.

1998-2000: Dean of Students' Affairs, Indian Institute of Technology, Bombay.

2003-2005: Head, Department of Electrical Engineering, IIT, Bombay.

2002-2006: Founder Head, Centre for Distance Engineering Education Programme
(CDEEP), IIT, Bombay. The Centre has been setup to generate and disseminate the video and web lectures from experts in IIT to the students of engineering colleges in the country using multi-media technology.

1995-1998: Chairman, Hostel Coordination Unit, Indian Institute of Technology, Bombay.

1992-1995: Warden, Hostel 4, Indian Institute of Technology, Bombay.

1989-1992: Assoc. Warden, Hostel 4, Indian Institute of Technology, Bombay.

Major Academic Awards and Distinctions:

1. **IEEE UG Teaching Award 2011**. Only one award is given annually across the world, and for the first time the award has gone outside the USA.

2. **IETE - CEOT -94 Award** for outstanding contribution in the field of Photonics and Opto-electronics.

3. **Fellow IEEE**

4. **Fellow   Indian National Academy of Engineering**

5. **Fellow   National Academy of Science, India**

6. **Fellow   Institute of Electronics and Telecommunication Engineers**

7. **Fellow   Optical Society of India**

8. **Fellow   Maharashtra Academy of Science, India**

9. **'Excellence in Teaching Award'** IIT, Bombay 2004.

10. **Top Management Consortium Award 2010 for 'Excellence in Education'**

11. **Dewang Mehta Business School Award 2010 for 'Outstanding contribution to Education'**

12. **Mahaganapati Award for Excellence in Academics and Research, 2010**

13. **National Education Leadership Award 2012 by Headlines TODAY.**

14. **Programme Chair** for **International Conference Photonics 2002**.

15. **Advisor**, Sixth International Infrastructure Business Summit and Expo, TELECOM India 2004.

16. **Member**   International Astronomical Union.

17. **Member**   Astronomical Society of India**.**

18. **Hon. Editor**   **IETE** Special Issue on 'Next Generation Networks' 2008

19. **Editor**   IETE Journal of Education

(15) **Memebr of Technical Programme Committees** for many International and   National conferences.

(16) **Graduate Fellow** University of Nebraska, Lincoln, USA

Major Academic Achievements:

- Contribution made in wide areas like Radio Astronomy and Antennas, Fiber Optic Communication, Image processing, and Distance Engineering Education.
- A text book on 'Electromagnetic waves' and a monograph on 'Transmission lines' published by McGraw Hill Education India.
- Design and development of a large Decameter Wave Radio Telescope in India.
- Establishing a Centre for distance learning at IIT Bombay.
- Development of image processing and data analysis software for low frequency radio astronomy.
- Study of the Sun from microwave observations using the largest radio telescope, the Very Large Array at New Mexico.
- Modeling and reconstruction of the 3-D structure of solar active regions and solar flares, and estimation of the solar parameters.
- Study of flare stars to establish non-thermal radiation during non-flaring periods.
- Development of Maximum Entropy Image restoration algorithm for polarized images of the Sun obtained with phase unstable aperture synthesis data.
- Establishing an advanced Fiber Optic laboratory at IIT Bombay

- Development of generalized frame work for designing various types of optical fibers like the ultra-low dispersion fibers, dispersion compensating fibers, large effective area fibers etc.
- Innovative idea of optically controlled semiconductor antennas.
- Investigations of optically controlled microwave devices like phase shifter, attenuator, polarizer etc.
- Innovative use of de-convolution algorithm for detection of straight lines in a digital image.
- Electrical modeling of photonic crystal devices for optical filter design.

Books :

1. **"Electromagnetic Waves",** Published by **Tata McGraw Hill,** 2005. An Undergraduate **text book** for Electronics and Telecommunication Engineering students.

2. **" Transmission Lines** " Ed. with V. Ramchandran and K. Shankar, IETE Publication, **Tata McGraw Hill** 1998. A **reference book**.

E-material :

1. **"Electromagnetic Waves and Transmission Lines", Video Lectures**, NPTEL, MHRD, Govt. of India. (Available on Youtube)

2. **"Advanced Fiber Optic Communication", Video Lectures** for a full PG course.

3. **"Electromagnetic Waves and Transmission Lines", Interactive Web course** for UG programme, NPTEL, MHRD, Govt. of India.

4. **"Fiber Optic Communication" Interactive Web course** for UG/PG programme, NPTEL, MHRD, Govt. of India.

Paper published in Professional Journals and Proceedings:

More than **150 papers** published in the area of Fiber optics, Radio Astronomy, Antennas, Image processing etc. (list attached).

Thesis/Dissertations guided : (List attached)

Ph. D.   14 + 4 in progress

M. Tech 41

B. Tech .   > 50

M. Sc.   2

Short term courses conducted under Continuing Education Program :

(a)   Fibre optic communication and Photonics   (5 days) **Four** times

(b)   Image processing   (5 days)

(c) Antennas   (3 days)

(d) Satellite communication   (3 days)

(e) Telematics   (5 days) **Two** times

(f) Computational Electromagnetics   (5 days)

(g) Electromagnetic Waves   (5days) **Three** times

(h) Many invited talks in short term courses on Antennas, Image processing, Fiber optic communication, Electromagnetics, etc.

Sponsored Projects handled :

(a) National Project for Technology Enhanced Learning (NPTEL-II and III), under   the MHRD.

(b) National Project for Technology Enhanced Learning (NPTEL-I), under MHRD.

(c) Fibre optic communication by Ministry of Human Research Development, India.

(d) MIC Tapered slot antenna under Defence Science and Technology Research, India.

(e)Fibre optic communication and photonic switching Ministry of Human Research
      Development, India.

(f)VLSI designing of picture processing unit for DTV under Department of Electronics,
      India

(g)Wavelength Division Multiplexed fibre optic links under All India Council of
      Technical Education, India.

(g)Optically controlled Semiconductor Antenna under Department of Electronics, Govt.
      of India

Consultancy Projects :

Automatic Signature Verification by Tata Infotech.

Hindi Script reading System by Tata Infotech.

Other Activities :

Academic :

 Setting up Fiber Optics Laboratory at IIT, Mumbai.

 Development of a 20 min. video program on fibre optics for UGC,

Continuing Education Program.

Development of educational software to effectively demonstrate the concepts of

Electromagnetic Waves

Development of graphical package to bring out concepts of fibre optic communication   more effectively.

Development of CAD for Microwave Amplifier Design.

Development of Beam Propagation software for non-linear pulse propagation in a fiber.

FEM program for analyzing dispersion characteristics of a fiber with arbitrary refractive index profile.

Administrative :

Member, ICT mission project of MHRD.

National Principal Coordinator for developing e-learning learning material for entire curriculum in Electronics and Telecommunication Engineering.

Member, AICTE committee for revision of NBA norms according to the Washington Accord.

Member of Accreditation team to NITs

Expert Member, Selection committes of DTE, Mumbai University.

Expert Member, IITs, NITs, DA-IICT, Gujrat University.

Member, Academic Board, College of Engineering, Pune.

Member, Academic committee for ExTC, College of Engineering, Pune

Member, Advisory Board, VJTI, Mumbai.

Member, Academic Council, Babasaheb Ambedkar Technical University, Lonere.

Member, Senate of SGGS College of Engineering, Nanded.

Member, Advisory Council, KJ Somaiya College, Mumbai University.

External Expert, Department of Technical Education, Maharashtra.

Member, Research Advisory Committee, SAMEER, Bombay.

Member, Board of Studies, University of Goa.

Served as Member of Departmental Under Graduate Committee, Department of Electrical Engineering IIT, Bombay.

Served as Member of Under Graduate Programme Committee of IIT, Bombay.

Served as external expert for DRDO, RAC over a period of 1991-1994.

Served as external expert for Goa, Public Service Commission.

Served as external expert for State Bank of India, Bombay.

Served as examiner in GATE and other IIT's and Universities.

Member of Scientific Advisory Committee SAMEER, Mumbai.

External Expert for Indian Space Research Organization, Bangalore.

Extracurricular Activities :

Music : **Bachelor of Music degree** in Hindustani Classical music (Sitar) from Kheragadh University.

Hindi Poem Writing, Painting etc.

Ranjan Bose

Professor, Department of Electrical Engineering,

IIT Delhi, Hauz Khas, New Delhi 110016.

Education:	**University of Pennsylvania, Philadelphia, USA**	9/93-12/95
	Ph.D. in Electrical Engineering, December 1995.	
	University of Pennsylvania, Philadelphia, USA	9/92-8/93
	M.S. in Electrical Engineering, December 1993.	
	Indian Institute of Technology, Kanpur, India	8/88-5/92
	B.Tech. in Electrical Engineering, May 1992.	
Experience	**Head of the School**	09/10 – present
	Bharti School of Telecom Technology and Management,	
	Indian Institute of Technology, Delhi, India	
	Professor	05/10 – present
	Microsoft Chair Professor since May 2010	
	Department of Electrical Engineering,	
	Indian Institute of Technology, Delhi, India.	
	Associate Professor	07/02 – 10/06
	Assistant Professor	11/97 – 07/02
	Senior Design Engineer	1/96 - 9/97
	(Alliance Semiconductor Inc., San Jose, CA, USA)	

Research Interests: Ultra-Wideband (UWB) Communications, Broadband Wireless Access
and Coding Theory.   Currently heading the Wireless Research Lab in IIT Delhi.

Sponsored R&D Projects:

- "Design and Development of a high-speed Ultra Wideband Communication System"
- "Indoor Wireless Communications"
- "Secure Communication using Chaos Theory"
- "Automatic tracking using Direction of Arrival**"**

Publications   **Book:** *Information Theory, Coding and Cryptography*, 2E, Tata-McGraw Hill, New Delhi, May 2008. ISBN: 0070669015

Journal Papers:	30
Conference Papers:	67
Patents:	12

Awards: URSI Young Scientist award in 1999, Humboldt Fellowship in July 2000,

Indian National Academy of Engineers (INAE) Young Engineers Award in 2003, AICTE Career Award for Young Teachers in 2004 and the BOYSCAST Fellowship in 2005.

Selected List of Journal Papers:

1. **R. Bose** and K. Hamacher, "Alternate Entropy measure for assessing Volatility in Financial Markets," *Physical Review E*, vol. 86., Iss. 5, Nov. 2012.

2. **R. Bose**, "An information-Theoretic approach to CLEAN," *IEEE Transactions on Aerospace and Electronic Systems*, (accepted Sep. 2012)

3. N. Ramakrishnan and **R. Bose**, "Dipole entropy based techniques for segmentation of introns and exons in DNA," *Applied Physics Letters*, vol. 101, 083701 Aug 2012.

4. S. Chouhan, M. Balakrishnan and **R. Bose**, "System Level Design Space Exploration Methodology for Energy Efficient Sensor Node Configurations: An Experimental Validation," *IEEE Transactions on CAD*, vol. 31, Iss. 4, pp. 586-596, Apr. 2012.

5. N. Subramanian and **R. Bose**, "Dipole angular entropy techniques for intron-exon segregation in DNA," *Europhysics Letters*, vol. 98, 28002, Apr 2012.

6. **R. Bose**, "Active CLEAN: A Modified CLEAN Algorithm for High Range Resolution Profiles of Contiguous Targets with Thinned Spectrum," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 48, Iss. 2, Feb. 2012 pp. 930 – 939.

7. **R. Bose**, "Lean CLEAN: A Deconvolution Algorithm for Radar Imaging of Contiguous Targets," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 47, Iss. 3, Jul. 2011. pp. 2190 – 2199.

8. **R. Bose** and S. Chouhan, "Super-information: A novel measure of information useful for DNA sequences," *Phys. Rev. E*, 83(5):051918, May 2011.

9. **R. Bose**, "The Effect of Swarming on Biodiversity in Non-symmetric Rock-Paper-Scissor Game," *IET Systems Biology*, Vol. 4, Iss. 3, 2010. pp. 177–184

10. V.V. Mani and **R. Bose**, "Direction of Arrival Estimation of Multiple UWB Signals", *Wireless Personal Communications*, ISSN: 0929-6212, Oct. 2009.

11. S. Chouhan, **R. Bose**, M. Balakrishnan, "Integrated Energy Analysis of Error Correcting Codes and Modulation for Energy Efficient Wireless Sensor Nodes," *IEEE Transactions on Wireless Communications*, vol. 8, no. 10, Oct. 2009. pp. 5348 – 5355.

12. S. Chouhan, **R. Bose** and M. Balakrishnan, "A Framework for Energy Consumption Based Design Space Exploration for Wireless Sensor Nodes," *IEEE Transactions on CAD*, vol. 28, no. 7, Jul. 2009. pp. 1017 – 1024.

13. M. R. Bhatnagar, Arti M.K., A. Hjørungnes, **R. Bose**, and L. Song, "Multiuser Relaying of High Rate Space-Time Code in Cooperative Networks", *Wireless Personal Communications*, Springer Netherlands, Apr. 2009. pp. 1-13. ISSN: 0929-6212.

14. A. Tyagi and **R. Bose**, "M-PAM Space-Time Trellis Codes for UWB MIMO Communications," *IET Communications*, vol. 2, Issue 4, Apr. 2008. pp. 514-522.

15. A. Tyagi and **R. Bose**, "PPM Space-Time Trellis Coding for UWB-IR MIMO Communication Systems", *IET Communications*, vol. 2, Issue 2, Feb 2008. pp. 366-371.

16. A. Tyagi and **R. Bose**, "A New Distance Notion for PPAM Space-Time Trellis Codes for UWB MIMO Communications," *IEEE Transactions on Communications*, vol. 55, no. 7, Jul. 2007. pp. 1279-1282.

17. **R. Bose**, "An efficient method to calculate the free distance of convolutional codes," *WSEAS Transactions on Electronics*, Issue 10, vol. 3, Oct. 2006. pp. 525-529.

18. **R. Bose** and S. Pathak, "A Novel Compression and Encryption Scheme using Variable Model Arithmetic Coding and Coupled Chaotic System," *IEEE Transactions on Circuits and Systems I,* vol. 53, no. 4, Apr. 2006. pp. 848-857.

19. **R. Bose**, "A novel Public Key Encryption technique based on Multiple Chaotic Systems," *Physical Review Letters*, vol. 95, issue 9, Sep 2005. 098702

20. G. Bauer, **R. Bose** and R. Jakoby**, "**Three Dimensional Interference Investigations for LMDS Networks using an Urban Database," *Special Issue of IEEE Transactions on Antennas and Propagation*, vol. 53, issue 8, Aug. 2005. pp. 2464-2470.

21. **R. Bose**, "Improving capacity in LMDS networks using Trellis Coded Modulation," *EURASIP Journal on Wireless Communications and Networking*, Issue 2, Nov. 2004. pp. 365-373.

22. **R. Bose**, G. Bauer and R. Jakoby, "Two-Dimensional Line of Sight Interference Analysis of LMDS Networks for the Down- and Uplink," *IEEE Transactions on Antennas and Propagation*, vol. 52, issue 9, Sep. 2004. pp. 2464-2473.

23. V.S. Chiranjeevi and **R. Bose**, "Performance of Hybrid Turbo coding scheme for Optical PPM communication systems," *WSEAS Transactions on Communications*, Issue 3, vol. 2, Jul. 2003. pp. 323-333.

24. **R. Bose**, "Sequence CLEAN Technique using Breeder Genetic Algorithm for Contiguous RADAR Target Images with High Sidelobes," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 39, no. 1, Jan. 2003. pp. 368-373.

25. **R. Bose**, A. Freedman, and B. D. Steinberg, "Sequence CLEAN: A Modified Deconvolution Technique for Microwave Images of Contiguous Targets," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 38, no. 1, Jan. 2002. pp. 89-97.

26. **R. Bose** and A. Kumar, "Reducing frequency reuse distance in cellular communications using trellis coded modulation," *IEE Proceedings on Communications*, vol. 148, Issue 3, Jun. 2001, pp. 149-154.

27. **R. Bose**, A. Hayn, and R. Jakoby**,** "Intra- and inter cell interference investigations for broadband radio access systems above 10 GHz," *Journal of Telecommunications and Information Technology*, no. 2, Jun. 2001, pp. 10-20.

28. **R. Bose**, "A Smart Technique for determining Base Station Locations in an Urban Environment," *IEEE Transactions on Vehicular Technology*, vol. 50, no.1, Jan. 2001. pp. 43-47.

29. A. Freedman, **R. Bose**, and B.D. Steinberg, "Thinned Stepped Frequency Waveforms to Furnish Existing Radars with Imaging Capability*,*" *IEEE Aerospace and Electronic Systems Magazine*, Nov. 1996. pp. 39-43.

30. A. Freedman, **R. Bose** and B.D. Steinberg, "Techniques to improve the CLEAN Deconvolution Algorithm," *Journal of the Franklin Institute*, vol. 332B, no.5, Sep. 1995. pp. 535-554.

Deployment and Maintenance of Virtual Labs

Kantesh Balani

Assistant Professor
Department of Materials Science and Engineering
Indian Institute of Technology Kanpur
Kanpur-208016, India

SHORT BIOSKETCH

Dr. Kantesh Balani joined as an Assistant Professor in the Department of Materials and Metallurgical Engineering (now Materials Science & Engineering) at Indian Institute of Technology (IIT) Kanpur in July 2008. He earned his doctorate in Mechanical Engineering from Florida International University, Miami, FL, in 2007. His research concentrated on the role of carbon nanotube dispersion in enhancing the fracture toughness of Al_2O_3 nanocomposite. He has also worked on bio-ceramic hydroxyapatite coatings for bio-medical applications. He pursued his post doctoral research in the Nanomechanics and Nanotribology Laboratory (NMNTL) and Plasma Forming Laboratory (PFL), Florida International University, Miami, FL. He is recipient of several fellowships and awards such as 2012 TMS *Young Leader Professional Development Award* (received during TMS 2012 Annual Meeting in Mar. 11-15, 2012, Orlando, US) by Materials Processing & Manufacturing Division, *Materials Science and Engineering C Young Researcher Award 2011* by Elsevier, *Young Engineer Award 2010* by Indian National Academy of Engineering, *Young Metallurgist Award 2010* from Indian Institute of Metals, *Young Scientist Award* in Materials Science division by Indian Science Congress Association 2009, *R.L. Thakur Memorial Prize* 2009 (Indian Ceramics Association), *David Merchant International Student Achievement* Award 2007, *Arthur E. Focke LeaderShape* Award 2004, RCTF (*Research Challenge Trust Fund*) Fellowship 2002, *Sudharshan Bhat Memorial Prize* and *S. Ananthramakrishnan Memorial Prize 2001,* and *Deutscher Akademischer Austausch Dienst (DAAD) Scholarship 2001.*

His **h-index of 15** (total citations exceeding 710) endorses his research productivity even at his early career stage. He is co-author of the book "***Advanced Structural Ceramics***" (*Wiley*, 2011), and has adapted "***The Science and Engineering of Materials***" (*Cengage Learning*, 2012). He has presented over 40 lectures in the international conferences and has over 55 publications in the peer-reviewed international journals and over eight conference proceedings. He has procured a funding of over US$600,000 during his last four years of tenure as Asst. Professor at IIT Kanpur. His research interests include nanomechanics and nanotribology of bio/nano composites, synthesis and processing of polymeric/ceramic nanocomposites, and energy materials. Currently, he is reviewer of over twenty technical journals from Elsevier, Blackwell Publishing Inc., Wiley, Springer, Hindawi, Highwire, MRS India/INSA, ACS Publications, Institution of Civil Engineers and American Society of Metals. He serves as a key reader for *Metallurgical and Materials Transactions A*, and is involved in the editorial board of *Recent Patents on Materials Science* (Bentham), *Recent Patents on Nanotechnology* (Bentham), *Nanomaterials and Energy (Institution of Civil Engineers), Journal of Materials & Metallurgical Engineering* (STM Journals), *Journal of NanoScience, NanoEngineering & Applications* (STM Journals), and *Journal of Engineering* (Hindawi).

EDUCATION

- 2007, ***Ph.D.***, Mechanical and Materials Engineering, *Florida International University* (FIU), Miami, Florida (CGPA ***3.975/ 4.0***). ***Best Ph.D. Student, Deans Award, Dissertation Year Fellowship.***
- 2002, ***M.S.***, Materials Science and Engineering, *University of Kentucky*, Lexington, KY (CGPA ***3.57/ 4.0***). ***Research Challenge Trust Fund Fellowship.***
- 2001, ***M.Tech.***, Metallurgical and Materials Engineering, *Indian Institute of Technology (IIT) Madras*, India (CGPA: ***9.86/ 10.0***). ***DAAD (Deutscher Akademischer Austausch Dienst) Scholarship*** and ***Sudharshan Bhat and S. Ananthramakrishnan Memorial Prize.***
- 1999, ***B. E.***, Metallurgical Engineering, *PSG College of Technology*, India (***83.5 %***). ***Best Outgoing Student.***

PUBLICATIONS/ SEMINARS GIVEN
Peer-Reviewed Publications: **60**
International Talks: **Over 45**

ACADEMIC/ RESEARCH HONORS

- **Editor** of **special thematic issue** on "*Solid Electrolytes: Emerging Global Competitors For Satisfying Energy Needs*" in Journal *Nanomaterials and Energy*, ICE Publications, Sept. 2012.
- **Letter of appreciation** from Chairman, Academic Senate, for **extraordinary teaching** the course MSE617 (Mathematics and Computational Methods) in Fall 2011.
- Recipient of "*2012 TMS Materials Processing & Manufacturing Division Young Leader Professional Development Award*" received during TMS 2012 Annual Meeting Mar. 11-15, 2012 at Orlando, FL, USA.
- Awarded **Materials Science and Engineering C Young Researcher Award 2011** by Elsevier for exceptional research efforts involving materials for biological applications on Nov. 29, 2011, Boston, USA.
- Received **INAE (Indian National Academy of Engineering) Young Engineer Award 2010** on Dec. 10th 2010, Visakhapatnam, India.
- Have been chosen for **National Academy of Sciences, India** (NASI) **Young Scientist Platinum Jubilee Award** 2010, which was presented on Dec. 4th 2010, Jaipur, India.
- Received "**Young Metallurgist of the Year**" award 2010 instituted by *Ministry of Steel, Govt. of India*, on Nov. 14th 2010 during *National Metallurgist Day* celebration, Bangalore, India.
- **Young Scientist Award** 2009 in Materials Science division by **Indian Science Congress Association** on Jan. 5th 2010, Trivandrum, India.
- Awarded **Dr. R.L. Thakur Memial Award-2009** from the **Indian Ceramic Society** on Dec. 11th 2009, Trivandrum, India.
- **Faculty Advisor** for "**Material Advantage @ IIT Kanpur**" since Dec. 2008. Chapter bagged "**Most Students Recruited**" membership challenge in Fall 2009 with a *cash prize of US$ 500* <u>competing against more than 60 active chapters worldwide</u>. Then, chapter has also received "**Most Creative Recruitment Strategies Award**" in Fall 2011 with a cash award of *US$ 250.*
- Selected by *National Phi Beta Delta Honor Society* to receive "**2007 David Merchant International Student Achievement Award**" owing to superior scholastic achievements. Annually only one international scholar is presented such a prestigious award worldwide. It consists of awarding $500 check with the acknowledgment certificate. Among <u>more than 150 chapters worldwide</u>, as president of Phi Beta Delta – Zeta Alpha Chapter at FIU, I received "*Eileen M. Evans Overall Outstanding Chapter for 2006-07*".
- Inducted *as full-member* in **Sigma Xi** honor society in Oct. 2007.
- Received "**2006-07 Dean's Award**" for highly productive doctoral student in the College of Engineering, FIU, with monetary award of $2000.
- Received "**Dissertation Year Fellowship**" to pursue doctoral research at Florida International University, 2006-07.
- Selected to attend *research-proposal writing workshop* organized by **National Science Foundation**, Aug. 22-23, 2007, University of Fairbanks, Alaska, USA.
- Awarded "**Best PhD Student**" by Department of Mechanical and Materials Engineering, FIU, for maintaining best grade point average, Spring 2005.
- Awarded "**National Science Foundation (NSF) Travel Scholarship**" to present a student poster during NSF Design and Manufacturing Innovation Conference at St. Louis, MO, July 24-27th 2006.
- **Won** a team technical quiz competition "**Materials Bowl**" during 2007 TMS (The Minerals, Metals and Materials) Annual meeting held in Orlando, Feb. 24-Mar. 1st, 2007. Overall twelve teams participated from colleges such as *Georgia Tech., Carnegie Mellon, Colorado School of Mines,* etc.
- Recipient of **RCTF** (*Research Challenge Trust Fund*) **Fellowship** for potential and capability in research at University of Kentucky during 2001-02.
- Awarded **Deutscher Akademischer Austausch Dienst (DAAD) Scholarship**, based on merit, to pursue M. Tech. Project at Materialprufungsanatalt (State Material Testing), University of *Stuttgart, <u>Germany</u>* (May2000-Feb.2001).

- Awarded *Sudharshan Bhat Memorial Prize* and *S. Ananthramakrishnan Memorial Prize* for "**Best Academic Record**" in Metallurgical Engineering branch for M.Tech. at IIT (Indian Institute of Technology) Madras, India, 2001.
- Awarded as **"*Best Outgoing Student*"** by Department of Metallurgical Engineering, P.S.G. College of Technology, Coimbatore, India for overall excellence in academics and sports (1999).

STUDENT-THESIS GUIDED:
PhD: 2 completed (9 ongoing)
M. Tech.: 5 completed (5 ongoing)

RESEARCH PROJECTS:
A total of over Rs. 3.00 crores (US$ 600,000) with external funding of Rs. 2.45 crores (US$ 490,000), being the main PI for projects ~ Rs. 2.28 crores (US $ 456,000).

Santosh B. Noronha

Assistant Professor
Department of Chemical Engineering
Indian Institute of Technology Bombay
Powai, Mumbai-400076, India

Education (Post-Graduation onwards & Professional Career)

Sl No.	Institution Place	Degree Awarded	Year	Field of Study
1	IIT Madras	B. Tech.	1990	Chemical Engineering
2	Univeristy of Maryland	Ph.D.	1996	Biochemical Engineering
3.	NIH, Bethesda, MD	PDF	2000	Bioprocess Engineering

Position and Employment (*Starting with the most recent employment*)

Sl No.	Institution Place	Position	From (Date)	To (date)
1	IIT Bombay	Asst. Professor	2001	

Professional Experience and Training

I am a biochemical engineer by training who has evolved multidisciplinary interests. I have focused on understanding various metabolic and regulatory aspects of microbial systems, towards rationally manipulating their productivity for production of therapeutics. In parallel I have focused on developing algorithms for online adaptive control and optimization such bioprocesses. I have recently developed a recombinant process for production of the chiral intermediate R-PAC, via a biotransformation route in *S. cerevisiae*. The process development aspects involved here included overexpression of the relevant enzyme in yeast, intensification of the catalysis by site directed mutagenesis of the enzyme, followed by reactor-level optimization. This process has been translated to a pharma company (which cosponsored the work along with DST (Drugs and Pharma)) and is undergoing the patenting process now in several countries.

Selected peer-reviewed publications (Ten best publications in chronological order)

Reshamwala, S., Noronha, S.B. , "Biofilm formation in Escherichia coli cra mutants is impaired
due to down-regulation of curli biosynthesis.", Arch Microbiol., vol. 193 (10), pp. 711 - 722, 2011

Shiloach, J., Reshamwala, S., Noronha, S.B., Negrete, A. , "Analyzing metabolic variations in
different bacterial strains, historical perspectives and current trends - example E. coli", Current
Opinion in Biotechnology, vol. 21, issue 1, pp. 21 - 26, 2010

Gokhale, A., Kunder, R., Goel, A., Sarin, R., Moiyadi, A., Shenoy, A., Mamidipally, C., Noronha, S., Kannan, S., Shirsat, N.V. , "Distinctive microRNA signature of medulloblastomas associated with the WNT signaling pathway", Journal of Cancer Research and Therapeutics, vol. 6, pp. 521-529, 2010.

Pusha, S., Gudi, R., Noronha, S. , "Polar classification with correspondence analysis for fault
isolation", Journal of Process Control, vol. 19, issue 4, pp. 656 - 663, 2009.

Karra, S., Shaw, R., Patwardhan, S.C., Noronha, S. , "Adaptive model predictive control of
multivariable time-varying systems", Industrial and Engineering Chemistry Research, vol. 47,

issue 8, pp. 2708 - 2720, 2008

Mukhopadhyay, M., Noronha, S.B., Suraishkumar, G.K. , "Copper biosorption in a column of
pretreated Aspergillus niger biomass", Chemical Engineering Journal, vol. 144, issue 3, pp. 386 -
390, 2008

Mukhopadhyay, M., Noronha, S.B., Suraishkumar, G.K. , "Kinetic modeling for the biosorption of copper by
pretreated Aspergillus niger biomass", Bioresource Technology, vol. 98, issue 9, pp. 1781 - 1787, 2007

Porwal, G., Jain, S., Babu, S.D., Singh, D., Nanavati, H., Noronha, S. , "Protein structure
prediction aided by geometrical and probabilistic constraints", Journal of Computational
Chemistry, vol. 28, issue 12, pp. 1943 - 1952, 2007

Kumar, R., Nanavati, H., Noronha, S.B., Mahajani, S.M. , "A continuous process for the recovery of lactic acid by
reactive distillation", Journal of Chemical Technology and Biotechnology, vol. 81,issue 11, pp. 1767 - 1777, 2006

Noronha, S., Yeh, H., T. F.l Spande and J. Shiloach. "Investigation of the TCA cycle and the glyoxylate shunt in
Escherichia coli BL21 and JM109 using (13)C-NMR/MS. Biotechnol. Bioeng. 68(3) 316-327. 2000

Noronha, S., L. W. Wagner, N. H. Matheson and J. Shiloach. Use of an ethanol sensor for feedback control of
growth and expression of TBV25H in Saccharomyces cerevisiae. Biotechnol Bioeng 63: 285-289. 1999

Deployment and Maintenance of Virtual Labs

P. Sriram

Professor,
Department of Aerospace Engineering,
I.I.T., Madras
Chennai-600 036, TN

Education

- B.Tech. (Aero) - IIT Madras, 1982

- M.S. (Aero) - Georgia Institute of Technology, USA, 1984

- Ph.D. - Georgia Institute of Technology, USA, 1988

Work History

- Dean (Administration), IIT Madras, 2011 – present

- Head, Department of Aerospace Engineering, IIT Madras, 2009 – 2011

- Professor, IIT Madras, 2004 – present

- Visiting Professor, Wichita State University, USA, 2004 – 2005

- Head, Computer Centre, IIT Madras, 1998 – 2001

- Associate Professor, IIT Madras, 1996 – 2004

- Assistant Professor, IIT Madras, 1995 – 1996

- Visiting Faculty IIT Madras, 1994 – 1995

- Assistant Professor, Wichita State University, USA, 1991 – 1994

- Post Doctoral Fellow, Georgia Tech, 1988 – 1991

- Graduate Research Assistant (1/2 time), Georgia Tech, 1984 – 1988

- Graduate Research Assistant (1/3 time), Georgia Tech, 1982 – 1984

Most recently taught courses at IIT Madras and elsewhere

- AS352 Aero Lab.-II

- AS302/AE332 Aircraft Design

- AS304 Experimental Strees Analysis

- AE772 Experimental Techniques Structural Mechanics

- AS-401 Detailed design and Manufacturing

- AS-303 Vibration

- AS-351 Aerospace Lab-I

Research Interests

- Structural Mechanics
- Composites
- Fatigue and Fracture
- Computer Networking
- Distributed and Parallel Processing

Career Highlights

- Top notch performer at every step as detailed below
- B.Tech. Gold Medallist at IIT Madras (1982)
- M.S. aggregate of 100% at Georgia Tech (1984)
- Ph.D. Thesis nominated for best thesis award (1988)
- Post Doctoral Work awarded Best Paper by ASTM (1989)
- Polished Professor at Wichita State University (1992)
- Nominated for University-wide Best Teacher award (1993)
- Short-listed for Marquis' Who's Who in the World (1996)
- Author of about 40 research papers including 18 in international journals with mean citation rate of over 6 citations per paper
- Principal Investigator on sponsored research projects of value Rs. 5.84 crores, consulting projects of value Rs. 6.74 lakhs and continuing education projects of value Rs. 72.4 lakhs

C.S. Kumar

Associate Professor
Department of Mechanical Engineering
IIT Kharagpur
Kharagpur-721302, West Bengal

1. Name in full : CHERUVU SIVA KUMAR

2. Address
Associate Professor,Dept. of Mechanical Engg.,
Indian Institute of Technology Kharagpur
Kharagpur – 721 302, West Bengal, India

3. Date of Birth : September 21, 1966

4. Nationality : Indian

5. Areas of Specialisation :
Robotics, Control Systems and Computer Networks

6.Qualifications :
B.Tech (Hons.), Mechanical Engineering (Manufacturing Science and Engieering) IIT Kharagpur, 1987
Ph.D. (Mechanical Engineering), IIT Kharagpur, 1995
Post Doc fellow (STA/Now JSPS), AIST, Tsukuba, Japan, 1999

7. Professional Associations:
Member IEEE (Robotics and Automation; Communication Systems and Oceanic Engineering Societies)
Member American Society of Mechanical Engineers
Member Robotics Society of India

8. Publications:
Journal Papers **:** 11
Book Chapters: 1
Conference Papers: 42

9.Ph.D./M.Tech Supervision
(i) Ph.D Thesis Supervision: 4 (5 ongoing)
(ii) M.Tech Thesis Supervision : 38 (3 ongoing)

10. **Sponsored projects as PI/ co-PI (sin 2006):**
1. "Development of an Autonomous Underwater Vehicle", Ministry of Earth Sciences. (as co-PI and group lead on Navigation and control) completed November 2011
2. "Establishment of a Nationwide QoS Network test bed", Ministry of Communications and Information Technology. (as PI)
3. "Mission Project on Virtual Labs - Pilot Phase, Main Phase and Real Time Labs", Ministry of Human resources Department, along with IIT Delhi, ongoing since 2009 (as Participating Insititute Coordinator, IIT Kharagpur and Discipline National Coordinator, Mechanical Sciences).
4. "Aluminium Alloys and Materials for Underwater Vehicles", Ministry of Earth Sciences (National Institute of Ocean Technologies) as Co-PI since 2011.

11. Selected Publications:

1. Vasu K, Sumit Maheshwari, Sudipta Mahapatra, C.S. Kumar, "An Energy and QoS Aware FUZZY-TOP Vertical Handover Decision Mechanism for Heterogeneous Wireless Networks", *IET Networks* (To appear February 2013)

2. Vasu K, Sumit Maheswari, Sudipta Mahapatra, C.S.Kumar, "QoS Aware Fuzzy Rule Based Vertical Handoff Decision Algorithm Incorporating a New Evaluation Model for Wireless Heterogeneous Networks" *EURASIP Journal for Wireless Communications and Networking*, Vol 2012:322 (2012)

3. Sumit Maheshwari, Sudipta Mahapatra, C.S Kumar, Vasu K, "A Joint Parametric Prediction Model for Wireless Internet Traffic using Hidden Markov Model", *Springer WINET*, Vol 1, Pages 1-15 (2012)

4. G.B. Madhab, C.S. Kumar, and P.K. Mishra "Modelling and Control of Bio-inspired microgripper", *International Journal of Manufacturing Technology and Management*, 21, 160-175 (2010)

5. R.Prasanth Kumar, C.S.Kumar, A. Dasgupta and D.Sen, "Time-Delay Control of an Autonomous Underwater Vehicle: Theory and Experimental Results" *Ocean Engineering - Special Issue of Ocean Engineering on Autonomous Underwater Vehicles*, 36, 74-81 (2009)

6. Prassanth Kumar R., Dasgupta Anirvan, Kumar C.S.", A New Tracking Controller Design for Underwater Vehicles Using Quadratic Stabilization" *Journal of Dynamic Systems Measurement and Control*, Vol 130, (2008)

7. R. Prasanth Kumar, A. Dasgupta and C.S. Kumar, "Robust Trajectory Control of Underwater Vehicles using Time Delay Control Law", *Ocean Engineering*, 34, 842-849 (2007)

8. J.Krishnaiah, C.S.Kumar, M.A.Faruqi, "Modelling and Control of Chaotic Processes though their bifurcation diagrams generated with the help of recurrent neural network models Part II: An industrial study", *Journal of Process Control* (2006)

9. J.Krishnaiah, C.S.Kumar, M.A.Faruqi, "Modelling and Control of Chaotic Processes though their bifurcation diagrams generated with the help of recurrent neural network models Part I: simulation studies",*Journal of Process Control*, (2006)

10. R. Prasanth Kumar, A. Dasgupta and C.S. Kumar, "Real-time optimal motion planning for autonomous underwater vehicles", *Ocean Engineering*, 32, Issues 11-12 (2005)

11. Kumar, C.S., A. Dasgupta and A. Mukherjee., "A study on Interaction Control through Passive Degrees of Freedom: Stability and Adaptation of Impedance Variation"*. Special Issue on Control Systems for students, Part II, Journal of the IETE*, July-Dec 1992.

12. Contributed a chapter "*Control Strategies in Physical Domains*" in the book entitled "*Bond graph in modeling simulation and fault identification*" by Amalendu Mukherjee, Ranjit Karmakar and Arun Kumar Samantaray, I.K.International, New Delhi, ISBN 81-88237-96-5 June 2006.

13. Vasu K, Sudipta Mahapatra, C.S Kumar, "An Analytical Framework for Evaluating MIPv6 Protocols Applying Transport Engineering Concepts", *ACM MSWiM 2012*, Vol. 1, Pages 53-60, Paphos, Cyprus.

14. Gupta, P.K.; Parul Saraswat; Kumar, C.S; Saswat Chakrabarti; Rajakumar, R.V.; "Measurement of Power Consumption in MultiMedia Mobiles for Various Network Activities in 2G/3G Networks" IEEE ANTS, 2012.

15. Gupta, P.K.; Rajakumar, R.V.; Kumar, C.S.; , "Energy Impact of Signalling Protocols in 3GPP-LTE and Guidelines For Savings," IEEE Indicon, 2012.

16. Gupta, P.K.; Rajakumar, R.V.; Kumar, C.S.; , "Analysis of Impact of Network Activity on Energy Efficiency of 3GPP-LTE, " IEEE Indicon, 2012.

17. Gupta, P.K.; Rajakumar, R.V.; Kumar, C.S.;, "Energy cost analysis of data plane and control plane protocols for 3GPP-LTE, " National Conference on Communications (NCC), 2012, vol., no., pp.1-5, 3-5 Feb. 2012.

18. Gan Chaudhuri, S.; Kumar, C.S.; RajaKumar, R.V.; , "Validation of a DiffServ based QoS model implementation for real-time traffic in a test bed," IEEE *National Conference on Communications (NCC), 2012*, vol., no., pp.1-5, 3-5 Feb. 2012.

19. Jallu Krishnaiah, C.S. Kumar, and M.A. Faruqi; "Intelligent Chaos Controller: A Computational Intelligence Based Approach for Data-Driven Real-World Systems"; Proceedings of the International Conference on

Information Systems Design and Intelligent Applications, Advances in Intelligent and Soft Computing 2012 (INDIA 2012), AISC 132, pp. 273–280.

20. Vasu K, Sumit Maheshwari, Sudipta Mahapatra, C. S. Kumar, "QoS Aware Fuzzy Rule Based Vertical Handoff Decision Algorithm for Wireless Heterogeneous Networks", *IEEE NCC*, Page(s): 371-375, Jan, 2011, IISc, Bangalore, India.

21. Sumit Maheshwari, Vasu K, Sudipta Mahapatra, C. S. Kumar, "A Joint-Parametric Realistic Traffic Model for Wireless Internet using Hidden Markov Model", *IEEE CSQRWT*, July, 2011, HIT, Harbin, China.

22. Vasu K, Sudipta Mahapatra, C.S Kumar, "MIPv6 Protocols: A Survey and Comparative Analysis", *CoNeCo 2012*, Vol. 4, pp. 73–93, 2012. © CS&IT-CSCP AIRCC, Coimbatore, India.

23. Vasu K, Sudipta Mahapatra, C.S Kumar, "Bulk Binding Update Procedure for PMIPv6 Based Intelligent Transportation Systems", *WiMo 2012*, Vol. 4, pp. 207-223, 2012. © CS&IT-CSCP AIRCC, Coimbatore, India.

24. Sumit Maheshwari, Vasu K, C. S. Kumar, Sudipta Mahapatra, "Measurement and Comparative Analysis of UDP Traffic over Wireless Networks", *ICWN, July, 2011,* Las Vegas, USA.

25. Sumit Maheshwari, Vasu K, C. S. Kumar, Sudipta Mahapatra, "Measurement and Analysis of UDP Traffic over Wi-Fi and GPRS", *ICCCD*, Dec, 2010, IIT Kharagpur, India.

26. Ayan Sinha; Madhusudan Chakraborty; Sudipto Ghosh; C.S. Kumar; Jitesh H. Panchal; Janet K. Allen; David L. McDowell; Farrokh Mistree *Microstructure-mediated integration of material and product design - Undersea submersible,* Proceedings of the ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference 2009, DETC2009 2010;5(PART A):467-478.

27. Krishnaiah.J, C.S.Kumar, M.A.Faruqi, *Analysing Behaviour of Submerged Arc Furnace using Recurrent Neural Networks,* General Abstracts: TMS-2007 Material Processing and Manufacturing Division, Modelling and Simulation of Materials and Processes, Feb 25- March 1, 2007, ORLANDO, FLORIDA USA.

28. Pretty Khare, G.B.Madhab, C.S.Kumar and P.K.Mishra, *Optimizing Design of Piezoelectric Actuated Compliant Microgripper Mechanism,* Proceedings of the 13th National Conference on Mechanisms and Machines (NaCoMM07), Bangalore, December 2007. Nacomm-2007-112.

29. T.S. Simil and C.S.Kumar, *"Planning micromanipulations using haptic interaction environment"*, Proceedings of the 13th National Conference on Mechanisms and Machines, Bangalore, December 2007.

30. Pretty Khare, Madhab, G.B., C.S.Kumar and P.K.Mishra *"Optimizing Design of Piezoelectric Actuated Compliant Microgripper Mechanism"*, Proceedings of the 13th National Conference on Mechanisms and Machines, Bangalore, December 2007.

Deployment and Maintenance of Virtual Labs

Ratnajit Bhattacharjee

Professor
Department of Electronics and Electrical Engineering
IIT Guwahati
Guwahati-781039, Assam

Dr. Ratnajit Bhattacharjee received his B. E. in Electronics and Telecommunication Engineering (First Class Honors) from Gauhati University (REC (at present NIT) Silchar), M. Tech. (E and ECE Department, Microwave Engineering specialization) from IIT Kharagpur and Ph. D. (Engineering) from Jadavpur University Kolkata. Presently he is a Professor in the Department of Electronics and Electrical Engineering, IIT Guwahati and also the Head of the Department. Prior to joining IIT Guwahati, he served as a faculty member in REC (at present NIT) Silchar. His research interests include Wireless communication, Wireless networks, Microstrip antennas, Microwave Engineering and Electromagnetics. He has published over ninety research papers in journals, international and national conferences. He has developed a web course on Electromagnetic Theory under the NPTEL project of MHRD. He is involved with the ongoing mission project of MHRD on Virtual labs at various capacities (Discipline wise national coordinator for Electrical Engineering, Institute coordinator for IIT Guwahati as well as laboratory development activities). Two students have completed their doctoral research under his guidance. At present ten (four are joint supervisions) research scholars are working under his supervision in the areas of antenna design, wireless communication, MIMO radar and communication networks. He has also supervised twenty nine M. Tech thesis (includes ten joint supervisions). He has been involved in several research projects. He was a Co-investigator for the contracted research from NICT Japan in the area of Next Generation Wireless Networks and was a member of the research team of the Tiny6 STIC project dealing with IPv6 and Sensor Networks. He has been an investigator of the DIT sponsored research project on   Ultra Wide Band Radio Technology and its Application. He has also been involved as principal investigator in a sponsored research project on antenna system development from ISRO. He has acted as reviewer for several conferences and journals. He was TPC chair for the Communication Symposium of the fifteenth National Conference on Communications, 2009 (NCC 2009) and also served as TPC member and session chair in some conferences. In NIT Silchar, he was one of the coordinators for the setting up of Campus Wide Optical Fiber based network under the Centre for Excellence scheme and was also Head of the Department of ETE for about a year. He is a member of IEEE and life member of Indian Society of Technical Education.

Some Recent Journal Publications:

1. Samar Shailendra, R. Bhattacharjee, and Sanjay K. Bose, "An implementation of Min–Max optimization for multipath SCTP through bandwidth estimation based resource pooling technique", In press, *AEU-International Journal of Electronics and Communications(Elsevier)*
2. H. Katiyar and R. Bhattacharjee, "On the Performance of Decode-and-Forward Relaying with Multi-Antenna Destination", *Elsevier's Int. J. Electron. Commun. (AEUe)* vol 66, Issue 1 January, 2012, pp. 1-6.
3. Samar Shailendra, R. Bhattacharjee, and Sanjay K. Bose, "MPSCTP: A Simple and Efficient Multipath Algorithm for SCTP", *IEEE Communications Letters*, VOL. 15, NO. 10, Oct. 2011 pp. 1139-1141.

4. H. Katiyar and R. Bhattacharjee, "Average capacity and signal-to-noise ratio analysis of multi-antenna regenerative cooperative relay in Rayleigh fading channel", *IET Communications,* vol. 5, Oct. 2011, pp. 1971-1977.
5. Himanshu Katiyar and R. Bhattacharjee, "Performance of two-hop infrastructure based multi-antenna regenerative relaying in Rayleigh fading channel", *Elsevier's Physical Communication ,* vol 4, Issue 3, Sep. 2011, pp. 190-195.
6. Himanshu Katiyar and R. Bhattacharjee, "Outage Performance of Multi-antenna Relay Cooperation in Absence of Direct Link", *IEEE Communications Letters*, vol. 15, no. 4, Apr. 2011, pp. 398-400.
7. B. S. Paul and R. Bhattacharjee, "Time and Angle of Arrival Statistics of Mobile-to-Mobile Communication Channel Employing Dual Annular Strip Model*", IETE Journal of Research*, vol. 56, issue 6, 2010, pp. 275-281.
8. Himanshu Katiyar and R. Bhattacharjee, "Performance of MRC combining Multi-antenna Cooperative Relay network", *Elsevier's Int. J. Electron. Commun.(AEU)*, vol. 64, issue 10, pp. 988-991, Oct. 2010.
9. Himanshu Katiyar and R. Bhattacharjee, "Performance of Two-Hop Regenerative Relay Network under Correlated Nakagami-m Fading at Multi-antenna Relay", *IEEE Communications Letters*, vol. 13, no. 10, Nov. 2009, pp. 820-822.
10. Himanshu Katiyar and R. Bhattacharjee, "Outage Performance of Two-hop Multi-antenna Cooperative relaying in Rayleigh Fading Channel", *IET Electronics Letters*, vol. 45, no. 17, Aug. 2009, pp. 881-883.
11. B. S. Paul, A. Hasan, H. Madheshiya and R. Bhattacharjee, "Time and Angle of Arrival Statistics of Mobile-to-Mobile Communication Channel Employing Circular Scattering Model", *IETE Journal of Research*, vol. 55, issue 6, 2009, pp. 275-281.
12. Himanshu Katiyar and R. Bhattacharjee, "Power Allocation Strategies for Non-Regenerative Relay Network in Nakagami-m Fading Channel", *IETE Journal of Research*, vol. 55, issue 5, 2009, pp. 205-211.

Vinod Kumar

Professor & Head Electrical Engineering Department

IIT Roorkee

ROORKEE-247 667 India

Research Interest : ECG Signal Processing and Analysis; Digital Signal and Image Processing; Transducer Instrumentation.

Supervision of Students

1. PhD theses : 16 completed + 7 in progress

2. ME dissertations: 76 completed + 4 in progress

3. BE projects : more than 100 completed

Qualification

➤ BSc Engg. (Electrical) Hons., 1973

➤ ME (Measurement and Instrumentation) Hons., 1975

➤ PhD (Biosystem Modelling and Analysis), 1984

Distinctions/Honours /Awards

1. Member International Program Committee, 31st Annual IEEE Engineering in Medicine & Biology Society Conference to be held in Minnesota, 2009

2. The Corps of Engineers Prize: Institution of Engineers (I) 2008

3. Honorary Editor, Medical Electronics, IETE Journal of Research April-2007

4. Member Editorial Board, International Journal of Medical Engineering and Informatics (IJMEI)

5. Editor, International Journal of Highly Reliable Electronic System Design

6. Guest Editor, IETE Journal of Research, Special issue on Biomedical Signal & Image Processing to published in Nov-Dec 2007.

7. The Railway Board's Prize: Certificate of Award on a research paper by Institution Of Engineers(I) 2006

8. Ist IETE-R S Khandpur Medical Instrumentation Gold Medal in recognition of life time achievements and outstanding contribution in the field of Biomedical Instrumentation 2006

9. The Brij Mohanlal Memorial Prize by Institution of Engineers (I) 2005

10. Outstanding Teacher's Award during 2005 IIT Roorkee

11. Excellent Performance during 2004-05 IIT Roorkee

12. Excellent Performance during 2003-04 IIT Roorkee

13. Excellent Performance during 2001-02 and 2002-03 IIT Roorkee

14. IETE K S Krishna Memorial Award 2004

15. Khosla Cash Award & Prize, Awarded by IIT Roorkee, 2002

16. Khosla Cash Prize, University of Roorkee, Roorkee, 2001

17. Khosla Annual Research Prize, University of Roorkee, Roorkee, 1994

18. Certificate of Merit for research paper by Institution of Engineers (I) 1994

19. Certificate of Merit for research paper by Institution of Engineers (I) 1990

20. Gold Medal for standing first class first in M.E. (Measurement and Instrumentation) 1975

21. J. Mukhopadhyay Medal for standing first class first in M.E. (Electrical) among all branches 1975

Membership of Professional Bodies

1. Life Fellow, Institution of Engineers (I)

2. Senior Member, IEEE, USA

3. Member, IEE, UK

4. Life Fellow, Institution of Electronics and Telecommunication Engineers

5. Life Member, Biomedical Engineering Society of India

6. Life Member, Indian Society for Technical Education

7. Life Member, Systems Society of India

8. Life Member, Ultrasonic Society of India

9. Life Member, Instrument Society of India

Member of Governing Board/Senate/BOS of Engineering Institutes

1. Member, Board of Studies, Delhi University, Delhi

2. Member, Board of Studies, Punjab University, Chandigarh

3. Member, Institute Research Board, TIET, Patiala

4. Member, Board of Studies, TIET, Patiala

5. Member, Board of Studies, MITS, Gwalior

6. Member – Board of Studies (Biomedical Engineering), Rajeev Gandhi Proudyogiki Vishwavidyalaya, Bhopal

7. Member of the Senate, Dr BRANIT, Jalandhar

Invited Talks/Speaker 2000 onwards

1. Computers in Medicine, National seminar on Trends in Industrial Electronics, Transducer, Control and Communication, TIET, Patiala, November 14-15, 2000

2. Role of Computers in Medicine during National Symposium on Instrumentation

(NSI-26), IRDE, DRDO, Dehradun , October 31-Nov. 2, 2001

3. Bridge Instrumentation during National Workshop on Research Interest in

Bridge Engineering – Present and Future, Organised by Bridge Engineering Group, UOR Roorkee March 15, 2001

4. Expert lecture on DSP, IRDE, DRDO, Dehradun, November 21-2002

5. Expert lectures on Telemedicine, SLIET, Longowal, December 27 & 28, 2002

6. Expert lecture, MITS, Gwalior, August 29, 2002

7. Invited Lecture, National Workshop on DSP and its Applications, RAIT, Mumbai, July 3-7,2006

8. Invited Lecture, ECG Signal Analysis, SGGGS, Nanded, Dec 2006.

9. Delivered a seminar on HRV Analysis , University of Washington, Department of

Bioengineering , Washington, Seattle, March 2008

10. Delivered a seminar on ECG Signal Analysis, PHYSIO CONTROL, Redmond, WA 98052 USA, March 2008

11. Invited talk on E-Governance, NIT Jallandhar Nov 2008.

Administrative Experience

➢   Prof & Head, Department of Electrical Engineering(Jan 2009-)

➢   Coordinator, QIP Centre, IIT Roorkee (till date)

➢   Head, Continuing Education Centre, IIT Roorkee (till date)

➢   Head, Information Super Highway Centre, IIT Roorkee (Jan 2002- Jan 2005)

➢   Coordinator, Educational Technology Service Cell, IIT Roorkee (2002-2003)

➢   Chairman, Spl Purchase Committee (Software), IIT Roorkee (till date)

➢   Coordinator , Audio Visual Research Centre, IITR (Sept 2001- March 2002)

➢   Director, Audio Visual Research Centre, University of Roorkee (1999-2001)

➢   Associate Dean Academic, University of Roorkee (for 2 yrs)

➢   Chief Warden of UG/PG Hostel for 3 years

    (a)   **Officer-in-charge:**

(i)   Instrumentation & Signal Processing Laboratory   15years

(ii)   Biomedical Engg. Laboratory tilldate

    (b)   **Member of the Department Committees:**

(i)	Chairman, Department Research Committee	
(ii)	Finance & Purchase Committee:	8 years
(iii)	Department Professorial Committee	4 years
(iv)	P.G.& U.G. Academic Programme Committee:	3 years each
(v)	Deptt. Administrative Committee:	8 years (till date)
(c)	Member of University/Institute Level Committees:	
(i)	The Senate (till date)	
(ii)	The Syndicate (upto 2001)	
(iii)	The Academic Council (upto 2001)	
(iv)	The Research Degree Committee (upto 2001) (v) VISION 2020	
(vi)	Member PG (Engineering) Admission Committee of the University 1999 & 2001	
(vii)	Member, University/Institute Lecture Series Committee (up to 2004) (viii) Member, Group Purchase Committee (Till date)	

Professional Experience:

(a)   33 years of teaching and research experience in the field of Biomedical Instrumentation, Signal Processing and Transducer Instrumentation. Interaction with industries to provide them consultancy in the area of Instrumentation and Signal Processing.

(b)   Monograph Written   :   2 nos.

Books Written   :   1

(c)   Expert in many meetings, organised by the All India Council for Technical Education, Ministry of Information Technology, and Department of Science and Technology for the evaluation of R&D projects in the area of Biomedical Engineering/Instrumentation.

(d)   Member of PG Academic Board of AICTE for 2 years for the approval of new PG

courses in Engineering Institutes.

(e)   Subject Expert in many interview panels for the posts of Professor/ Associate

Professor/Lecturer in Engineering Institutes of National Importance.

Sponsored Research Projects completed

(As Principal Investigator/Investigator)

1. National Competitiveness in the Knowledge Economy, MIT, GOI, Rs 497.00 lacs (in progress). This is a joint project being executed by IITM, IMI, NPC & IITR.

2. Setting-up of Community Information and Service Centres in five boarder districts of Uttarakhand, GoUK , Rs 113.00 lacs (inprogress)

3. Pro-Poor IT Initiatives in Uttaranchal – Data Centre, Community Information Centres and Networking, UNDP, Rs. 336 lacs

4. Intelligent Fault Diagnosis of High Performance Electric Drives, MHRD, New Delhi. 13.00 lacs .

5. Development of Integrated Software for Quantification of Autonomic Tone, Ministry of Communication & Information Technology, New Delhi, in collaboration with IIT Delhi & AIIMS New Delhi.

6. Establishment of Correlation between Ultrasound Signal and Flow Geometry CSIR, New Delhi, Rs. 3.9 lacs .

7. Future Extraction and Interpretations of Ultrasound Medical Images, AICTE, New Delhi, Rs. 5.0 lacs .

8. Condition Monitoring System for Human Cardiac System and Large Electric

Machines, DST, New Delhi, Rs. 20,00,000/- .

9. Development of `A Computerized ECG Interpreter for Mass Healthcare', AICTE, New Delhi, Rs. 8, 00,000/-.

10. Expert System Based Condition Monitoring of Industrial Drives Department of

Science & Technology, New Delhi, Rs. 11,47,000/-

11. Studies on Development of Efficient Heating System for Biogas Digesters, Ministry of Non-Conventional Energy Sources 1998., Rs. 14,58,000/-

12. Information Technology, State of Art and Application to Industry, All India Council for Technical Education, New Delhi, 1995. Rs. 2.5 lacs

13. Computer Based Monitoring, Protection and Control of Power Stations. Ministry of Human Resource Development, India 1992. Rs. 10.0 lacs14. Disease Classification based on ECG and Blood Pressure data. Rs. 1.0 Lac, Ministry of Education, through University of Roorkee. 1988.

15. Microprocessor based Analysis and Interpretation of ECG signal, sponsored by

University of Roorkee, Roorkee. 1986.

16. Development of time optimal policy for Heomodialysis system, sponsored by U.G.C. New Delhi. 1985.

17. Development of test bench for testing of circuits, sponsored by University of Roorkee, Roorkee. 1985.

18. Reliability Based Design of Electronic System considering Catastrophic and Gradual Failure, sponsored by Department of Electronics, Govt. of India, 1984, Rs. 12.0 Lac

Consultancy projects

(As Principal Investigator or Investigator)

1. Development of Software & Sensors for Testing of Energy Meters, REIL Jaipur, Rs 4.00 lacs (inprogress).

2. Setting-up of Community Information and Service Centres in five boarder districts of Uttarakhand, GoUK , Rs 378.00 lacs (inprogress)

3. Development of ECG package for analysis, BARC Mumbai, Rs 5.00 lacs.

4. Pro-Poor e-governance initiatives in Uttranchal, GoU, Rs. 200.00 lacs.

5. Performance Evaluation of Small Hydroelectric Power Plants, MNES, Rs. 25.00 lacs

6. Pro-poor IT initiatives in Uttaranchal – Data Centre, Community Information Centres and Networking, UNDP, Rs. 144 lacs

7. RLA & RMU studies of electrical equipment of Nirgajini Power Plant, U.P. Jal Vidyut Nigam Ltd., Rs. 3.50 lacs

8. Performance evaluation of small hydroelectric power plants, MNES, Rs. 2.00 lacs

9. RLA & RMU studies of electrical equipment of Mohammadpur Power Plant, U.P. Jal Vidyut Nigam Ltd., Rs. 2.4 lacs

10. Computer controlled vibration damper test system, Asbesco (India) Pvt. Ltd., Calcutta, Rs. 50,000/-, 2000.

11. Design and development of computerised calibration system for static energy meters. M/s REIL, Jaipur Rs. 5,30,000/-, 1999.

12. Design and development of 12 kV Impulse Voltage Generator, M/s Capital Power Systems Ltd., Noida, Rs. 1,40,000/-, 1999.

13. Design and development alternating flux density meter, M/s Capital Power Systems Ltd., Noida, Rs. 14,000/-, 1999.

14. Design and development of impulse voltage generator for electromechanical energy meters, M/s G.E.C. Alsthom, Calcutta, Rs. 75,000/-, 1998.15. Design and development of impulse test system for the energy meters, as per specification of the firm VXL Landis & Gyr Ltd., Rs. 1,50,000/-, 1998.

16. Computerized calibration of three-phase static energy meters, M/s Rajsthan Electronics and Instruments Ltd., Jaipur, Rs.2,47,000/-, 1998.

17. Development of PC based ECG monitor. M/s Bergan Healthcare Pvt. Ltd., Gurgaon, Rs. 50,000/-, 1998.

18. Development of an electromagnet analyzer, M/s Havell's Industries, New Delhi, Rs. 40,000/-, 1997.

19. Computer aided calibration and routing testing of energy meters in the production line, M/s Towers & Transformers, Ghaziabad, Rs. 50,000/-, 1997.

20. Instrumentation of 235 m RCC Tower at Pitampura, New Delhi, consultancy Rs. 2.5 Lac and Total cost of project Rs. 75.0 Lac, Directorate General Doordarshan, Mandi house, New Delhi, 1997.

21. Development of microprocessor control for A.C. coaches, Research, Design & Standards Organisation, Ministry of Railways, Lucknow, Rs.1,25,000/-, 1996.

22. PC based vibration testing of energy meter as per IS: 13010-1990, M/s Towers & Transformers, Ghaziabad, Rs. 50,000/-, 1996.

23. Design and development of impulse testing setup as per IS: 13010-1990, M/s Havell's Industries, New Delhi, Rs. 40,000/-, 1996.

24. Design and development of energy meter impulse testing setup, M/s Baroda Electric Co., Rs. 30,000/-, 1994.

25. Design and development of Impulse Generator. Towers & Transformers, New Delhi. Rs. 30,000/-, 1993.

26. Model testing of 375 m multiflue chimney in wind tunnel, M/s CESC Ltd., Victoria House, Calcutta. Rs. 50,000/-, 1993.

27. Design and development of a test equipment (Impulse Generator) Rs.15,000, ECE Industries , Hyderabad. - 1992.

28. Design and development of software and hardware for PC based flow and discharge monitoring system, Irrigation Research Institute, Bhopal (Through Western Precision Instruments, Roorkee), Rs. 22,000/- 1992.

29. Development of software for PC based data acquisition, monitoring and analysis for turbogenerator testing, Bharat Heavy Electricals Ltd., Hardwar. (Through New Engineering Enterprises, Roorkee) Rs. 20,000/-, 1992.

30. Development of software and hardware for on-line data acquisition , processing & display for wind tunnel studies, Central Building Research Institute, Roorkee, Rs.22,000, 1991.

31. Development of microprocessor based on-line torque speed recording and plotting system. Bharat Heavy Electricals Ltd. Hardwar, Rs. 45,000/-, 1990.32. Review of DC to DC converter circuit design. Centre for Development of Telematics, New Delhi, Rs.20,000. - 1986.

33. Technical discussions and design/development consultancy in the field of instrumentation to many industries. Rs. 10,000/-

34. System design for PC based vibration monitoring and control system, as per IS: 13010- 1990, M/s APEEC, Hydrabad, Rs. 75,000/-.

35. Development of software for on-line monitoring and display of 64 channel temperature signals for ISRO through M/s Recordtech, Roorkee, Rs. 30,000/-

36. Design and development of zero power factor source for energy meter testing, M/s Havell's Industries, New Delhi, Rs. 20,000/-.

37. Design and development of computerized calibration system for batch testing of static energy meters, M/s REIL, Jaipur, Rs. 5,30,000/-

38. Technical discussions and consultancy in the area of energy meter calibration, M/s REIL, Jaipur, @ Rs. 1000/- per day.

39. Transfer of technology - for the calibration of static energy meters to M/s Bergen Electronics Ltd., Gurgoan, (one prototype unit + consultancy charges).

40. Design and development of a prototype unit for fault detection equipment, M/s Jindal Electronics, Roorkee, Rs. 60,000/-.

41. Design and development of 10 kV Impulse Voltage Generator, M/S H.S. Chawla & Co., New Delhi, Rs. 1,40,000/-.

42. Design and development of 5 kV, 0.5J, 1.2/50 μs bipolar impulse voltage tester, M/S National Test House, Ghaziabad, Rs. 80,000/-

43. Design and development of 6 kV, 0.5J, 1.2/50 μs bipolar impulse voltage tester, M/S National Test House, Ghaziabad, Rs. 80,000/-

44. Design and development of vibration test system, M/S National Test House, Ghaziabad, Rs. 3,50,000/-

137

45. Design and development of test equipment for voltage interruption, voltage dips short time over current, M/S H.S. Chawla & Col., New Delhi, Rs. 1,00,000/-

46. Residual-life estimation of electrical equipment of Mohammedpur Power House, Uttaranchal Power Corporation, Dehradun, Rs. 2.40 lacs.

47. Short-time overcurrent, voltage interruption and voltage dip testers for static watthour meters, National Test House, Ghaziabad, Rs. 1.25 lacs

48. Renovation & modernization studies of Galogi Power Plant, Uttaranchal Hydropower

    Corp., Rs. 0.20 lac

49. Stator Core Fault Detection System, BHEL, Hardwar, Rs. 60,000/-.

Short Term Courses Organised

About 20 courses have been organised in the past 15 years in the field of Instrumentation, Biomedical Engineering and testing of Electrical & Electronic instruments as per IS & International Standards for the teachers of engineering colleges and for engineers working in industries and research organizations.

Workshop/Conferences Organised

1. Organised one day Workshop on "Biomedical Engineering Education" sponsored by AICTE, New Delhi. In this workshop packages/syllabi in the area of Biomedical Engineering were finalised in 1996.

2. Organised one day Continuing Medical Education Programme for Military

    Hospital, Roorkee during March 14, 1999.

3. Organised National Conference on "Biomedical Engineering" during April 21-22,

    2000 at Roorkee.

4. Organised one day workshop on "National Accreditation Board for Testing and

    Calibration Laboratories" on 29 September 2001.

5. Organised International Conference on "Computer Applications in Electrical

    Engineering – Recent Advances", during Feb. 21-23, 2002.

6. Organised QIP Workshop on Establishment of ECG Database of Healthy Native Popuplation, May 2008

7. Organised QIP course Comprehensive Electrocardiography: ECG Lead s systems, Signal Processing (Computer) Interpretation, Clinical Application" Oct 2008

PhD Theses Supervised/Under Progress

Completed

1. Myoelectric Signal Analysis in Hansenology – (DS Emanuel,1989)

2. Digital Processing of low frequency Random Signals Using Orthogonal Functions – (Ashwani Kumar,1992)

3. Ultrasonic Imaging System for Flaw Characterization - (RS Anand,1993)

4. Performance Improvement of Vibration Transducers & Their Applications – (Ashok

Trivedi, 1997)

5. Ambulatory Monitoring and Analysis of ECG Signals – (PK Kulkarni,1998)

6. Artificial Neural Network Based ECG Classification – (G Vijaya, 1998)

7. Analysis and Interpretation of ECG Signal Using Wavelet Transform – (ST Hamde, 2000)

8. Developments in ANN Based Controllers for On-Line Process Control Appl. – (LM Waghmare,1999)9. Intelligent Diagnostic and Monitoring of Electrical Drives–(Saad ASA Kazzaz, 2001)

10. Computer Aided Analysis and Interpretation of EMG Signals for Disease Diagnosis- (AK Wadhwani, 2003)

11. ECG Data Compression for Telemedicine- (VK Giri, 2003)

12. Analysis and Interpretation of Heart Rate and Blood Pressure Variability (Dilbag Singh, 2004)

13. Medical Image Analysis and Compression for Tele-consultation (Sukhwinder Singh, 2005)

14. Vibration Analysis for Fault Identification in Rotating Machines (S. Wadhwani, from Jan 2006)

15. Protocol and Algorithms for Data Handling in Telecardiology (Mandeep Singh, 2007

16. Physiological Manifestations under Venom Interaction and their Analysis (Ranjan

    Maheshwari, 2007)

17. Segmentation and interpretation of Ultrasound Medical Images (Vibhakar Shrimali, Dec 2008)

Currently in Progress

18. Intelligent Health Monitoring & Fault Diagnosis of IM (Khawaja Hina Ahmed, from Jan 2004)

19. Condition Monitoring of Rotating Electrical Machine (Rajesh Patel, from Jan 2004)

20. Studies in Detection of DIM Targets(Haribabu Shrivastava, from 2006)

21. Heart Rate Variability (Ramesh Kumar Sunkaria, from 2005)

22. Medical Image Processing (Deepti 2007)

LIST OF RESEARCH PAPERS (JOINTLY) FROM 1990 ONWARDS

Journal Publications (FROM 2000 ONWARDS):

1. "Current Trends in Segmentation of Medical Ultrasound Bmode Images: A Review", accepted for publication in IETE Technical Reviews, Jan 2009.

2. "Medical feature based evaluation of structuring elements for morphological enhancement of ultrasonic images". Accepted in Journal of Medical Engineering and Technology, 2008.

3. "Citizen-centric E-governance project in Uttaranchal, India" , The Journal of Community Informatics, Vol 4, No 2 (2008) Special Issue: E-Governance and Community Informatics.

4. 'FAULT CLASSIFICATION FOR ROLLING ELEMENT BEARING IN ELECTRIC MACHINES', IETE Journal of research, vol   .

5. 'Image preprocessing algorithms for detection of small point airborne targets'   Accepted for publication in Defence Science Journal, Aug 2008.

6. "Medical Feature Based Qualitative Evaluation of Denoising Techniques for Ultrasound Liver Images". Accepted in International Journal of Signal and Imaging Systems Engineering,2008.

7. "Neural network based species identification in venom interacted cases in India", J. Venom.Anim. Toxins including Tropical Disease, Vol 13, No.4, 2007, pp 766-781.

8. "Non-arrhythmic ECG Data Compression using EBP-NN and Feature Extraction using Wavelet Transform", IE(I), Jr. – ET, Volume 88, July 2007, pp 39-48.

9. "Innovative Approach of Info Portal and Standards for e-Gov Apps" PC Quest 20, Special issue on Future Technology Roadmap, Dec 2007, pp 52-56.

10. " A new statistical PCA-ICA algorithm for R-peaks in ECG", Int J Cardiology, available online PMID:17655943 July 24, 2007.

11. " Artifacts and noise removal in electrocardiograms using independent component analysis", Int J Cardiology, available online PMID:176897, Aug 7, 2007.

12. "Vibration – Based bearing fault detection of main motors of steel rolling mill", Int J of Electrical Analysis available online ISSN:0973-8088, Nov. 1, 2007.

13. "Adaptive   Threshold   Based   Block   Classification in Medical Image Compression for

    Teleradiology", Computers in Biology & Medicine, Vol 37, issue 6, June 2007, pp 811 819.

14. "DWT-DCT hybrid scheme for Medical Image Compression", Journal of Medical

    Engineering & Technology, Volume 31,issue 2, March 2007, pp 109-122.

15. "Optimization of Block Size for DCT-Based Medical Image Compression", Journal of Medical Engineering & Technology, Volume 31, issue 2, March 2007, pp 129-143.

16. "Reduction of Blocking Artifacts in JPEG Compressed Images", Journal of Digital

    Signal Processing, Volume 17, No.1, Jan 2007, pp 225-243.

17. "Modified SPIHT Wavelet Compression for ECG Signal", Journal of Medical

    Engineering & Technology, Volume 31,issue 1, Jan 2007, pp 29-35.

18. "Online Fingerprint Verification", Journal of Medical Engineering & Technology,

    Volume 31,issue 1, Jan 2007, pp 36-45.

19. "Detail-Preserving Image Information Restoration guided by SVM based noise mapping", Journal of Digital Signal Processing, accepted 2006.

20. "Spectral Evaluation of Aging on Heart Rate and Blood Pressure Variability in Healthy Subjects", Journal of Medical Engineering & Technology, Vol. 30, No. 3, pp. 145-150, May-June, 2006.

21. "Telemedicine – in Context to Indian Health Scenario", Journal of the Institution of Engineers (I), Comp. Engg. Division, Vol. 87, pp. 38-45, May, 2006.

22. "Vibration Based Fault Diagnosis of Induction Motor", IETE Technical Reviews, Vol 23, No. 2, March-April, 2006.

23. "The Time Evolution of Frequency Components of Heart Rate Variability Using

Wavelets", IETE Journal of Research, Vol. 52, No. 1, January-February, 2006.

24. "Direct Data Compression of ECG Signal for Telemedicine", Int. J. of Systems Science,

Vol. 37, No. 1, pp. 45-63, January, 2006.

25. "Toxicity and Symptomatic Identification of Species involved in Snakebites in the Indian Subcontinent", J. Venom. Anim. Toxins including Tropical Disease, Vol. 12, No. 1, pp. 3-18, February, 2006.

26. "Wavelet Based Vibration Monitoring for Detection of Faults in Ball Bearings of

Rotating Machines", Journal of the Institution of Engineers (I), India, Vol. 86, pp. 77-

81, September, 2005.

27. "An improved windowing technique for heart rate variability power spectrum estimation", Journal of Medical Engineering & Technology, Vol. 29, No. 2, pp. 95-

101, March, 2005.

28. "Improved modified AZTEC technique for ECG data compression: Effect of length of parabolic filter on reconstructed signal", Computers & Electrical Engineering, Vol. 31, No. 4-5, pp. 334-344, June-July, 2005.

29. "Intelligent Condition Monitoring & Fault Diagnosis of Induction Motor", Journal of Multi Disciplinary Engineering Technologies, Vol. 1, No. 1, pp. 1-6, July-December, 2005.

30. "Road Roughness Measurement using PSD Approach", Journal of the Institution of Engineers (I), CE Division, Vol. 85, pp. 193-201, November, 2004.

31. "Hansen disease diagnostics using wavelets, Fuzzy and EBP-NN based Expert system", IETE Technical Review, Vol. 21, No. 2, pp. 153-175, March- April, 2004.

32. "Non-arrhythmic ECG data compression using EBP-NN and feature extraction using wavelet transform", Journal of the Institution of Engineers (I), ET Division, Accepted, June, 2004.

33. "Effects of RR segment duration on HRV spectrum estimation", Physiological

Measurement, Vol. 25, pp. 721-735, June, 2004.

34. "Heuristic strategy for the optimal selection of neural network parameter", International Journal of Computational Intelligence, Vol. 1, No. 3, pp. 131-134, April, 2004.

35. "Sampling frequency of RR- interval time series for spectral analysis of the heart rate variability", Journal of Medical Engineering & Technology, Vol. 28, No. 6, pp. 263-272, 2004.

36. "Instrumentation of bridges for monitoring thermal gradients-laboratory model studies", Highway Research Bulletin, Vol. 70, pp. 167-180, 2004.

37. "ECG Data Compression using EBP-NN", IETE Technical Review, Vol. 20, No. 6, pp.

583-604, November- December, 2003.

38. "Quality assurance in cardiac disease diagnostic using computerized feature extraction of ECG signal", IETE Technical Review, Vol. 20, No. 4, pp. 377-386, July- August, 2003.39. "Telecardiology for effective health care

services", Journal of Medical Engineering & Technology, Vol. 27, No. 4, pp. 149-159, July- August, 2003.

40. "Cascade control of interconnected system using neural network", IETE Journal of Research, Vol. 48, No. 6, pp. 461-469, November- December, 2002.

41. "Remote monitoring of bridge structures- Instrumentation and Internet access", Bridge Engineering: Some Issues of Research Interest, (Book), June, 2002.

42. "QRS detection using new wavelets", Journal of Medical Engineering & Technology,

   Vol. 26, No. 1, pp. 7-15, February, 2002.

43. "Feature extraction from ECG signal using wavelet transforms for disease diagnostics", Int. J. of Systems Science, Vol. 33, No. 13, pp. 1073-1085, 2002.

44. "A linear Area Estimation Technique for SNR Enhancement and Echo Detection in Ultrasound Signals", Journal of the Institution of Engineers (I), ET Division, Vol. 82, pp. 20-23, July, 2001.

45. "ECG data Compression using Non-redundant Templates", IETE Technical Review, Vol. 17, No. 5, pp. 299-310, September- October, 2000.

Conference Publications (FROM 2000 ONWARDS):

1. "Semi-Automatic Level Set Segmentation of Ultrasound Images for Fetal Growth Evaluation", The   IASTED International Conference on Signal and Image processing (SIP2008) Kauilua-Kona, USA, 18-20, August, 2008, Paper Ref No-623

2. "Interactive Feature Extraction of Ultrasound Medical Images for Fetal Growth Evaluation", International Conference   on Recent Advancements and Applications of Computer in Electrical Engineering (RACE 2007), Bikaner , Rajasthan, India, 24-25 March 2007.

3. "Diagnostic features based comparative evaluation of wavelet filters for ultrasound medical images", Accepted for The 2006 International Conference on Image Processing, Computer Vision, and Pattern Recognition, La Vegas, USA, 26-29, June, Paper ID #: IPC4549, 2006.

4. "Time-Evolution of Cardiovascular Variability During Autonomic Function Tests in Physiological Investigations" Proceedings of the 28th IEEE, EMBS Annual International Conference, New York City, USA, Aug 30-Sept 3, 2006 pp [1772-74]

5. "SVM Based System for classification of Micro calcifications in Digital Mammograms", Proceedings of the 28th IEEE, EMBS Annual International Conference, New York City, USA, Aug 30-Sept 3, 2006 pp [4747-50]

6. "WAVELET FILTER EVALUATION FOR HRV SIGNAL PROCESSING", 3rd International Conference on Advances in Medical, Signal and Information Processing (MEDSIP 2006) , July 17-19,2006 Glasgow UK.

7. "ECG Modeling and QRS Detection using Principal Component Analysis", ", 3rd International Conference on Advances in Medical, Signal and Information Processing (MEDSIP 2006) , July 17-19,2006 Glasgow UK

8. "Snakebite Epidemiology in Kota Division, Rajasthan", National Conference on Controls, Communication and Bioinformatics (NCCCB-2006), March 8-10, 2006 Kota, INDIA.

9. "A new Approach to ECG modeling using Principal Component Analysis", National Conference on Controls, Communication and Bioinformatics (NCCCB-2006), March

8-10, 2006 Kota, INDIA.

10. "Speckle suppression for Image Enhancement for Ultrasound Medical Images: Comparative Evaluation of Wavelet Filters", National Conference on Controls, Communication and Bioinformatics (NCCCB-2006), March 8-10, 2006 Kota, INDIA.

11. "Quantitative measures for evaluation of mammographic image contrast enhancement techniques", Proc, National conference on information and emerging technologies, IET, Bhaddal, Punjab (INDIA). Feb 17 – 18, 2006. pp.[17 – 22]

12. Poincare Plot: An Efficient HRV Delineator for mass screening in the Assessment of Cardiovascular and Autonomic systems, Proc. Computer Applications in Electrical Engineering Recent Advances, CERA 05, IIT Roorkee, Sept. 28 – Oct. 1, 2005.

13. Improved modified AZTEC technique for ECG data compression: Effect of length of parabolic filter on reconstructed signal", Proc. Computer Applications in Electrical Engineering Recent Advances, CERA 05, IIT Roorkee, Sept. 28 – Oct. 1, 2005.

14. "Statistical based sub band filtering technique for enhancement of digital mammograms", Proc. National conference on computational intelligence in electrical engineering, SLIET, Longowal, Punjab (INDIA). November 18 – 19, 2005. pp. [29 – 32].

15. "Public Private Partnership in e-Governance: The Uttaranchal Experience", International Conference on "e-Governance in the Developing World: Best Practices and Critical Success Factors", July 29-31, 2005 Hydrabad, INDIA.

16. "Inferential MRAC Neural Controller For Temperature Control Of CST Process", 24th IASTED International Conference on MODELLING, IDENTIFICATION, AND CONTROL (MIC 2005), February 16-18, 2005 Innsbruck, AUSTRIA.

17. "Virtual Instrument for Real Time Monitoring and Control of Temperature", Proceeding of the International Conference on "Emerging Technologies in Intelligent System and Control" (EISCO-2005), January 5-7, 2005 Coimbatore, INDIA.

18. "Effect of RR Segment Duration on Short-Term HRV Assessment Using Poincare Plot", Second international Conference on Intelligent sensing and information processing, January 4-7, 2005 IIT Madras, INDIA.

19. "Neural Network Based Motor Current Analysis For Fault Detection Of Bearings", International Conference on Cognitive Systems (ICCS), December 14-15, 2004 New Delhi, INDIA.

20. "Fault Detection Of Three Phase Induction Motor Using Neural Network", International Conference on Cognitive Systems (ICCS), December 14-15, 2004 New Delhi, INDIA.

21. "Disease Diagnostics using Neural Network", International Conference on Cognitive Systems (ICCS), December 14-15, 2004 New Delhi, INDIA.

22. "Removing Blocking Artifacts in Compressed Medical Images", Proceedings of 1st International Bio-Engineering Conference 2004, September 8-10, 2004 Singapore.

23. "Fuzzy Variable Structure Controlled Non- Linear Fast Response DC Drive", NSC- 2004, December 16-18, 2004 Vellore Institute of Technology, Vellore, INDIA.

24. "Non-Linear System Modeling and Analysis using Multi-layered Neural Network", NSC- 2004, December 16-18, 2004 Vellore Institute of Technology, Vellore, INDIA.

25. "Information security through biometrics", National Conference on Research and

   Practices in current areas of IT, March 26-27, 2004 SLIET Longowal (PB), INDIA.

26. "A complete scheme for data compression for telecardiology", World Congress on

   Medical Physics & Biomedical Engineering, August 24-29, 2003 Sydney, Australia.

27. "Vibration based fault diagnosis of dry bearing in induction motor", 4th Int. R&D Conf, January 28-31, 2003 Aurangabad, INDIA.

28. "Condition monitoring of rolling element bearing", Int. Symposium on Process Systems Engg. and Control, January 3-4, 2003 IIT Bombay, INDIA.

29. "Effect of supply disturbances on vibration profile of induction motor", Twelfth National Power Systems Conference, December 27-29, 2002 IIT Kharagpur, INDIA.

30. "On Noise Segmentation and Filtering", International Conference on Control, Instrumentation & Information Communication CIIC, Dec. 2001 Kolkatta, (INDIA).

31. "Stator current monitoring for detection and diagnosis of faults in induction motors", Proc.-International Conference on Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), February 21-23, 2002 IIT, Roorkee, INDIA.

32. "EBP-NN based ECG data compression", Proc.- International Conference on

   Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), pp

   175-187, February 21-23, 2002 IIT, Roorkee, INDIA.

33. "Stability aspects of the neural controller", Proc.- International Conference on Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), February 21-23, 2002 IIT, Roorkee, INDIA.

34. "PSCAD/EMTDC TSC-TCR type SVC control scheme and dynamic performance simulation for industrial load bus", Proc.- International Conference on Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), February 21-

   23, 2002 IIT, Roorkee, INDIA.

35. "Condition monitoring of induction motor based rotor reference frame model", Proc.- International Conference on Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), February 21-23, 2002 IIT, Roorkee, INDIA.

36. "Digital instrumentation for bridges– Possibilities and limitations", National Workshop on Research Interests in Bridge Engineering – Present and Future, March 15, 2001 New Delhi, INDIA.

37. "Vibration based induction machine faults identification using wavelet transforms",

   International Conference on Mathematical Modeling, January, 2001 Roorkee, INDIA.

38. "Performance study of some four arm ac bridges used as notch filters", National Conf. On Trends in Industrial Electronics Transducers, Control and Communication, November 14-15, 2000 TIET, Patiala (Punjab), INDIA.

39. "ANN based vibration diagnostics of induction machines", International Conference on Power Management, November, 2000 Lucknow, INDIA.

144

40. "Temperature control of CST process using Gaussian neural network with adaptive learning rate", Proc. IEEE Int. Conf. on Control Applications, September 25-27, 2000 Anchorage, Alaska, USA.

41. "Study and analysis of heart rate variability using wavelet transform and power spectral density distribution", National Conference on Biomedical Engg., April, 2000 U.O.R., Roorkee, INDIA.

42. "Computerized cardiac disease diagnostics using wavelet transforms and modified scoring criteria", Proceedings SBME & NM, January, 2000 BARC Mumbai, INDIA.

Jayanthi Sivaswamy

International Institute of Information Technology (IIIT-H)

Gachi Bowli, Hyderabad 500 032, India

o **EDUCATION**

Ph.D. and M.S. in Electrical Engineering   **1992, 1986**

Syracuse University, Syracuse, U.S.A.

B.S. in Electrical Engineering   **1984**

Rochester Institute of Technology (RIT), Rochester, U.S.A.

o **WORK EXPERIENCE**

Professor, **International Inst. of Information Technology (IIIT), Hyderabad, India**, (July 2006-).

Associate Professor, **International Inst. of Information Technology (IIIT), Hyderabad, India**, (July 2001- June 2006).

Lecturer (Tenured), Dept. of Electrical & Electronic Engineering, **The University of Auckland, New Zealand**, (Jan. 1993 - June 2001).

Recent visiting positions

Visiting Research Fellow, **School of Engineering, University of Warwick, UK**, (May 2004).

Visiting Research Fellow, **ISIS**, **School of Electronics and Computer Science, University of Southampton**, (June-July 2004).

o **RESEARCH PUBLICATIONS (selected over past 5 yrs)**

o ***Book / book chapters***

o *Sivaswamy J, Agarwal A, Chawla M, Rani A & Das T (2008) Extraction of Capillary Non-perfusion from fundus fluroscein angiograms. In **Biomedical engineering systems and technology** (eds.) Fred A, Filipe J and Gamboa H , pp. 176-188, Berlin: Springer, ISBN: 3-540-92218-0.*

o   *Middleton L. & Sivaswamy J. (2005) Hexagonal Image Processing - a practical approach, London: Springer, ISBN: 1-85233-914-4.*

o   ***Journals and conferences***

Keerthi Ram, Yogesh Babu, Sivaswamy J (2009) Curvature orientation histograms for detection and matching of vascular landmarks in retinal images,. Proc. **SPIE Medical Imaging 09**, Orlando.

Pragada S, Sivaswamy J (2008) Image denoising using matched biorthogonal wavelets**, Proc. of ICVGIP 08,** Bhubaneswar.

G Phani Deepti, Borker MV, Sivaswamy J (2008) Impulse Noise Removal from Color Images with Hopfield Neural Network and Improved Vector Median Filter**, Proc. Of ICVGIP 08,** Bhubaneswar.

Joshi GD, Sivaswamy J (2008) Colour Retinal Image Enhancement based on Domain Knowledge**, Proc. Of ICVGIP 09**, Bhubaneswar, pp.

Singh J, Joshi GD and Sivaswamy J. (2008) Appearance-based object detection in colour retinal images , **Proc. of IEEE International Conf. on Image Proc. (ICIP)**, San Diego pp. 1432-1435.

Joshi GD., Gondle V. and Sivaswamy J., (2008) Optic disk detection using topographical features, **Proc. of International EURASIP conf. (BIOSIGNAL)**, Brno.

Singh J. and Sivaswamy, J. (2008) Fundus foveal localization based on Image Relative Subtraction-IReS approach. **Proc.of National conference on communications,** Mumbai, pp. 254-258.

Pragada S and Sivaswamy,J. (2008) Design of Image Adaptive Wavelets for Denoising Applications, **Proc. of National conference on communications**, Mumbai, pp. 249-253.

Agarwal A., Sivaswamy J., Rani A. and Das T. (2008) Automatic segmentation of capillary non-perfusion in retinal angiograms. Proc. **Int'l conf. on bio-inspired systems and signal processing** (**Biosignals)**, Funchal, pp. 170-177.

Joshi GD, Garg S and Sivaswamy,J. (2007) A generalised framework for script identification, **International Journal for document analysis and recognition** (IJDA), 10(2), pp.55-68.

Garg, S., Sivaswamy,J and Chandra, S (2007) Unsupervised curvature-based vessel segmentation, **Proc**. of **IEEE Int'l symposium on bio-medical imaging (ISBI 2007)**, Washington D.C., pp. 344-347.

Garg, S, Sivaswamy,J. and Joshi, G D (2006) Automatic drusen detection from colour retinal images, **Proc. of Indian conf. on medical informatics and telemedicine**, Kharagpur, pp.84-88.

147

Joshi, G.D. and Sivaswamy, J. (2006) A computational model for boundary detection, **Proc. of Indian conf. on vision, graphics and image processing (ICVGIP),** Madurai, pp.172-183.

Sivaswamy J, Joshi G D and Chandra S. (2006) An alternative curvature measure for topographic feature detection, **Proc. of ICVGIP,** Madurai, pp.228-239.

Joshi, G.D., Garg, S. and Sivaswamy, J. (2006) Script identification from Indian Documents, **Proc. of IAPR workshop on Document Analysis Systems (DAS)**, Nelson, pp.255-267.

Joshi, G.D. and Sivaswamy, J. (2006) A simple scheme for contour detection**,** Proc. of **Int'l conf. on computer vision and applications (VISAPP),** Setubal, pp.236 - 242**.**

Chandra, S. and Sivaswamy,J. (2006) An analysis of curvature based ridge and valley detection, Proc. of **IEEE Int'l conf. on acousitcs, speech and signal processing (ICASSP)**, Toulouse, Volume 2, 737 - 740.

Joshi, G.D. and Sivaswamy,J. (2005) A multiscale approach to contour detection, Proc. of **Int'l conf. on cognition and recognition**, Mysore, pp.183-193.

RESEARCH GRANTS[**] **(last 5 yrs)**

	Project title	Funding source	Project duration
1.	Evolving shape grammar[1]	Royal Society	December 2006- 08
2.	Development of a pilot content based image retrieval system for thin layer chromatographic images	FRLHT (Foundation for Revitalisation of Local Health Traditions), Bangalore	May-July 2006
3.	Computer aided tools for Fluoroscein fundus angiogram analysis[2]	Lions Club International Fund	June 2006-09
4.	Development of specialized tools for detecting and tracking the progress of diabetic retinopathy from colour fundus images[3]	DST, Govt. of India SR/S3/EECE/17/2005	January 2006-08
5.	Hexagonal image processing	Royal Society and DST, Govt. of India	May-June 2004
6.	Hexagonal image processing	British Council, Chennai	May-June 2004

[**] Principal investigator in all grants except 1.

[1] In collaboration with University of Southampton (UK).

[2, 3]. In collaboration with LV Prasad Eye Institute, Hyderabad

Professional community

- **Reviewer for** *IEEE Transactions on Image Processing* **and** *DST research grant proposals*

- **Conference program committee member**

- *ICVGIP 2004   ACCV 2006   VIE 2006ICVGIP 2006   WCVGIP 2006*

- **Co-organizer**

- *IRocha*: Indian robotics challenge 2006 – All terrain critter construction and robot safari (real-time vision) were 2 contests. Open for participation to educational institutions, research labs and companies. With Prof Bipin Indurkhya and Dr Madhav Krishna.

- **Lectures delivered at engineering colleges**

2006

20.   JNTU refresher course on image processing: *1) Introduction to medical image processing and 2) Retinal image processing*

21.   Refresher course at MVSR college of engineering: *Image processing fundamentals*.

22.   St. Mary's College of engineering: *Image processing applications*.

2005

1.   JNTU refresher course on Image Processing: *Advances in sampling*

2.   *Excitement of Image processing*. Videotaped lecture for distribution on CD to a special programme for encouraging gifted girl students (from JNTU colleges) to pursue research in the area.

Workshops conducted at IIIT

1.   *Robocamp* – a 1-week workshop for engineering college students (summer 2006). Assisted Prof Bipin Indurkhya

2.   *Workshop on multimedia content development*- Weeklong workshop for school science teachers. Training was on use of open source authoring tools for multimedia content development, 2004-2006. (Total of 14 workshops for ~ 250 teachers from Navodaya Vidyalaya schools from 3 states)

Krishnashree Achuthan

Professor, ECE Department

CEO, Amrita TBI

Amrita Vishwa Vidyapeetham, India

Education

Ph. D., Chemical Engineering, *December 1998*

Clarkson University, Potsdam, NY.

(Research conducted at Sandia National Laboratories, Albuquerque, NM)

M. S., Chemical Engineering, *May 1994*

Clarkson University, Potsdam, NY.

B. Tech, Chemical Engineering, *April 1992*

Anna University, Madras, India

Experience

Teaching & Research at *Amrita University, Amritapuri (2008 – Present)*

o   Liasion for several Indo-US and Indo-European consortiums on Amrita's behalf (most recent is European Union's Erasmus Mundus program)

o   Lead cross-continental projects/students of Amrita University and UT Austin related to OLPC, innovative technologies.

o   Lead advisor in the geotechnical areas of research in relation in soil mechanics

o   Heading the Technology Business Incubator Division

IT Industry

Amrita Technologies, Kochi (2007 – 2008)

o   Productization of Hospital Information Systems Products in India.

o   Lead Professional Services Management for HIS Clients

IC Industry

Advanced Micro Devices, Sunnyvale, California (1998 – 2006)

Spansion LLC, Sunnyvale, California

o Developed and implemented unit processes in CMP for 65nm, 90nm and 130 nm technologies in the FEOL & MEOL modules such as STI, Gate and Contact. Several of theses processes are running in full production modes in > 10,000 wafers per week wafer-start fabs.

o Introduced new module processes to save costs of manufacturing and ease of operation. Estimated gains characterized by throughput and consumable costs run in $Ms.

o Led cross-site (U.S. and abroad) teams in the evaluation of several tool platforms for semi-conductor processing applications

o Characterized impact of process induced defectivity on overall yield for BEOL integration.

o Recognized & rewarded as key contributor to the introduction of novel techniques and development of Flash processes.

o Developed creative uses of existing unit processes to mitigate contamination issues and overall defectivity in manufacturing processes.

o Assisted in the materials research and characterization for novel gate architectures.

o Leading process development of metal plating processes for current and future generation technologies. Characterization and improvement of process efficiencies through the addition of organic additives.

o Proactive participation in the resolution of issues related to manufacturing of transistor devices.

- **Patents & Publications**

  o K. Achuthan, B. Davis, J. Xie, K. Sahota, US Patent # 7358191, Apr. 2008.

  o U. Kim, H. Kinoshita, Y. Sun, K. Achuthan, C. H. Raeder, C. M. Foster, H. K. Sachar, K. Sahota, US Patent # 7307002, Dec. 2007

  o K. Achuthan, U. Kim, K. Sahota, P. C. Regalado, US Patent # 7294573, Nov. 2007

  o K. Achuthan, S. S. Ahmed, H. Wang, B. Yu, US Patent # 7125776, Oct. 2006

  o K. Achuthan, K. Sahota, US Patent # 7077728, July 2006

  o K. Sahota, K. Achuthan, US Patent # 7052969, May 2006

  o K. Achuthan, P. K. Cheung, C. Tabery, J. Y. Yang, N. Cheng, M. V. Ngo, US Patent # 6989563, Jan. 2006

  o K. Achuthan, S. S. Ahmed, H. Wang, B. Yu, US Patent # 6982464, Jan. 2006

  o E. H. Lingunis, K. Achuthan, M. V. Ngo, C. Tabery, J. Y. Yang, US Patent # 6933219, Aug. 2005

  o K. Achuthan, S. S. Ahmed, H. Wang, B. Yu, US Patent #, 6855607, Feb. 2005

  o K. Achuthan, S. S. Ahmed, H. Wang, B. Yu, US Patent # 6812076, Nov. 2004

  o K. Sahota, J. P Erhardt, A. Halliyal, M. V. Ngo, K. Achuthan, US Patent # 6770523, Aug. 2004

  o K. Achuthan S. S. Ahmed, H. Wang, B. Yu, US Patent # 6756643, June 2004

  o K. Achuthan, A. P. Marathe, US Patent # 6649511, Nov. 2003

- K. Sahota, K. Achuthan, US Patent # 6613646, Sep. 2003.

- J. Thomas, U. Kim, K. Achuthan, US Patent # 6610577, Aug 2003

- U. Kim, D. Hopper, Y. Wu, K. Achuthan, US Patent # 6607925, Aug 2003

- J. Bhakta, K. Achuthan, A. Hui, US Patent # 6605517, Aug 2003.

- K. Achuthan, K. Sahota, US Patent # 6569747, May 2003

- K. Achuthan, S. Lopatin, US Patent # 6559546, May 2003.

- K. Achuthan, A. P. Marathe, US Patent # 6498397, Dec. 2002

- K. Achuthan, S. Lopatin, US Patent # 6498093, Dec. 2002

- K. Achuthan, S. Lopatin, US Patent # 6472310, Oct. 2002

- K. Achuthan, C. M. Woo, US Patent # 6462409, Oct. 2002

- K. Sahota, K. Achuthan, S. Lopatin, US Patent # 6426297, July 20002

- S. Lopatin, K. Achuthan, US Patent # 6423433, July 2002

- K. Achuthan, S. Avanzino, K. Sahota, US Patent # 6314869, July 2002

- S. Lopatin, K. Achuthan, US Patent # 6291348, Sep. 2001.

- Fractal Properties of Polyurethane Pads, K. Achuthan et. al, CAMP Conference, July 1998.

- Investigation of pad deformation and conditioning during chemical-mechanical polishing of silicon dioxide films, K. Achuthan et. al *J. Electronic Materials* **25**, 1628-1632 (1996).

- Complex Distillation Calculations, **Best Paper Award**, R. Taylor, K. Achuthan et. al, *Computers and Chemical Eng.,*1996.

Soami P. Satsangee

Name: Dr. Soami P. Satsangee

Designation: Reader & Head, University Science Instrumentation Centre, Dayalbagh, Agra.

Date of Birth: 2/3/1961

Address, email & mobile no:

> **University Science Instrumentation Centre,**
>
> **Dayalbagh Educational Institute,**
>
> **Dayalbagh, Agra.**
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> **Email: deiusic@gmail.com**
>
> **Mobile: +919760230620**

Qualifications:

Degree Awarded	Subject	University	Year
MSc. (5 years Integrated Course)	Chemistry	IIT Kanpur	1984
Ph.D.	Inorganic Chemistry	State University of New York, Stony Brook, USA	1990

Ph.D. Thesis Title:

The Chemistry of Aryl Thiolate Ruthenium Complexes.

Job Experience:

1991: Research Assistant at IIT Delhi (under Prof. Khandelwal, Chemistry Department).

1992-1995: Lecturer in Chemistry, St. Stephen's College, Delhi University.

1995-1999: Lecturer, University Science Instrumentation Centre, Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra.

1999-present: Reader & Head, University Science Instrumentation Centre, Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra.

Job Profile:

USIC job is very varied. However, at present, the following are the job activities (in order of priority):

1. Teaching & Research.
2. Overall Supervision of repair jobs in USIC (Electronic, Mechanical & Glassblowing).
3. Fabrication of Computer based Low Cost Instruments (Analytical, Biomedical).

4. Supervising students of science (Chemistry, Physics) & Engineering (Electronics) in project work.

Memberships:

American Chemical Society, Systems Society of India (Life Member)

Area of Specialization:

Instrumentation (Analytical, Virtual & Biomedical), Chemical Education

Area of Research:

Instrumentation & Nanotechnology

Teaching & Research Experience:

18 years (Teaching- MSc. (Chemistry) & M.Tech (Bioinstrumentation))

Papers Published (Last 8 years):

20 (with 2 Book Chapters)

Monographs:

Prepared 6 manuals for short courses offered by USIC.

Thesis guided:

1. Ph.D. -1 (ongoing M.Phil. cum PhD.)
2. M.Tech(Engineering Systems)-6
3. MSc.(Chemistry)-7
4. B.Tech(Electronics)-2

Research Projects carried out:

Minor -2

Major(co-PI)-1

Workshops organized (National & International)- 6

Extension work:

Extending USIC's Advisory & Technical Services for Community Based Charitable Institutions.

Co-Curricular activities:

Computers, cycling, reading & community service.

Dr. K V Gangadharan

1. Name: Dr. K V Gangadharan

2. Designation: : Professor

3. Department: Mechanical Engineering

4. Date of Birth: : 31-05-68

5. Nationality: Indian

6. Qualification

Qualification:	Year	Institute/ University
Ph.D (Dynamics, Vibration & FEM)	2001	IIT Madras
M.E. (Manufacturing Technology)	1992	REC Trichy (NIT Trichy)
B.Tech. (Mechanical Engineering)	1989	Calicut University

7. Professional Experience :14 years Teaching (at NITK Surathkal)

Designation	From	To
Professor	01-01-2009	
Assistant. Professor	31-10-2001	01-01-2009
Senior Grade Lecturer	11-12-1999	31-10-2001
Lecturer	16-2-1993	11-12-1999

8. Industrial Experience FACT Udyoganadal , Kerala (A process Industry) – 1 year National Aeronautical Laboratory, Bangalore – Six months

9. Research Interests: Vibration and its control, Dynamics, Smart materials & Composites, FEM, Condition monitoring , Machine Tool Dynamics, Experimental Methods

10. PhD Research scholar 1 awarded + 4 (on going)

11. M Tech Thesis Guided 14 completed + 4 on going

12. B Tech Thesis Guided 16 completed +2 on going

13. Sponsored Research Projects (Last five years)

Title	Agency	Status	Year of completion
Magneto Rheological Fluid	MHRD	Completed	2007
Active Vibration Control of Flexible Structures using Mag-	MHRD	Completed	2009

14. Consultancy Projects:

15. Out of Class Room Student pro jects

16. Publications:http://people.nitk.ac.in/index.php?q=kvganga-research.html

Journals: International − 6

(a) Umashankar K S, Abhinav Alva, K V **Gangadharan** and Vijay Desai (2009)Damping behaviour of cast and sintered aluminium,ARPN Journal of Engineering and Applied Sciences,

(b) K. V. **Gangadharan**, C. Sujatha, V. Ramamurti. (2008) Dynamic response of railroad vehicles: a frequency domain approach. Int. J. Heavy Vehicle Systems (IJHVS), Vol. 15, No.1 . pp 65-81

Title	Organization	Status
Thermax Pune − Fabric bag filter	Thermax Pune	Ongoing
GMR Power plant- Dynamic analysis of bacon buoy and chlorination pipe	GMR Ltd	Completed
Compressor Testing and Pressure gauge calibration for Marine jobs	Yojaka Marine Pvt Ltd	Completed
MRPL Vibration analysis of Plant Equipment	ONGC −MRPL	Completed
Vibration and Sound measurement	Various Industries	Completed

Title	Remarks
SAE BAJA All terrain Vehicle (2007, 2009)	Won II prize (Rs 4.5 Lakh prize) in 2007
Quake Rates (a mobile robots to help quake hit area rescue operation)	
Flying Car	

(c) Shivaram A C , K V Gangadharan, (2007) Statistical modelling of a magneto-rheological fluid damper using design of experiments approach, Int. Journal of Smart Materials and Structures 16,(2007), pp1310-1314

(d) K. V. Gangadharan, C. Sujatha, V. Ramamurti . (2008) Dynamic response of railroad vehicle to rail joints and average vertical profile (AVP) A Time Domain Approach. Int. J. Heavy Vehicle Systems (IJHVS) Vol. 14, No. 4 . pp 402-420

(e) K. V. Gangadharan, C. Sujatha, V. Ramamurti. (2009) Ride Comfort Evaluation of a Railway Coach, To appear in Int. J. Heavy Vehicle Systems (IJHVS).

(f) Shivaram A C , K. V. Gangadharan, B R Balaraddi (2009) Constant velocity drop test setup using MR fluid brake and Fuzzy controller. Communicated to Int. Journal of Smart Materials and Structure.

Conferences: International- 14

(a) Ravish, K. V. Gangadharan, (2009)'Recurrence Quantification Analysis to Monitor Conditions in Machine Tools', International Conference on Advanced Manufacturing and automation, (INCAMA- 2009), March 26-28, Kalasalingam University.

(b) Abhinav Alva, Ravish, Abhishek Pandey, Umashankar K. S., K. V. Gangadharan, (2009) 'Potential Application of Tuned Mass Absorbers in Mechanical Vibrations', International Conference on Advanced Manufacturing and automation, (INCAMA- 2009), March 26-28, Kalasalingam University.

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159

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Prof. Sudhir Dattatraya Agashe

1.	Name	Prof. Sudhir Dattatraya Agashe
		Dean Academics
2.	Address	Department of Instrumentation and Control Engineering
		College of Engineering Pune, Shivaji Nagar Pune -411005
3.	Contact Details	020- 25507172　(O)
		9890229539 (M)
		E-mail: sda@instru.coep.org.in
4.	Qualification:	➢ Ph.D in Instrumentation Pune University in 2007
		➢ Diploma in Business Management (April 2000)
		➢ ME (E&TC) with specialisation in Instrumentation (1998)
		➢ BE (Instrumentation and Control)　(1989)
		➢ Diploma in Electrical Engineering (1986)
5.	Experience:	➢ 2009 till date working as Dean Academic, COE, Pune
		➢ 2007 till date working as Professor and Head Instrumentation and Control, COE, Pune
		➢ 1999- 2007 Asst. Professor, Head Instrumentation and Control COE, Pune.
		➢ 1995-1999 Lecturer in Instrumentation
		➢ 1994-1995 Alfa Laval (India) Limited
		➢ 1992-1994 Innovators systems.
		➢ 1989-1992 Inventa Controls and Systems (P) Ltd.
6.	Conferences attended/ paper presented	Total number of papers presented: 11
		➢ International conference on Machine Automation Barcelona, Spain 2008.
		➢ International Conference on Instrumentation (IEEE workshop at Canada 2006)
		➢ International Conference on Instrumentation (IEEE workshop at Brazil 2007)
		➢ International Conference on Instrumentation (INCON 2004)
		➢ Journal of Instrument Society of India paper on "Model Heat Exchange Automation"

7.	Academic attainments	➢ Research project in progress "Braille Printer" worth Rs. 5.00 Lakh.
		➢ Completed one Research Project " SMART Energy meter", worth Rs. 3.00 Lakh.
		➢ Acquired a patent for the product "Flow measurement and control system for solar water heater/Air heater System" in April 2003.
		➢ Completed 2 MODROBs in the field of Process Instrumentation worth Rs. 17 Lakhs.
		➢ Developed innovative method for result analysis.
		➢ Developed package for dairy simulation.
		➢ Recognized research guide of Pune University for Doctoral work
8.	Administrative attainments	➢ Setting-up of Industrial Automation Training Centre in collaboration with Emerson Process Management, USA, Rockwell Automation, and Messung Systems, Pune. (Worth Rs.90 Lakhs)
		➢ Revenue generation worth Rs. 10 Lakhs in last one year
9.	Membership of professional bodies and key positions held	➢ Life member and Vice President of Instrument Society of India.
		➢ Life member Indian Society for Technical Education
		➢ Ex. Chair and Member IEEE, Measurement and Instrumentation Society under Bombay Section of IEEE (R10)
		➢ Project coordinator TEQIP

Annexure II: LIST OF VIRTUAL LABS ALREADY DEVELOPED

List of Virtual Labs already developed are available at http://vlab.co.in

PART-I Information relating to Department/Institute

1. Name of Institute with complete address: Indian Institute of Technology, Bombay
   Powai, Mumbai 400 076

2. Title of the Research Project: **e-Yantra – Robot enhanced teaching in engineering colleges and schools - Phase 2**

   Control Number: KR1320099887

3. Department/Broad Area: Embedded systems and Robotics in the department of
   Computer Science and Engineering

4. Major areas of research in the Department:

   - Developing content, curriculum, and pedagogy in Embedded systems and Robotics –Designing projects and themes for hands-on experiments with robots; Delivering workshops to train students and teachers to handle robots through educational technology software tools such as Spoken tutorials, Moodle.

   - Studying the impact of workshops and lab set-up initiative on effective dissemination of Embedded systems and Robotics education – Impact analysis and recommendations for efficient and effective use of resources to improve quality of hands-on training at engineering colleges throughout the Nation.

   - Deploying robots and embedded systems in the automation of day-to-day repetitive tasks; Use of robots in agriculture – in green houses to automate the various steps in a plant's life cycle such as sowing, weeding, harvesting, etc.

5. Names and Designation of Principal Researchers in the major areas and list of publications during last 5 years based on work done in the Department:

   PI: Prof. Kavi Arya, IIT Bombay

   The resume of the PI has already been submitted to NME-ICT for the previous project (e-Yantra (Phase 1)).

6. Is it Inter-disciplinary Project? Yes

7. Is it Inter-Institutional Project? No

8. Is any Industry/User agency participating? No

9. Brief of completed and or ongoing research projects supported by MHRD/AICTE in the Department during last 5 years. To be supplied when required.

PART-II Information relating to Department/Institute

10. Principal Investigator

(a) Name: Kavi Arya

(b) Designation: Associate Professor, Computer Science Department

(c) Age: 53

(d) Educational qualification: Ph.D.

(e) Experience: More than twelve years of teaching and research

(f) Books and papers published: included in the resume of the PI submitted in the first phase of this project.

(g) Is it a joint project with other Institution? : No

(h) Has an MOU been signed? : Not relevant

(i) Present commitments of the Principal Investigator

 i. Teaching: two courses a year

 ii. Ph.Ds registered under him: -

 iii. Sponsored research:
  - The first phase of this project
  - Building of an Indigeneous radiosonde (for Indian Army)

 iv. Consultancy: -

(j) Other members of the research group to work on the proposed project:
Prof. Krithi Ramamritham as advisor.

PART-III About research project

15. About the research project:

(a) **Summary of the project:**

Budget: Rs. 17. 1 crores, including the following:

  (i) Training students through hands-on projects: 2.53 crore for competitions

  (ii) Training teachers through workshops and hand-on projects and seeding robotic labs in the colleges: 2.47 crore

  (iii) Workshops, Internships, external projects and symposium for awareness creation and continuous engagement with colleges: 1.04 crore

  (iv) Content creation for workshops and competitions and for projects and code repository in open-source: 2.1 crore

Current financial Status: We used up all the previous funding by March 31, 2013 and the last installment 61.62 L that was received end of March 2013 has already been committed towards the e-Yantra Robotics Competition-2013 and the e-Yantra Lab Setup Initiative workshops being conducted at 5 Nodal Centers. 20.61 L of the sanctioned amount for Phase 1 is yet to be received. As per the PRSG recommendations Phase 2 funding is sought to scale up the activities. (Please refer to Annexure 1 and Annexure 2 for the PRSG recommendations)

Project Objective:

The objective of the project is to enable effective Embedded systems and Robotics education across engineering colleges in India, by

  • **Providing training for teachers and students** -- through workshops where participants are taught basics of embedded systems and programming

  • **Engaging teachers and students in hands-on experiments with robots** -- through competitions where participants are given robots to devise a solution, and

  • **Helping colleges to set-up Robotics labs/clubs** -- by awarding a basic set of robots and expert advice to colleges, facilitating setting up of labs, in addition to training their teachers through workshops.

Phase 1:
In Phase 1 we deployed the program through workshops and competitions in the following manner:
  1. Conducted workshops for teachers and students; Students participating in the competitions are given workshop material in the form of video tutorials as part of a Robotic kit and are provided with on-line forums for clearing doubts.

2. Organized competitions as the best mode to reach out to students across the Nation and distributed robots to colleges through these competitions.

Thus, e-Yantra has achieved effective dissemination of both knowledge and the resource (robots) enabling students to implement Robotics projects in a scalable manner.

Colleges in Mumbai region that participated in our lab setup initiative:

1. Pilot phase; teachers from these colleges were trained through workshops and teacher teams participated in the e-Yantra Robotics teacher competition, where they were taken through all aspects of a Robotics project.
2. Participation in the competition provides them with hands-on experience of the robot and the know-how and confidence to assign Robotics projects to their students.
3. A starter kit of 5 Firebird V robots is given to these colleges in addition to consultation and recommendations for setting up Robotics labs.

Through this model of providing support for both knowledge and technology transfer, we achieved the desired objective of having trained teachers who are able to effectively utilize the resources in the newly established Robotics lab at their colleges. In Phase 2, we propose to scale up the reach of Robotics education in the following manner:

1. e-Yantra Robotics competition – 2013:
In the current edition of this competition, 1581 teams, each consisting of 4 members have registered, total number of participants being 6,324. Themes from the domain of "Urban agriculture" such as **Seed-sowing robot, Weeding robot, Fertilizing robot, and Fruit plucking robot** will be assigned to teams qualifying through selection tests – taken remotely by each team member during a time-slot allocated to each team. These tests are scheduled from 12th – 30th September 2013.

Having conducted the competition in 2012 and 2013, it is clear that competitions is one of the best ways to reach out to students across the country in a scalable manner. e-Yantra proposes to run the e-Yantra Robotics competition as an annual event. While we have received registrations from almost all states of India, in order to encourage engineering students from remote places to participate in the e-Yantra Robotics competition – 2013, we need to create awareness. We propose to create awareness using the following modes:

1. Conduct workshops in strategically located colleges in the remote regions.
2. Launch the second edition of e-Yantra Ideas competition – in this competition students present an idea to automate a task from their environment. Internships at e-Yantra are awarded for the winning entries.
3. Hold press conferences and publicity through media.

2. e-Yantra lab setup initiative – Expansion phase:

Training students is important as they are the future architects of our Nation; but training teachers and equipping colleges with appropriate facilities is even more important as one trained teacher produces many educated and enthusiastic students. Having a Robotics lab at every Engineering college is essential to imparting Embedded Systems and Robotics education, as hands-on experimentation is a mandatory component for effective

education of these subjects. In order to achieve these goals it is essential to create an eco-system of agencies to manufacture and support the robotic infrastructure in the field. The goal of this next phase is to scale-up and to sustain this process.

In the first phase of scale up of the e-Yantra lab setup initiative 20 colleges/institutes will be chosen as Nodal centers at different regions, from the set of colleges where e-Yantra has already conducted workshops. The Nodal centers coordinate between the colleges in the region and they serve as hubs from where all e-Yantra meetings and competitions will be held. Each Nodal center serves as contact center for 20-30 colleges from the region, thus scaling up the reach of e-Yantra lab setup initiative to over 500 colleges across the Nation. The following approach will be used for transfer of knowledge and establishment of infrastructure simultaneously:

1. Colleges from the region will be invited to the Nodal Center for participating in the initiative.

2. Colleges commit a team of teachers to be trained through a two-day workshop; this team also participates in the e-Yantra Robotics teacher competition – 2013. Through the competition teachers will be trained in handling the robot and implementing a project - this prepares them with the complete Robotics project life cycle helping them assign such projects to their students.

3. Each team that successfully participates in the competition is awarded a basic set of Robots to help their college start off the Robotics lab setup.

4. Colleges also commit funds to procure robots and accessories to establish a basic Robotics lab – e-Yantra provides the necessary consultation.

5. At the end of the e-Yantra Robotics Teacher competition, trained teachers are ready to educate their students and assign robotics projects to students using the equipment from their newly established Robotics lab!

Figure below summarizes the three-pronged approach.
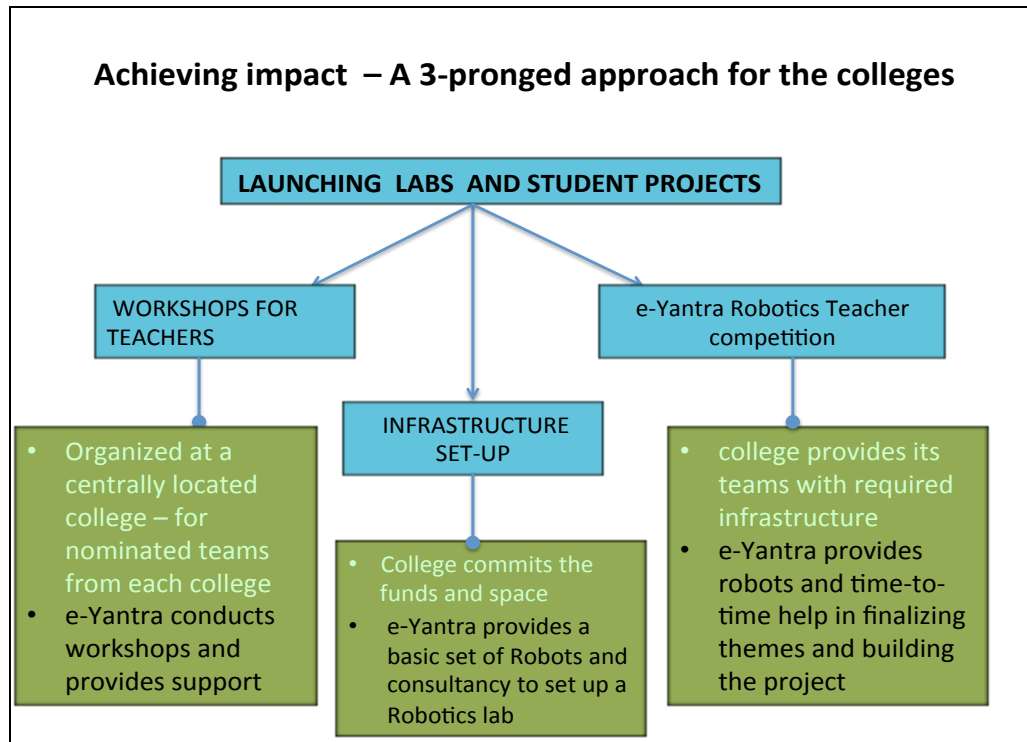
In order to engage with the engineering colleges after establishing the Robotics labs, e-Yantra proposes an annual e-Yantra Symposium – this is envisaged as an event where colleges share their experiences, projects, and research ideas in Embedded systems and Robotics.

3. Research and development -- Open source content creation

Research and development is a staple activity at e-Yantra and is being expanded for (i) developing better training content, (ii) coming up with novel themes for competitions, and (iii) exploring state-of-the-art platforms and software tools. In order to create content, especially on new concepts and technology, the following resources are required:

(i) Test beds for vetting new technologies and software tools:

Example: We propose to test our various homegrown technologies in a live test bed – greenhouse created in IIT Bombay. Concepts and applications such as -- Communication system design (use of Akash tablet), Scheduling of sensing and other activities in greenhouse, Image processing techniques for monitoring plant health, Artificial Intelligence techniques for anticipating pest and other problems, Remote monitoring system and fault diagnosis in greenhouses (both machinery and plants) -- will be tested.

(ii) Content creation team – A technical team would convert the concepts and technology vetted in the test beds into teaching modules. These modules would be shared with the engineering colleges as workshop modules in advanced topics and hands-on training modules in new technologies and software tools.

(iii) Content editing team – Content design and video editing team will play the crucial role of appropriately editing the content created by the technical team into modules for consumption in open source.

All the workshop material and projects implemented as part of the competitions for students and teachers are available on the e-Yantra website as open source content under the Creative Commons license.

Additionally, applications that leverage equipment and tools from other Mission projects have been experimented with. For example:

Aakash: Controlling Robotics applications using Aakash tablet has already been demonstrated through the "I SPY" application, where an Aakash tablet, remotely controls a Robot as it captures a video of its environment.

Spoken Tutorials: Our core 2-day workshop is being converted to Spoken tutorials in order to facilitate training distributed teams competing in our competition across the country.

FOSSEE: All the software we use, from the compilers to the tools such as Scilab are open source.

10,000 Teacher Training: Once the network of robotic labs is established in the colleges, we propose to teach our Embedded Systems course using this infrastructure.

Synergies with other projects will continue to be explored as and when we understand how it might help our mission.

b) Justification, importance of the project:

Automation of repetitive, hazardous, and exploratory tasks is the core of cutting edge industrialization and engineering education around the world. Education that incorporates hands-on experiments with robots is the need of the hour for equipping our engineering students with skills to compete in the International arena. Our project aims to spread effective Embedded systems and Robotics education to engineering colleges across our Nation through training and support for setting up curricula based around Robotics labs at the colleges. The importance and justification of this project has already been elaborated in our previous project proposal, which has been successfully executed.

This project aims to substantially scale up the efforts to reach out to:

i. Students and teachers through workshops and competitions,
ii. Engineering colleges to provide support to setup lab facilities to impart effective Robotics education to their students, and
iii. Create a repository of open source training contents, projects, and code in Embedded systems and Robotics.

(c) Details of the work already done by the Investigators in this area:

16. Overall Budget (in lakh):
Overall budget for two years = Rs. 1709.59 lakhs. Details of the budget are given below:

Details of the budget (Amounts specified are in lakhs):

Budget for e-Yantra activities (in lakhs)				
	Year 1	Year 2	Year 3	Total
Activities of e-Yantra				
e-Yantra Robotics Competition (eYRC)[1]	54.2	98	124	**276.2**
e-Yantra Ideas Competition (eYIC)	5.9	8	10	**23.9**
Internships and Projects	6.3	10.6	15.9	**32.8**
Workshops	7.2	7.2	7.2	**21.6**
e-Yantra Lab setup Initiative (eLSI)[2]	49.5	99	99	**247.5**
e-Yantra Symposium (eYS)[3]	10	15	25	**50**
Testing concepts/technology/tools[4]	75	55	25	**155**
Content creation/Teaching modules[5]	150	50	50	**250**
Operating costs of e-Yantra				
Equipment	45	20	20	**85**
Salary	120.24	142.4	170.16	**432.8**
TA/DA	30	20	20	**70**
Consumables and Contingency	5	5	5	**15**
TOTAL	**558.34**	**530.2**	**571.26**	**1659.8**
PI consultancy (3%) of Total	16.75	15.91	17.14	49.79
GRAND TOTAL	575.09	546.11	588.4	1709.59

Table below lists out the targets set for the project:

---

[1] Budget for 3 years = 276.2 L; Targeted number of students = 60,000
Number of robotic kits distributed = 650;
Cost of robotic kits = 162.5 L (@25K/kit inclusive of accessories and shipping); Cost of prizes = 7.08 L
Amount spent on conducting the competition = 276.2 -169.58 = 106.62 L
Cost/student reached = 106.62/0.6 = Rs. 177.67

[2] Budget for 3 years = 247.5 L; Targeted number of colleges = 500
Number of teachers trained to be experts = 2000; Number of robotics kits dispatched = 500
Cost of robotic kits = 125 L (@25K/kit inclusive of accessories and shipping);
Cost of prizes for e-Yantra Robotics teacher competition = 9.5L
Cost of eLSI = 247.5 -125-9.5 = 113L
Cost/college = 113,00,000/500 = Rs. 22,600
Cost/teacher = 22,600/4 = Rs. 6,125

[3] Year 1 (budget – 75L) includes expenses related to travel and stay of invited speakers, dignitaries, and Nodal Center Coordinators (NCCs)
Targeted number of teachers = 200; Targeted number of Nodal Centers = 10
Cost/teacher = 4,60,000/200 = Rs. 2300

[4] Year 1 (budget projected – 75L)
Creating Test beds (includes: Fabrication, Electronic components, Web technologies, PCB design and manufacturing, etc.): 22.44 L
Equipment: 30 L, Manpower (trainees, research assistants): 14.56 L, and Consumables 8L

[5] Year 1 (budget projected – 120L)
Includes: Test module generation – 28 L, Project conversion – 10 L, Creation of Advanced modules– 50 L,
Conferences – 20 L, Postal campaign – 2 L, Travel for dissemination – 10 L

e-Yantra Deliverables				
	Year 1	**Year 2**	**Year 3**	**Total**
e-Yantra Robotics competition				
Targeted students	10,000	25,000	25,000	**60000**
Selected for competition	600	1000	1000	**2600**
Teams participating in competition	150	250	250	**650**
Robots distributed to colleges	150	250	250	**650**
Teams identified for nurturing (finalists)	15	25	25	**65**
e-Yantra Ideas competition				
Targeted students	5000	7000	8000	**20000**
Entries received	500	700	800	**2000**
Internships	10	15	20	**45**
Projects	10	15	20	**45**
Workshops (12 workshops/year)				
Targeted colleges	100	100	100	**300**
People made aware through training	480	480	480	**1440**
Lab setup initiative				
Regions targeted	5	10	10	**25**
Colleges with lab setup	100	200	200	**500**
Teachers trained	400	800	800	**2000**
e-Yantra Symposium				
Participating colleges	25	100	500	**625**
Open source content				
Targeted students/teachers	5000	10000	15000	**25,000**
Embedded Systems course				
Targeted teachers			10,000	**10,000**

17. Recurring budget of the proposal along with item-wise breakup (in lakh)

	Year 1	Year 2	Year 3	Total
Competition related				
e-Yantra Robotics Competition	49.2	80	100	**229.2**
e-Yantra Ideas Competition	5.9	8	10	**23.9**
Internships and Projects	6.3	10.6	15.9	**32.8**
Workshops	7.2	7.2	7.2	**21.6**
Lab setup initiative related	49.5	99	99	**247.5**
e-Yantra Symposium (eYS)	10	15	25	**50**
Testing concepts/technology/tools	**45**	45	18.5	**108.5**
Content creation/Teaching modules	120	45	45	**210**
Salary	120.24	142.4	170.16	**432.8**
TA/DA	30	20	20	**70**
Consumables and Contingency	5	5	5	**15**
	448.34	**477.2**	**515.76**	**1441.3**

18. Detailed breakup of non-recurring items (Rs. lakh)

	Year 1	Year 2	Year 3	Total
Equipment	110.0	53.0	55.5	**218.5**

174

Summary Sheet

1. Name of the Institution: IIT Bombay
2. Title of the Project: e-Yantra – Robot enhanced teaching in engineering colleges and schools (Phase 2)
3. Name of the Department: Department of Computer Science and Engineering
4. Cost of the Project: Rs.1709.59 lakh
5. Amount released earlier if any: The first phase of the project
6. Utilization position in respect of grants released earlier for various projects (Details to be given project-wise): Funds used and committed.
7. Reasons for unspent balance: All the balance money is already committed.
8. Name of the Principal Investigator responsible for implementation of the Project: Prof. Kavi Arya

(NAME & SIGNATURE OF THE PRINCIPAL INVESTIGATOR)

Certificate from IIT Bombay

Certified

. that the Principal Investigator is not due to retirement during the currency of this project.

. that the Principal Investigator is a regular employee of this Institution. However in case he/she proceeds sabbatical/resigns/proceeds VRS etc., the Institute will ensure to replace PI by a compatible academician to ensure that without any brake whatsoever, project will be completed within the stipulated period.

. that it will be ensured that the implementation will be carried out on mission mode with no time or cost over run and we are aware that ministry will neither provide any extension of time nor additional funding.

. that no overheads will be charges by the Institution for this project and all facilitation including other essential/infrastructure support like air-conditioning etc. will be provided by the Institution.

Seal of the Institution

Signature of Head of the Institution

For Office Use Only

1. Name of the Area:

2. Recommendations:

(a) Approved (b) Not approved

(c) Deferred Amount (Rs.——————- in lakhs)

(d) Transferred to area

3. Remarks, if any (common for all the 3 schemes)

176

Estimated Expenditure for E-Resources under INDEST-AICTE Consortium for Core Institutions for the Year 2013

S.No.	E-Resource	No. of Institutions	Rates for 2013 in Original Currency	Total Price in Original Currency	Total Subscription Rate in Rs. (Revised)
A	**Subscription of INFLIBNET E-resources for IITs / IISc / NITs / IISERS (Annual Reviews - 42, Nature - 34 and JSTOR - 55 and T&F -21)**				
1	Annual Review	34	$3,125.00	$1,06,250.00	69,06,250.00
2	Nature- 27 Titles	13	£28,413.00	£3,69,369.00	380,45,007.00
3	Nature- 27 Titles New IITs and NITs	21	£22,733.00	£4,77,393.00	491,71,479.00
4	Taylor & Francis	21	$23,100.00	$4,85,100.00	315,31,500.00
	Total				**1256,54,236.00**
B	**Subscription of INDEST E-resources to Universities (Web of Science)**				
5.1	Web of Science	100	$14,76,168.75	$14,76,168.75	**959,50,968.75**
C	**Subscription of INDEST E-resources to Universities (Web of Science)**				
5.2	Web of Science for new IITs/IISc*	13	$23,000.00	$2,99,000.00	**194,35,000.00**
	Grand Total (A+B+C)				**2410,40,204.75**

1USD= 65.00
1UKP= 103.00

Estimated Expenditure for E-Resources under INDEST-AICTE Consortium for Core Institutions for the Year 2014

S.No.	E-Resource	No. of Institutions	Rates for 2013 in Original Currency	Rates for 2014 in Original Currency (5% increase)	Total Price in Original Currency	Total Subscription Rate in Rs.
A	**Subscription of INFLIBNET E-resources for IITs / IISc / NITs / IISERS (Annual Reviews - 42, Nature - 34 and JSTOR - 55 and T&F -21)**					
1	Annual Review	42	$3,124.80	$3,281.04	$1,37,803.68	89,57,239.20
2	Nature- 27 Titles	13	£28,413.00	£29,833.65	£3,87,837.45	399,47,257.35
3	Nature- 27 Titles New IITs and NITs	21	£22,731.45	£**170**	£5,01,228.47	516,26,532.67
4	Taylor & Francis	21	$23,100.00	$	$5,09,355.00	331,08,075.00
5	JSTOR	55	$1,000.00	$1,000.00	$55,000.00	35,75,000.00
	Total					**1372,14,104.22**
B	**Subscription of INDEST E-resources to Universities (Web of Science)**					
	Web of Science	100	$14,76,168.75	$15,49,977.19	$15,49,977.19	**1007,48,517.19**
C	**Subscription of INDEST E-resources to Universities (Web of Science)**					
	Web of Science for new IITs/IISc*	13	$23,000.00	$24,150.00	$3,13,950.00	**204,06,750.00**
	Grand Total (A+B+C)					**2583,69,371.41**

1USD= 65.00
1UKP= 103.00
1EURO= 86.00

National Library and Information Infrastrcture for Scholarly Content
Expenditure on Subscription to E-resources for 2014 under N-LIST Project

Sl No.	E-resources	No of Colleges	No of Sites	2013 Price (per site) (Freezed at 2012 price)	2014 Price per Site (5% increase)	Total 2014	Total Amount to be paid (in original currency)	Amount to be Paid in Rs.
1	AIP/APS	600	3	$77,726.00	$81,612.30	$81,612.30		
		601-1000	2	$25,909.00	$27,204.45	$54,408.90		
		1001-1400	2	$20,727.00	$21,763.35	$43,526.70		
		1401-2000	3	$20,727.00	$21,763.35	$65,290.05	$2,44,837.95	159,14,466.75
2	Annual Reviews*	1001-3000	15	$56,040.00	$64,446.00	$64,446.00	$64,446.00	41,88,990.00
3	CUP	1000	5	£59,603.16	£62,583.32	£62,583.32		
		1001-2000	5	£37,251.98	£39,114.58	£39,114.58		
		2001-4000	10	£37,251.98	£39,114.58	£39,114.58	£1,40,812.48	145,03,685.03
4	EPW**	1 to 3000	15	Rs. 900.00	Rs. 945.00	Rs. 28,35,000.00		
		3001-4000	5	Rs. 850.00	Rs. 892.50	Rs. 8,92,500.00	Rs. 37,27,500.00	37,27,500.00
5	HW Wilson*	1000-4000	20	$1,36,500.00	$1,56,975.00	$1,56,975.00	$1,56,975.00	102,03,375.00
6	Indian Journals	600	3	Rs. 18,00,000.00	Rs. 18,90,000.00	Rs. 18,90,000.00		
		601 - 2600	10	Rs. 3,50,000.00	Rs. 3,67,500.00	Rs. 36,75,000.00		
		2601-4000	7	Rs. 1,30,000.00	Rs. 1,36,500.00	Rs. 9,55,500.00	Rs. 65,20,500.00	65,20,500.00
7	IOP	1000	5	£29,106.80	£30,562.14	£30,562.14		
		1001-3000	10	£7,276.70	£7,640.54	£7,640.54	£38,202.68	39,34,875.53
8	MathSciNet	1 - 1000	5	$7,069.04	$7,422.49	$37,112.47		
		1001 - 2000	5	$5,352.83	$5,620.47	$28,102.34		
		2001 - 3000	5	$4,014.62	$4,215.35	$21,076.77		
		3001 - 4000	5	$594.76	$624.50	$3,122.50	$89,414.07	58,11,914.75
9	OUP	1000	5	£4,500.00	£4,725.00	£23,625.00		
		1001-3000	10	£4,200.00	£4,410.00	£44,100.00		
		3001-4000	5	£4,200.00	£4,410.00	£22,050.00	£89,775.00	92,46,825.00
10	RSC	1000	5	£38,664.00	£40,597.20	£40,597.20		
		1000-2000	5	£4,833.00	£5,074.65	£25,373.25	£65,970.45	67,94,956.35
11	Ebrary*	1000-4000	20	$3,80,250.00	$4,37,287.50	$4,37,287.50	$4,37,287.50	284,23,687.50
	Subscription to JSTOR							
12	JSTOR AAF	1 to 2600	13	$36,500.00	$36,500.00	$36,500.00		
	JSTOR AAF	2600 - 3000	2	$2,307.00	$2,307.00	$4,614.00	$41,114.00	26,72,410.00
	JSTOR ACF	3001 - 4000	5	$13,462.00	$13,462.00	$67,310.00		
	JSTOR AAF	3001 - 4000	5	$2,307.00	$2,307.00	$11,535.00	$78,845.00	51,24,925.00
	Total							**1170,68,110.90**

* 15% Increase for all colleges, ** Price per College

Sl No.	Ebooks- Perpetual Basis							
	Collection	**No of Coll.**	**Sites**	**Price per Site**	**No of e-books**	**Total Price**	**Total Price**	**Total Price in Rs.**
12	OSO 902 coll	3001 - 4000	5	$21,455.00	902	$1,07,275.00	$1,07,275.00	69,72,875.00
13	McGraw Hill ebook	3001 - 4000	5	$21,000.00	1124	$1,05,000.00	$1,05,000.00	68,25,000.00
14	Hindustan ebook	3001 - 4000	5	$5,000.00	65	$25,000.00	$25,000.00	16,25,000.00
15	ISAES ebook	3001 - 4000	5	$28,571.43	382	$1,42,857.15	$1,42,857.15	92,85,714.75
16	Pearson	3001 - 4000	5	₹ 5,00,000.00	500	₹ 25,00,000.00	₹ 25,00,000.00	25,00,000.00
17	Sage	3001 - 4000	5	$46,000.00	1000	$2,30,000.00	$2,30,000.00	149,50,000.00
18	Springer	3001 - 4000	5	€ 1,15,000.00	2300	€ 5,75,000.00	€ 5,75,000.00	494,50,000.00
19	T&F	3001 - 4000	5	$78,120.00	1800	$3,90,600.00	$3,90,600.00	253,89,000.00
20	OUP	3001 - 4000	5	$12,250.00	500	$61,250.00	$61,250.00	39,81,250.00
21	CUP	3001 - 4000	5	$33,120.00	1800	$1,65,600.00	$1,65,600.00	107,64,000.00
	Total							**1317,42,839.75**
	Grand Total							**2488,10,950.65**

1USD= 65.00

1UKP= 103.00

1EURO= 86.00

Expenditure on Monitoring Agency including Manpower

Sl. No.	Item of Expenditure	2013	2013 (Revised)	2014
		Rupees in	Rupees in Lakhs	
1	Stationery/ Printing of Brochure and Manuals	8.00	0.00	8.00
2	Toner and Other Consumables	2.00	0.00	2.00
3	Federated Search and Access	40.00	0.00	40.00
4	Postal / Courier	10.00	0.00	10.00
5	Expenditure on Manpower	33.24	0.00	38.23
6	Training Programmes	12.00	0.00	12.00
7	Travel Grants	10.00	0.00	10.00
	Total	**115.24**	**0**	**120.23**

Manpower Requirement @ INFLIBNET Centre			
Position	2013 (pre-revised)	2013 (Revised)	2014
	Rupees in Lakhs	Number	Rupees in Lakhs
Senior project Scientist	9.6	0	11.04
Project Scientists	10.56	0	12.14
Project Associates	8.64	0	9.94
Project Assistants	3.6	0	4.14
Office Attendant	0.84	0	0.97
Total Expenditure on Manpower	**33.24**	**0**	**38.23**

Aakash Project Status Report

Collated by

Firuza Aibara

Project Investigators

Prof. D. B. Phatak
Prof. Kannan M. Moudgalya

Advisor

Prof. Pradeep Varma

Indian Institute of Technology Bombay

August 19, 2013

Aakash Project Status Report from IIT Bombay, 30 July 2013
Summary for Executive Perusal

1. IIT Bombay was entrusted with the responsibility of executing the Aakash project, in March/April 2012. Funds were transferred in May 2012.

2. The main objective was to empower college teachers and students in the country, to provide quality education to millions of Indian students. This objective was to be achieved by procuring 1 lakh tablets, developing applications, content, and methods for their effective educational use, and by deploying these in our colleges. A pilot for schools was also planned.

3. IIT Bombay renegotiated the technical specifications prescribed earlier, to obtain a better performing Aakash tablet at a lower price. Procurement of 1 lakh tablets has been completed.

4. For lab testing, a partnership was established with CDAC. It has provided test results and useful feedback on the given samples. The delivered tablets have been found compliant with the hardware and software specifications. Only about 300 out of all the delivered tablets, have been found to have manufacturing defects (about 0.30%). These units are being replaced by the supplier. CDAC has submitted its final lab-test report.

5. Many useful educational applications and content were initially developed by IIT Bombay, to kick-start the deployment of tablets in educational institutions.

6. For field testing, IIT Bombay has selected about 300 colleges in the country, called Aakash Project Centres. Tablets have been supplied to these centres for use in classroom teaching, and for further application development through final year projects. Additionally, Aakash Application Development Labs have been set up by IIT Madras, at five sister IITs. The tablets are also being used in the large-scale teacher training program T10KT, being conducted by IIT Bombay and IIT Kharagpur. The results of this field testing are positive and very encouraging. The school pilot has also been deployed recently in 4 schools.

7. IIT Bombay has trained over 10,000 teachers on the use of Aakash in education, and about 13,000 students in developing applications for Aakash, on the Android platform. Contests have been organized as an incentive to get more focussed work done.

8. Based on the feedback from this project, a committee has worked out the specifications for the next version of Aakash. These have been now frozen. It is recommended that a project should be initiated jointly by IITB and CDAC, under the aegis of DEITY, for developing and implementing a reference design, to achiev greater and faster indigenisation.

9. The project will continue to refine the learning, and to add more useful applications to the repository. Developed applications and content are released in open source, to benefit the entire community of students and teachers.

10. IIT Bombay thanks MHRD for this wise and timely initiative, and for strongly supporting the project. Its successful execution at IIT Bombay, should be the Launchpad to integrate Aakash in Indian education system, on a much larger scale.

Contents

Contents   v

Chapter 1

Introduction

Preamble

Responsibility for running this flagship project of NME-ICT, was given by MHRD to IIT Bombay on 19 March 2012. Ministry's orders for transfer of funds were issued on 16 April 2012. Project funds were received by IIT Bombay in three tranches. Substantial amount was received by 20 April, and the remaining by 5 May 2012.

IIT Bombay initiated a fresh procurement process in April 2012, continuing with the same vendor Datawind, identified earlier through a global tender, as L1 bidder. Upgraded specifications for Aakash were prescribed by us, and the Institute managed to negotiate a notional reduction in the previously agreed price which now stands at Rs 2263 per unit. Purchase order was placed by IIT Bombay on 4 May 2012. Delivery schedule was stipulated as 6 months after acceptance of samples. The required LC was opened on 9th May 2012.

CDAC was requested to join the project as Co-PI. Prof. Rajat Moona agreed to become co-PI, and CDAC Thiruvananthpuram took the responsibility of carrying out the detailed lab testing of the Aakash samples from each delivered lot. 100 samples were delivered by Datawind during the month of May 2012.

1.1 Work done on the project from May to July 2012

The main objective of the project assigned to IIT Bombay, is empowerment of teachers in engineering colleges. We have planned the deployment of the Aakash tablets in a large number of engineering colleges in the country, with two objectives. The first is to test and enhance the effectiveness of these tablets for use in a classroom environment. The second is the development of new educational applications and contents on Aakash, largely through final year R&D projects done by BE/ME students.

In these 3 months, we developed some key educational applications on Aakash 2. These include applications for playing interactive video lessons on Aakash 2, and for conducting on-line real time quiz tests in a classroom. We ported the popular programing environment for C, C++, Python, and Scilab on Aakash. To demonstrate the development capabilities of engineering college students, we guided summer interns from other colleges to develop a Robot control application on Aakash 2.

1

We had a strong relationship with 185 engineering colleges across the country, including several NITs, which work with us as Remote Centers for teachers' training workshops under 'Talk to a Teacher' project of NME-ICT. In these 3 months, 168 colleges agreed to participate in deploying Aakash tablets for achieving the project objectives.

Aakash-2 was soft launched by the then hon'ble HRM, Shri. Kapil Sibal, on the occasion of inauguration of our workshop on Research Methodologies for 10,000 teachers, conducted from 25 June to 4 July 2013. Hon'ble HRM, as also Shri. Ashok Thakur, Secretary (HE), remotely interacted with participants during this workshop.

1.2 Further upgrade to the Aakash specifications

We had developed applications using the 100 sample devices delivered to us. The devices were working as expected. However, we noticed a few issues. We discovered that the Android version 2.2 supplied, was not a stable build. There were snags with the device driver software. Occasionally, tablet would simply freeze during operation, requiring a hard reset. These problems are common with lower-end versions of mobiles/tablets available in the market. We were concerned with the fact that thousands of our students were going to use the tablets regularly in their studies, and such intermittent problems could seriously affect their enthusiasm. We sent 25 of these tablets to CDAC, for more rigorous lab testing. It also endorsed our findings on the occasional non-working of tablets, and freezing of the operating system in the middle of usage. There was also delay at DataWind manufacturing units, due to late delivery of the capacitive screens from their Montreal facility.

We raised these issues with Datawind which admitted that the processor used did have occasional operational issues with Android software. It mentioned that it had completed work on a different and faster processor, which was certified on Android platform. The enhanced device operate on an Android 4.0, and much larger memory of 512 MB. However, the device was costlier, and had only one mini-USB port instead of two required by us. We called Datawind people for immediate discussions on 20th July, to determine the suitability of this version. Datawind team handed us 2 samples. Our team was able to port all applications, and there was a much greater comfort level about the stability of the new device. The device ran faster due to a higher processor speed and larger memory. We could convince the Datawind team, that it was as much in their interest as ours, to supply Aakash tablets which were very stable in operations. They agreed, and after considerable persuasion, offered the upgraded version with the new processor, at the same price. There would however, be a delay in getting 100 samples all over again, and testing and certifying the golden samples as per contract, for them to start deliveries in substantial quantities.

We waited for two more weeks, for our development teams to carry out further tests. Their report was satisfactory. While this change involved some more delay, it was our considered opinion that the upgrade was in the greater interest of the project. Datawind agreed to supply all remaining units with upgraded specifications, at the same price. Since the design was now completely new, they felt more time was needed for the delivery of all units, but agreed to try and complete all deliveries by 31 December 2012.

No. 201200018/1   Date : 26.07.2013

To,
M/s. Datawind Innovations Private Limited
8148, Jubilee Complex, Sultanwind Road,
Amritsar – 143 001.

Sub : Amendment of PO No. 201200018/1 Dtd. 04.05.2012
Ref. No. MHRD/12/EQP/001/2012/001/L/CS/DBP

Dear Sir,

This has reference to our email Dated 29.08.2012 from Computer Science & Engineering Dept. The following upgradation are done in Aakash – 2 Tablets :

	Current	Upgraded Offer
Microprocessor	700 MHz Cortex A8	1 GHz Cortex A8
Memory (RAM)	256 MB	512 MB
Storage	2GB & 2GB SD Card	4 GB Internal Partitioned
Peripherals	2 USB Ports	1 mini-USB & 2-port USB-A adapter cable
Sensor	N/A	G-Sensor
Audio In	3.5mm jack	Integrated Mic
Connectivity	Wifi 802.11 a/b/g	Wifi 802.11 b/g/n
Operating System	Android 2.3	Android 4.0

The battery in the Upgraded Offer will be 3000 mAH, but continue to provide 3 hours of usage under normal mixed usage conditions.

The above specifications will apply to 98,000 units & Pricing will remain the same.

Other terms and conditions will remain unchanged.

Thanking You,

Yours faithfully,

Dy. Registrar (MM)

C.C. To : Dean (R&D), Prof. D B Phatak, CS&E, DSK

1.3   Launch of Aakash-2 and Subsequent Activities

From this point onwards, we prepared ourselves for the large scale field testing envisaged in our proposal. This involved distribution of tablets to various colleges, and starting different training, development and R&D programs. We soon ramped-up the number of our Remote Centers. Most of them agreed to become Aakash Project Centres (APCs) of IIT Bombay. In order to train teachers and students of these colleges, we planned two training programs. The first was a 2 day orientation program for teachers, which was conducted on 10, 11 November 2012. Over 13,000 teachers from the APCs, participated in this program. On this occasion, Aakash 2 was formally launched by Hon'ble President of India, Shri. Pranab Mukherjee, on 10 November 2012. Honble HRM Dr. Pallam Raju, Honble Ministers of State Dr. Shashi Tharoor and Shri. Jitin Prasada, and Secretaries from MHRD, were present during this launch.

An 'Aakash Research Fellowship Award' contest was announced for participating teachers. They were asked to form teams, and write essays, on how best to utilize Aakash tablets to enhance the effectiveness of learning process, and to improve quality of education in engineering colleges. More than 2000 submissions have since been received. These are being evaluated through a peer review process.

A training program for students from these colleges, was similarly planned and conducted over 2 weekends: 23-24 February 2013, and 3-4 March 2013. More than 30,000 students originally registered for this training program. Because of the restricted lab facilities in our remote centers, we could accommodate only about 8000 of these to attend the program and complete all quizzes and assignments, and they were awarded certificates. The program was greatly appreciated by the participants. We had asked the students to work on their final year projects, for further application and content development on Aakash. Additionally, we also announced an 'Aakash Android application development' contest. More than 700 students have registered for the contest, and 250 project ideas have been submitted by them.

We had also planned R&D projects at the level of M. Tech. dissertations at IIT Bombay. 20 such research projects were given, which have since been completed. Several other important projects have also been undertaken and completed at IIT Bombay. In August 2012, Prof. Jhunjhunwala established Aakash Application Development Labs (AADL) in several sister IITs. They have also carried out substantial development work at 5 IITs. We had asked all our Aakash Project Centers to offer development projects on Aakash. These APCs have begun doing that task. We have already received details from 28 colleges which have started work on over 120 projects.

All of this work and feedback obtained are included in this report.

During the last semester (January-April 2013), we have extensively used Aakash tablets in several of our courses at IIT Bombay. The application which teachers have found to be most useful, is the clicker application for conducting short quizzes in the classroom. Students have reported that the ability to carry digital contents for a course, in a searchable format, is what they find most useful. The clicker application has also been successfully used in a workshop on DBMS, under our T10KT program, conducted across the country at about 250 Remote centers, in which over 9000 teachers participated.

In the coming academic year, July 2013 to December 2013, it is expected that each of the participating APC will teach a course using Aakash. At IIT Bombay and IIT Kharagpur, a large scale deployment is being carried out.

Chapter 2

Proposal Submitted by IITB

Proposal for the Aakash project, sponsored by MHRD

1. Title

Hardware and software optimization and testing of Low Cost Access Devices (LCAD)

2. Background:

These LCAD tablets, named 'Aakash', have been under test and development by IIT Rajasthan. It had conducted a regular tender process to acquire 1,00,000 tablets. The tender was won by M/s DataWind. Unfortunately, some intractable problems arose during execution of the project. IIT Rajasthan has requested MHRD to take back the project and hand it over to another PI for its continuatuion and successful implementation. MHRD has now decided to transfer the project to IIT Bombay, with CDAC acting as Co-PI for the overall project.

3. Deliverables:

Based on the preliminary discussions, the scope of the project is to undertake and complete the following activities:

3.1 To complete the acquisition process initiated by IIT Rajasthan.

3.2 To test these tablets in the labs, and then more comprehensively in the field, to provide feedback on functionality and usability.

3.3 To further optimize the tablet by adding useful educational applications and contents, and by providing critical feedback on the tablet architecture, design, and construction.

3.4 To liaison regularly with the Committee appointed by MHRD for Continuous R&D on Aakash.

4. Duration   : 2 Years

5. Budget :   Rs. 47.72 Crores

[Notes:
 (i). An amount of Rs. 27.72 Crores is earmarked for payment to DataWind, for acquisition of 100,000 tablets.
 (ii). An amount ranging between Rs 2 Crores to Rs 5 Crores is earmarked for lab testing. This will be mainly carried out by our project partner CDAC, and to a smaller extent, by IIT Bombay]

1

6.   Project Leadership at IIT Bombay

PI   :   Prof. Deepak B Phatak (CSE)

CoPI   :   Prof. Sridhar Iyer (CSE)

Prof. Kannan Moudgalya (Chemical Engineering)

7.   Proposed activities:

Activities are described below for each of the four deliverables mentioned in section 3 above.

7.1 Completion of procurement. [0 - 8 months]

This is the most critical activity, and needs to be concluded as early as possible. MHRD is transferring the project to IIT Bombay from IIT Rajasthan, on an as-is basis. We will have to place an order with M/s DataWind, on the basis of the earlier contract between them and IIT Rajasthan. For this purpose, a study will be carried out on the tender process followed by IIT Rajasthan, and copies of the relevant documents will be obtained for our scrutiny and record. An LC has already been opened by IIT Rajasthan in favor of DataWind. It will be studied, and if possible, it will be transferred in the name of IIT Bombay. A new contract will be executed between us and DataWind. M/s DataWind have suggested a draft contract, which is being uploaded on the IRCC website, for a preliminary legal opinion.

Once the contract is signed, M/s DataWind is supposed to deliver the tablets as per an agreed time table. These will be tested as elaborated in the next section. Payments will be released to M/s DataWind, against the deliveries of tested and accepted tablets, by using the operative LC. This will complete the acquisition phase.

It is explicitly provided that we will be responsible for the project, only from the point when the project is transferred to IIT Bombay. Any issues between IIT Rajasthan and M/s DataWind, arising out of activities conducted for the project earlier, before being transferred to IITB, will be resolved by them directly.

7.2 Testing. [2 months to 18 months]

The delivered tablets will have to be first tested in the labs, and subsequently in field by deploying these in a well planned fashion. These two components are elaborated in next subsections.

7.2.1 Lab Tests.   [2 months to 9 months]

2

Our project partners, M/s CDAC, will be providing their expertise, and their Lab (currently identified as their Thiruananthpuram and/or Bengaluru establishments), for conducting these tests. Additionally, we will be procuring some test and development facility in the Aakash lab, set up at IITB for this purpose. The details are being worked out jointly with CDAC. The agreement with M/s DataWind will contain details of the tests to be carried out, and the acceptance criteria, as also the process for testing rejected tablets, when redelivered after appropriate modifications.

7.2.2   Field testing [3 months to 18 months]

This is the larger part of testing, which will be carried out by IIT Bombay. Here, the functionality and usability of tablets will be tested by the actual users, i.e., students and teachers of different colleges in the country. Feedback obtained in the process will be used to further optimize the tablet. Selection of these colleges and the approach to carry out the tests, are proposed under three different categories, as follows:

7.2.2.1 Category I, Institutes with relatively large deployment.

About 10 Institutions will be chosen for what may be called a large scale deployment test. A complete batch of new UG and PG students will be given these tablets, along with several final year students working on projects for development of new applications. These institutions will be expected to carry out the following tasks:

(a) Teachers teaching courses to these students will identify specific course components for which these tablets will be used. These would include quizzes, assignments, and contents for home reading. Even class attendance is expected to be taken using these tablets

(b) Usage by students will be monitored and feed back will be collected and forwarded to IIT Bombay. A simple web based mechanism will be set up to collect and accumulate such feedback.

(c) They will set up several student projects for development of additional useful Open-Source applications and contents for educational use

(d) Additionally, the Institutes will be required to propose and implement an action plan to incorporate the use of these tablets into their internal assessment system (e.g., attendance, assignments, etc), and provide details of the same. It is expected that such usage will be based on Open Source components at the back-end, such as moodle for LMS, a local web portal based on Drupal/ Joomla / or Java, an Open Source ERP system, etc. This will ensure that the software interfaces, built for such integration, will be usable by every other Institute deploying such systems.

It is proposed that a total of 20000 tablets be deployed in this fashion.

3

7.2.2.2 Category II. Colleges with medium deployment

At present, IIT Bombay is executing 'train 1000 teachers' program, as a project under NMEICT. This program has successfully engaged about 10000 teachers, belonging to over 1000 different colleges, in focused workshops. The workshops are conducted through Remote Centers, which are institutes of some standing. Currently, there are 78 remote Centers. This number will be scaled up to 200 shortly, such that all parts of the nation are covered, with an equitable distribution of these Institutes across all Indian states.

It is proposed that that each centre will be given 150 tablets, provided they agree to do the following:

a) About 100 tablets will be given to a selected class of that college (up to 90 students). Their usage in the classroom for purposes as in (a) and (b) of section 7.2.2.1 above, along with the usage in hostels (outside the class), will be monitored.

b) Teachers participating in the future workshops, conducted during vacation period, will be given these tablets for use during the workshop, for conducting quizzes conducted, and for accessing e-learning contents of the workshop.

c) About 50 tablets will be given to final year students, for projects related to further development of applications and contents.

A total of 30000 tablets are proposed to be deployed in this fashion.

7.2.2.3 **Category III**, **Other Institutions.**

The first two components will account for deployment of 50,000 tablets. The remaining 50000 will be deployed in consultation with MHRD. It is suggested that a certain number be allocated to high school students, so that features such as use of Indian Language scripts, and of Open Source contents suitable for high school students for some select subjects, can be tested.

Several novel schemes for popularizing the usage of Aakash can be launched. For example, colleges making proposals for specific content and application development can be given, say, 20 tablets to begin with, and the Institutes coming out with best implementations can be given 'awards' of additional 100 tablets.

In any case, a proper feedback must be provided by these colleges as well.

In the context of the overall deployment proposed in these sections, it should be noted that the chosen colleges will also have to be provided with a small server dedicated for use with Aakash tablets, and a few Wi-Fi access points in some class rooms, labs, and a seminar hall, connected on the Institute LAN through a VPN. Category I Institutions

4

are expected to deploy this infrastructure on their own. For the 200 Institutes of category II, some minimal equipment will have to be provided as part of the project implementation. Since this may entail an expenditure of about Rs 1,00,000 per Institute, an amount of Rs 2 Crores is proposed to be earmarked for this purpose from the project budget. A further reduction in the cost of this equipment will be attempted through our Affordable Solution Lab.

Provision of such equipment to other Institutes in category III, is outside the scope of this project

7.3   Applications and contents.

The tablet is expected to become a ubiquitous tool in the hands of all learners. As such, more and more applications and contents will keep coming. Some of it could have a cost model associated with them. Thus we may see some license fee for applications; a monthly access fee for internet access; an annual subscription for useful contents, courses and on-line tests; etc. In such an emerging scenario, it is vital to provide useful open source applications, open source educational contents, and free access (at least within the school and colleges campuses).

An important thrust area for this project, is to build and release more applications and contents in open source. Towards this end, the spectrum of applications will be studied, and a few important ones will be selected for development and porting. Similarly the accessibility to all the available open source educational contents will be studied, and usage formats will be suitably modified for access through tablets. We have already identified a few such applications and contents. These include a simple Quiz/Assignment application, an attendance recording application, a stand-alone e-learning application for using multi-media lessons, etc. We have also initiated work on porting of SciLab.

While the team at IITB would be working on these developments, we will rope-in the large number of teachers (over 10000 already), engaged in workshops over last two years, and through them, many of their enthusiastic students. They will be encouraged to work on multiple useful projects as collaborative teams, We may consider conducting a special 5 day workshop for teachers and students, to train them on such developments. The IITB project web portal will be extended to include a development and testing platform for such groups to work on.

Some incentive schemes can be operated through this project for individuals as also for participating Institutes, such as award of more tablets for best Institutions in each category, cash rewards for the best projects, etc.

7.4 Liaison

As mentioned in the objectives, the project will provide regular feedback to the committee set up for continuous R&D on Aakash tablet. Different R&D projects, emanating from the committee recommendations will receive regular reports on short-comings, if any, found in the working of the tablets, as also inadequacies of applications and contents.

8. Project Governance Structure

This project will be governed under the existing provisions of administration of sponsored projects prevailing at IIT Bombay. In view of the criticality of this project, it is proposed to have regular reviews by a steering committee. These would be conducted on quarterly basis in the first year, and every six months in the second year. Additionally, there would be a monthly activity report submitted by the project team in the first six months of the project. An appropriate project monitoring tool will be used for tracking project progress.

(Prof Deepak B Phatak)

6

Chapter 3

Details of Receipt of Funds and Summary of Expenditure

We received a total of Rs. 51,76,84,893 from IIT Rajasthan, including the interest component. The tables given below gives details of the expenses as on 30 June 2013.

	Amount (Rs)
Funds Received	51,76,84,893
* Total Expenses	31,89,84,949
Balance As On 30 June 2013	19,86,99,944

* Account Head Wise Expenses	Amount (Rs)
Consumables / Contingencies	53,43,495
Equipment	23,83,68,449
Paid To C Dac	5,03,14,000
Staff Salaries	1,30,85,564
Travel	71,00,413
Workshops	47,73,028
Total Expenses	31,89,84,949

The table given below provides the details of payment to Datawind, security deposit and the penalty. All the amounts are in rupees.

Cost of the tablets	22,63,00,000
10% withheld as security deposit	2,26,30,000
90% of the cost paid	20,36,70,000
Penalty for late delivery	29,56,836
Amount paid (90% - penalty)	20,07,13,164

Copies of purchase order, and subsequent ammendments are included in the subsequent pages.

13

सामग्री प्रबंधन प्रभाग
भारतीय प्रौद्योगिकी संस्थान मुंबई
पवई, मुंबई-400 076, भारत
Materials Management Division
Indian Institute of Technology Bombay
Powai, Mumbai-400 076, India

Receipt of Funds and Summary of Expenditure

दूरभाष/ Phone	:	(+91-22) 2576 8800 (DR), 8802/8805 (Billing Section/Inquiry) 8801 (PO) 8803
मोबाईल/ Mobile	:	9833117920 (DR)
फैक्स/ Fax	:	(+91-22) 2576 8808, 2572 3480
ई-मेल/ E-mail	:	drmm@iitb.ac.in, bkganesh@iitb.ac.in
वेबसाईट/ Website	:	www.iitb.ac.in

स्थानीय क्रयादेश
LOCAL PURCHASE ORDER

(Please quote "Purchase Order No. & Code No." for reference in all documents)

Ref Number: MHRD/12/EQP/001/2012/001/L/CS/DBP
(PO Number: 201200018/1)

INDENT TYPE:	Local
PO Number:	201200018/1
Sanctioning Authority:	
Department/Project:	Project [P12MHRD001]
Head of Account:	EQP

To,
DataWind Innovations Pvt. Ltd
8148 Jubilee Complex,
Sultanwind Road,
Amritsar 143001

Thru,

Ref Number:	MHRD/12/EQP/001/2012/001/L/CS/DBP	**Date:** 04/05/2012
Your Ref. :	NIL	**Date:** 02/05/2012
Supplier ID :	S/101461	

Dear Sir / Madam,
Please supply the under mentioned items subject to the terms and conditions stated in this order.

All Amounts are in: Indian Rupees

S.No.	Item Description	Unit Cost	Qty	Discount	Total
1	LCAD LCAD(Low Cost Access Device) / Aakash-2 tablets with minimum hardware, software, and safety requirements, as per enclosed attachment. Out of these 1,00,000 tablets following number LCAD with higher technical specification: (a) Minimum 2000 with one USB port and GPRS 2.5 G voice and data modem. (b) Minimum 1000 tables with	2263.00	100000	0.0%	226300000.00

Deputy Registar (MM)

सामग्री प्रबंधन प्रभाग
भारतीय प्रौद्योगिकी संस्थान मुंबई
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ई-मेल/ E-mail	: drmm@iitb.ac.in, bkganesh@iitb.ac.in
वेबसाईट/ Website	: www.iitb.ac.in

स्थानीय क्रयादेश
LOCAL PURCHASE ORDER

(Please quote "Purchase Order No. & Code No." for reference in all documents)

Ref Number: MHRD/12/EQP/001/2012/001/L/CS/DBP
(PO Number: 201200018/1)

S.No.	Item Description	Unit Cost	Qty	Discount	Total
	one USB port and UMTS 3G data modem.				
		Total			226300000.00
		Total Discount		0	0.00
		Other Charges		0	0.00
		Net Amount	Indian Rupees		226300000.00

Particulars:
THIS PURCHASE ORDER IS SUBJECT TO ALL TERMS & CONDITIONS OF INTEGRITY PACT ISSUED ALONG WITH TENDER DOCUMENT.

YOU ARE REQUESTED TO SUPPLY 100 DEVICES FOR SAMPLE TESTING.

Price Base:
Inclusive of All Taxes.
Free delivery to C-DAC Hyderabad.

Octroi charges extra if necessary as applicable. Payment of Octroi charges will be against original Octroi receipt only.

Guarantee:
GUARANTEE/WARRANTY : Supplies should be guaranteed/warranted for 12 months after successful testing report from C-DAC and date of acceptance of LCAD(AAkash-2) by the IIT Bombay.

Other Details:
I) Delivery Schedule:

First lot of the Delivery should start in the month of May, 2012 after acceptance of golden samples and establishment of a commercially valid Letter of Credit, whichever is later. Minimum 2000 units of LCAD must be delivered by end of May, 2012, subject to acceptance of golden samples and establishment of a commercially valid Letter of Credit by May 5, 2012. The last lot of delivery should be send before 31st October, 2012, subject to acceptance of golden samples by May 5, 2012 and establishment of a commercially valid Letter of Credit.

Deputy Registar (MM)

सामग्री प्रबंधन प्रभाग

भारतीय प्रौद्योगिकी संस्थान मुंबई

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ई-मेल/ E-mail	:	dr mm@iitb.ac.in, bkganesh@iitb.ac.in
वेबसाईट/ Website	:	www.iitb.ac.in

स्थानीय क्रयादेश

LOCAL PURCHASE ORDER

(Please quote "Purchase Order No. & Code No." for reference in all documents)

Ref Number: MHRD/12/EQP/001/2012/001/LJCS/DBP

(PO Number: 201200018/1)

II) LIQUIDATED DAMAGES : Timely delivery is essence of the contract and hence should any consignment be delayed, liquidated damages at the rate 0.5% of the price of the delayed consignment, for each weeks or part thereof shall be levied and recovered subject to maximum of 10% of total order value.

III) TRANSFER AND SUBLETTING : The seller shall not sublet, transfer, assign or otherwise part with the acceptance to the tender or any part thereof, either directly or indirectly, without the prior written permission of the Purchaser.

IV) TRAINING : The tenderer shall submit training proposal for the operation and maintenance to the personnel of IIT Bombay on the offered machine.

V) LEGAL MATTER : All Domestic and International disputes are subject to Mumbai Jurisdiction Only.

Payment Term:

1) Please send your order acceptance to enable us to establish LC.

2)90 % payment of PO value against LC. Payment will be released in parts as per the delivery schedule and submission of dispatch document to the Bank.

3)Balance 10% of PO Value will retain as Performance guarantee till the expiry of warranty period.

4)Bank guarantee / Bid Bond will be returned after on expiry of Bank Guarantee Period.

Other Conditions:

1.The order should be acknowledged immediately on receipt and delivery period confirmed.

2. All goods are to be delivered carriage paid to the Institute's Materials Management Division/ C-DAC Hyderabad, unless otherwise stated between the hours of 10.30 a.m. & 4.00 p.m. on working days (Monday to Friday).

3. All goods will not be accepted by the Institute unless accompanies by delivery challans giving full details as to Order No, Order Code No., Description of the items, Quantity, Make, Unit, Gross Weight or Tare Weight. In the absence of any of the above, the Institute will not be responsible for refusing to take delivery of the goods.

4. We reserve the right to reject any goods which in materials or workmanship are not approved by the Dy.. Registrar (MM) whose decision shall be final.

5. If any goods are rejected, notice of such rejection shall be given to you and on receipt of such notice the rejected goods must be removed immediately at the Supplier's expenses and must be replaced by other goods to be approved by the Dy Registrar (MM).

6. All rejected goods pending removal will remain in our premises at the Supplier's risk and cost.

7. If any rejected goods are not removed by the Supplier within 7 days from the notice of rejection to by the Supplier, we shall be entitled to charge Godown rent, plus insurance charges on the approximate value of the goods. We shall also be at liberty to remove the rejected goods from the premises at the Supplier' expenses and to sell the same by public

Deputy Registar (MM)

सामग्री प्रबंधन प्रभाग

भारतीय प्रौद्योगिकी संस्थान मुंबई

पवई, मुंबई-400 076, भारत

Materials Management Division

Indian Institute of Technology Bombay

Powai, Mumbai-400 076, India

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मोबाईल/ Mobile	:	9833117920 (DR)
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ई-मेल/ E-mail	:	drmm@iitb.ac.in, bkganesh@iitb.ac.in
वेबसाईट/ Website	:	www.iitb.ac.in

स्थानीय क्रयादेश

LOCAL PURCHASE ORDER

(Please quote "Purchase Order No. & Code No." for reference in all documents)

Ref Number: MHRD/12/EQP/001/2012/001/L/CS/DBP

(PO Number: 201200018/1)

auction and/or private treaty and in the event of such sale the supplier shall be entitled to claim only the net sale proceeds after deduction of the godown rent, insurance charges, removal charges and all other charges and expenses incurred by us in connection with the goods or the sale thereof.

8. If after the acceptance of this order you fail to deliver the goods within the specified time or if you fail to replace any rejected goods, we shall be at liberty to purchase the goods which you have failed to supply or replace as the case may be, in the open market on your account and risk and you will be liable to make good to us any loss or damage we may suffer thereby.

9. Your bill, in triplicate, should be submitted within 7 days from the date of delivery of the goods.

10. As per Govt. Notification No. 10/97-CE dt. 1-3-97, IIT is exempted from payment of whole of Excise Duty. We shall provide all the documents under this notification to enable you to clear the goods without payment of Excise Duty, wherever required. Please state clearly that this certificate is required.

11.As per the provisions of minimum wages Act 1948, if you are engaging labourers then, please inform to the undersign & a copy of labourers engaged in work to Regional Labour Commissioner, Shram Raksha Bhavan, Shivshrushti Road, Sion, Mumbai 400 022.

Deputy Registar (MM)

Indentor: D B PHATAK (051013), CS

cc: Accounts/Progress/Record/Indentor/DSK/Dealing Asst.

सामग्री प्रबंधन प्रभाग
भारतीय प्रौद्योगिकी संस्थान मुंबई
पवई, मुंबई–400 076, भारत.

Materials Management Division
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दूरभाष/ Phone	:	(+91-22) 2576 8800/8801 to 07
फैक्स/ Fax	:	(+91-22) 2576 8808
ई–मेल/ E-mail	:	armm@iitb.ac.in
वेबसाईट/ Website	:	www.iitb.ac.in

Technical Specifications

1. <u>Minimum Hardware Requirements</u>
1.1 Processor 800MHz Cortex A8 (with HD Video Co-processor)
1.2 Memory (RAM): 256 MB or more/DDR1 SDRAM or better
1.3 Storage (Internal) 2GB or more integrated NAND flash
1.4 Storage (External): SD Interface (at least 2GB SD card to be provided, upto 32GB supported;or 4GB NAND flash in lieu of 2 GB SD Card)
1.5 Peripherals: Standard USB 2.0 ports (2nos.)
1.6 Audio-out: 3.5 mm jack or integrated speakers
1.7 Audio-in 3.5 mm jack for external headphones/speakers or integrated MIC
1.8 Display and Resolution: 7" display with at least 800x480 resolution
1.9 Input Devices: 7" Four point multi-touch projective capacitive touch panel
1.10 Connectivity and Networking: WiFi IEEE 802.11 a/b/g
1.11 Power and Battery: 3200 mAh. When fully charged, the device should run for 180 minutes without requirement of further charging. An AC adapter (Indian) for charging.

2. <u>Minimum Software Requirements</u>
2.1 Operating System and System Software
2.1.1 An open source operating system complying with an Open License approved by the Open Source Initiative (OSI), e.g., Android 2.3 or later, or some GNU/Linux distribution running a kernel more recent than 2.6.24.
2.1.2 All the device drivers for the device hardware, with additional support for: Broadband Internet (3G dongle), external VGA webcam drivers (supporting v412: video for Linux. Or some other video capture drivers)
2.2 Document Rendering
2.2.1 Rendering of document formats: DOC, DOCX, PPT, PPTX, XLS, XLSX, ODT,ODP,ODS
2.2.2 PDF viewer
2.2.3 Text-editor
2.3 Multimedia and Image Display
2.3.1 Image-viewer support PNG, JPG, BMP and GIF display
2.3.2 Audio: MP3, AAC, AC3, WAV, WMA
2.3.3 Video: MPEG-2, MPEG-4 (AVI container, available through ffmpeg), FLV (Flash lite version 3 or later)
2.4 Communication and Internet
2.4.1 Web-browser (XHTML1.1 compliant, JavaScript 1.8 compliant)
2.4.2 Browser Flash 9 or later support (through plugin)
2.4.3 Optional Java support (through plugin)
2.4.4 Audio/Video/Text chat/conferencing applications
2.4.5 Separate application for online video (capable of playing at least YouTube video):Video pause/play

उपकुलसचिव (सा.प्र)
Dy. REGISTRAR(MM)
भारतीय प्रौद्योगिकी संस्थान, मुंबई
INDIAN INSTITUTE OF
TECHNOLOGY, BOMBAY
पवई/ *Powai,* मुंबई/ *Mumbai -* 400 076.

सामग्री प्रबंधन प्रभाग

भारतीय प्रौद्योगिकी संस्थान मुंबई
पवई, मुंबई—400 076, भारत
Materials Management Division
Indian Institute of Technology Bombay
Powai, Mumbai-400 076, India

दूरभाष / Phone	:	(+91-22) 2576 8800 / 8801 to 6 19
फैक्स / Fax	:	(+91-22) 2576 8808
ई—मेल / E-mail	:	armm@iitb.ac.in
वेबसाईट / Website	:	www.iitb.ac.in

IIT Bombay

2.5   Other Utilities
2.5.1 Zip decompression utility as part of the file manager or standalone
2.6   Other Desirables (optional):
2.6.1 AVCHD Playback
2.6.2 DTV, IPTV, DTH Playback

3.   <u>Safety and other standards compliance</u>
3.1   CE certification
3.2   RoHS certification
3.3   Any other

Note: In order to achieve the full functionality, if there are some licensing issues related to software, Indian Institute of Technology, Bombay will extend help to the Seller.

उपकुलसचिव (सा.प्र)
Dy. REGISTRAR(MM)
भारतीय प्रौद्योगिकी संस्थान, मुंबई
INDIAN INSTITUTE OF
TECHNOLOGY, BOMBAY
पवई / Powai, मुंबई / Mumbai - 400 076.

DATAWIND

Date: **August 27th, 2012**

Professor D.B. Phatak
Project Indentor

Indian Institute of Technology Bombay
P.O. IIT, Powai, Bombay 400076.

Dear Sir,

Sub: Reference number MHRD/12/EQP/001/2012/001/L/CS/DBP
Purchase Order 201200018/1

Further to recent discussions, we're pleased to offer the following upgraded specifications:

	Current	Upgraded Offer
Microprocessor	700MHz Cortex A8	1 Ghz Cortex A8
Memory (RAM)	256 MB	512 MB
Storage	2GB & 2GB SD Card	4GB Internal Partitioned
Peripherals	2 USB Ports	1 Mini-USB & 2-port USB-A adapter cable
Sensor	N/A	G-Sensor
Audio In	3.5mm jack	Integrated Mic
Connectivity	WiFi 802.11 a/b/g	WiFi 802.11 b/g/n
Operating System	Android 2.3	Android 4.0

The battery in the Upgraded Offer would be 3,000 mAH, but continue to provide 3 hours of usage under normal mixed usage conditions.

Please note that in the Upgraded Offer we've only listed those specifications which have changed. All other specifications will remain the same.

We would continue to supply 2,000 Aakash2G tablets, while the above specifications would apply to 98,000 units. Pricing would remain unchanged. Please confirm your acceptance, subsequent to which we'll supply 50 units for testing and approval. Upon approval of the 'golden samples' we'll start delivery of the mass production.

Yours truly,

Accepted and approved

28.8.12

_____
Suneet Singh Tuli
President & CEO
+1 416 848 0940

Datawind Innovations Private Limited
8148, Jubilee Complex, Sultanwind Road, Amritsar -143001

सामग्री प्रबंधन प्रभाग
भारतीय प्रौद्योगिकी संस्थान मुंबई
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वेबसाईट / Website	:	www.iitb.ac.in

No. MHRD/12/EQP/001/2012/001/L/CS/DBP   DATE : 19/10/12

To,
Bank Manager,
State Bank of India,
I.I.T Powai, Mumbai – 400076.

Sub: Amendment to LC No. 0505012LC0000974 dt. 09/05/12
          against PO No. 201200018/1 dt. 04/05/2012
          Ref. No: MHRD/12/EQP/001/2012/001/L/CS/DBP
Ref: Letter from Datawind Innovations Pvt. Ltd. dt. 12/10/2012
          & email dt. 19/10/12

Dear Sir/Madam,

You are requested to amend the subject Letter of Credit as below:

1. **EXPIRY DATE** is to be amended as "30th April 2013" **Instead of** "30th November 2012.
2. **AMOUNT OF L/C** is to be amended as "INR 16,08,99,300/-" **Instead of** "INR Rs.20,36,70,000/-".
3. The consignment is to be **delivered** to "-C-DAC, Hyderabad/Noida" **Instead of** "-C-DAC, Hyderabad.
4. **"Full set of LR/RR/Courier Receipt** made out to the order applicant's Bank marked freight prepaid and notify applicant at the address stated in the credit evidencing shipment of Merchandise indicated in the L/C" **Instead of** "Full set of LR/RR made out to the order applicant's Bank marked freight prepaid and notify applicant at the address stated in the credit evidencing shipment of Merchandise indicated in the L/C".

Kindly do the necessary amendment and let us know.

Thanking you.

Yours faithfully,

Dy. Registrar (MM) 19.10.2012

Cc: 1) M/s. Datawind Innovations Pvt. Ltd.
        2) Dean (R&D)
        3) Prof. D B Phatak (Indentor), Computer Sci. & Engg. Deptt.

सामग्री प्रबंधन प्रभाग
भारतीय प्रौद्योगिकी संस्थान मुंबई
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वेबसाईट / Website	:	www.iitb.ac.in

No. MHRD/12/EQP/001/2012/001/L/CS/DBP　　　　　　DATE : 25/10/12

To,
Bank Manager,
State Bank of India,
I.I.T Powai,
Mumbai – 400076.

　　　　Sub:　Amendment to LC No. 0505012LC0000974 dt. 09/05/12
　　　　　　　against PO No. 201200018/1 dt. 04/05/2012
　　　　　　　Ref. No: MHRD/12/EQP/001/2012/001/L/CS/DBP
　　　　Ref:　Your email dt. 19/10/12.

Dear Sir/Madam,

You are requested to amend the subject Letter of Credit as below:

1. **Latest Shipment Date** is to be amended as "31st December 2012" **Instead of** "31st October 2012.

Kindly do the necessary amendment and let us know.

Thanking you.

　　　　　　　　　　　　　　　　　　　　Yours faithfully,

　　　　　　　　　　　　　　　　　　　　Dy. Registrar (MM)

Cc:　　1) M/s. Datawind Innovations Pvt. Ltd.
　　　　2) Dean (R&D)
　　　　3) Prof. D B Phatak (Indentor), Computer Sci. & Engg. Deptt.

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भारतीय प्रौद्योगिकी संस्थान मुंबई
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वेबसाईट / Website	:	www.iitb.ac.in

No. MHRD/12/EQP/001/2012/001/L/CS/DBP ·   DATE : 21/12/12

To,
Bank Manager,
State Bank of India,
I.I.T Powai,
Mumbai – 400076.

Sub: Amendment to LC No. 0505012LC0000974 dt. 09/05/12
       against PO No. 201200018/1 dt. 04/05/2012
       Ref. No: MHRD/12/EQP/001/2012/001/L/CS/DBP

Dear Sir/Madam,

With reference to Datawind letter dt. 15th December, 2012, you are requested to amend the subject Letter of Credit as below:

1. **Latest Shipment Date** is to be amended as "31st March 2013" **Instead of** "31st December 2012.
2. The consignment is to be **delivered** to "Any C-DAC center or IIT Bombay" **Instead of** "-C-DAC, Hyderabad/Noida"

Kindly do the necessary amendment and let us know.

Thanking you.

                                                        Yours faithfully,

                                                        Dy. Registrar (MM) 31/12/2012

Encl: Datawind letter dt. 15th December, 2012.

Cc: 1) M/s. Datawind Innovations Pvt. Ltd.
       2) Dean (R&D)
       3) Prof. D B Phatak (Indentor), Computer Sci. & Engg. Deptt.

No. MHRD/12/EQP/001/2012/001/L/CS/DBP   Date : 07.03.2013

To,
The Bank Manager,
State Bank of India,
I.I.T Powai, Mumbai – 76

Sub : Amendment of LC No. 0505012LC0000974 Dtd. 09.05.12
against PO No. 201200018/1 Dtd. 04.05.2012
Ref . No. MHRD/12/EQP/001/2012/001/L/CS/DBP

Ref : Letter from M/s. Datawind Innovations Pvt. Ltd. Dtd. 24.02.2013.

Dear Sir,

You are requested to amend the Letter of Credit as below :

Amount of L/C is to be amended as "INR 10,99,81,800/-
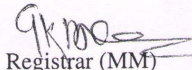
Instead of

Amount of L/C as " INR 16,08,99,300/-.

Kindly do the necessary amendement and let us know.

Thanking You,

Yours faithfully,

Dy. Registrar (MM)

Encl : Letter of M/s. Datawind Innovations Pvt. Ltd.

c.c.to :   1. M/s. Datawind Innovations Pvt. Ltd.
2. Dean (R& D)
3. Prof. D B Phatak (Indentor), Computer Sci. & Engg. Deptt.

- 7 MAR 2013   o/c

Chapter 4

Aakash Tablets Received and Distributed by IIT Bombay

The table given on the next page displays the date wise receipts of the tablets. The total number of tablets received is 1,00,000 as ordered.

The table given on the subsequent pages provides the distribution details of the tablet.

Note: IIT Kharagpur, now a part of IITB for Aakash related activities, have been entrusted with the responsibility of new Remote Centers in the eastern and northern India and to distribute Aakash for testing and application development.

Details of Tablets Received by IIT Bombay			
Sr. No	**Qty**	**Date**	**Place of Receipt**
1	5000	29/05/2013	C-DAC (Noida)
2	5000	22/05/2013	C-DAC (Noida)
3	5000	18/05/2013	C-DAC (Noida)
4	2936	18/05/2013	C-DAC (Noida)
5	6984	18/05/2013	C-DAC (Noida)
6	380	01/05/2013	C-DAC (Noida)
7	1100	29/04/2013	C-DAC (Noida)
8	2000	26/04/2013	C-DAC (Noida)
9	1700	24/04/2013	C-DAC (Noida)
10	1000	23/04/2013	C-DAC (Noida)
11	1500	23/04/2013	C-DAC (Noida)
12	2300	22/04/2013	C-DAC (Noida)
13	2000	22/04/2013	C-DAC (Noida)
14	1200	20/04/2013	C-DAC (Noida)
15	1300	18/04/2013	C-DAC (Noida)
16	250	17/04/2013	IIT BOMBAY
17	250	17/04/2013	IIT BOMBAY
18	250	17/04/2013	IIT BOMBAY
19	250	17/04/2013	IIT BOMBAY
20	250	17/04/2013	IIT BOMBAY
21	250	17/04/2013	IIT BOMBAY
22	250	17/04/2013	IIT BOMBAY
23	250	17/04/2013	IIT BOMBAY
24	5000	17/04/2013	C-DAC (Noida)
25	1500	16/04/2013	C-DAC (Noida)
26	2000	14/04/2013	C-DAC (Noida)
27	4000	13/04/2013	C-DAC (Noida)
28	4000	12/04/2013	C-DAC (Noida)
29	3000	04/04/2013	C-DAC (Noida)
30	2000	31/03/2013	C-DAC (Noida)
31	2200	31/03/2013	C-DAC (Noida)
32	4300	31/03/2013	C-DAC (Noida)
33	4000	30/03/2013	C-DAC (Noida)
34	2500	29/03/2013	C-DAC (Noida)
35	2500	29/03/2013	C-DAC (Noida)
36	2500	26/03/2013	C-DAC (Noida)
37	2000	25/03/2013	C-DAC (Noida)
38	3000	30/01/2013	IIT BOMBAY

Details of Tablets Received by IIT Bombay			
Sr. No	**Qty**	**Date**	**Place of Receipt**
39	1000	05/12/2012	C-DAC (Noida)
40	1000	04/12/2012	C-DAC (Noida)
41	1000	29/11/2012	C-DAC (Noida)
42	2000	10/11/2012	C-DAC (Noida)
43	1000	07/11/2012	C-DAC (Noida)
44	1000	07/11/2012	C-DAC (Noida)
45	2500	07/11/2012	C-DAC (Noida)
46	1500	06/11/2012	C-DAC (Noida)
47	1000	03/11/2012	C-DAC (Noida)
48	1000	03/11/2012	C-DAC (Noida)
49	100	01/10/2012	IIT BOMBAY
50	170	29/09/2012	IIT BOMBAY
51	200	28/09/2012	IIT BOMBAY
52	200	27/09/2012	IIT BOMBAY
53	200	15/09/2012	IIT BOMBAY
54	80	07/09/2012	IIT BOMBAY
55	50	06/09/2012	IIT BOMBAY
56	20	30/05/2012	IIT BOMBAY
57	17	28/05/2012	IIT BOMBAY
58	13	26/05/2012	IIT BOMBAY
59	15	22/05/2012	IIT BOMBAY
60	16	19/05/2012	IIT BOMBAY
61	19	14/05/2012	IIT BOMBAY
TOTAL	**100000**		

No.	Quantity	RC Code	Name of Institution
**Distribution By IITB to RCs**			
1	22162	1000	IIT Bombay*
2	965	8007	C-DAC, Trivandrum
3	542	1281	Sveri`S College Of Engineering, Pandharpur
4	462	1290	Cdac, Noida
5	10365	8001	IIT Kharagpur*
6	282	1012	G H Raisoni College Of Engineering, Nagpur
7	282	1014	P. V. P. Siddhartha Institute Of Technology, Kanuru
8	282	1025	National Institute Of Technology, Warangal
9	282	1032	Muffakham Jah College Of Engineering & Technology, Hyderabad
10	282	1036	Kakinada Institute Of Engineering & Technology, Kakinada
11	282	1054	National College Of Engineering, Muruthakulam
12	282	1056	Malla Reddy College Of Engineering & Technology, Maisammaguda
13	282	1061	Er. Perumal Manimekalai College Of Engineering, Krishnagiri
14	282	1079	Geeta Institute Of Management & Technology, Kurukshetra
15	282	1080	Griet, Kukatpally
16	282	1081	Gvit, Bhimavaram
17	282	1102	Mother Teresa Institute Of Science & Technology, Sathupally
18	282	1112	S. V. U. College Of Engineering, Tirupati
19	282	1125	Turbomachninary Institute Of Technology & Science, Patancheru
20	282	1145	Kmea Engineering College, Aluva
21	282	1147	Kongu Engineering College, Perundurai
22	282	1161	Anurag Group Of Institutions, Cvsr College Of Engineering, Ranga Reddy
23	282	1167	Birla Vishwakarma Mahavidyalaya Engg. College, Vallabh Vidhyanagar
24	282	1175	Truba College Of Science & Technology, Bhopal
25	282	1177	Vels University, Pallavaram
26	282	1193	Prof. Ram Meghe Institute Of Technology & Research, Badnera
27	282	1210	Gogte Institute Of Technology, Udyambag
28	282	1221	N.P.R. College Of Engineering & Technology, Natham
29	270	8002	Reliance IITM Telecom Centre of Excellence
30	250	8003	Indian Institute of Technology Guwahati
31	250	8004	IIT Mandi
32	250	8008	Indian Institute of Technology Hyderabad
33	250	8009	Indian Institute of Technology Gandhinagar
34	242	1001	Maulana Azad National Institute Of Technology, Bhopal
35	242	1002	Amal Jyoti College Of Engineering & Technology, Kanjirappally
36	242	1003	Government College Of Engineering, Salem
37	242	1004	National Institute Of Technology, Calicut
38	242	1006	National Institute Of Technology, Tiruchirappalli
39	242	1008	D.K.T.E Society`s Textile & Engineering Institute, Ichalkaranji
40	242	1010	Sardar Vallabhbhai National Institute Of Technology, Surat
41	242	1011	Jaipur Engineering College, Kukas
42	242	1013	Mepco Schlenk Engineering College, Sivakasi
43	242	1015	Vidya Pratisthan College Of Engineering, Baramati
44	242	1016	K. J. Somaiya College Of Engineering, Vidyavihar
45	242	1020	Don Bosco College Of Engineering & Technology, Azara

No.	Quantity	RC Code	Name of Institution
Distribution By IITB to RCs			
46	242	1026	St. Xaviers Catholic College Of Engineering, Chunkankadai
47	242	1027	Sudharsan Engineering College, Sathiyamangalam
48	242	1028	Tatyasaheb Kore Institute Of Engineering & Technology, Warananagar
49	242	1029	Terna Engineering College, Nerul Navi Mumbai
50	242	1030	Nielit - Formerly Doeacc, Srinagar
51	242	1031	St. Margaret Engineering College, Neemrana
52	242	1033	Manipal Institute Of Technology, Manipal
53	242	1034	M. E. Society`S Imcc, Pune
54	242	1035	Srinivasa Institute of Engineering & Technology
55	242	1037	Jabalpur Engineering College, Jabalpur
56	242	1039	Ips Academy, Indore
57	242	1040	College Of Engineering, Pune
58	242	1041	Shri Mata Vaishno Devi University, Katra
59	242	1042	Saintgits College Of Engineering, Kottayam
60	242	1043	Sarvajanik College Of Engineering & Technology, Surat
61	242	1044	Sasurie College Of Engineering, Vijayamangalam
62	242	1045	Saveetha Engineering College, Thandalam
63	242	1046	Sagar Institute Of Research & Technology - Excellence, Bhopal
64	242	1047	S.D.M. College Of Engineering & Technology, Dhavalagiri
65	242	1048	Royal College Of Engineering & Technology, Akkikavu
66	242	1050	Prasad Engineering College, Jangaon
67	242	1051	Pacific Institute Of Technology, Udaipur
68	242	1052	Noorul Islam Centre For Higher Education, Thuckalay
69	242	1055	Mar Baselios College Of Engineering & Technology, Nalanchira
70	242	1057	Madhuben & Bhanubhai Patel Women`S Institute Of Engineering, Anand
71	242	1058	Goa College Of Engineering, Farmagudi Ponda
72	242	1059	Gf Gharda Institute Of Technology, Lavel
73	242	1060	Ebet Group Of Institutions, Nathakadaiyur
74	242	1062	Dungarpur College Of Engineering & Technology, Dungarpur
75	242	1063	Dr. D.Y. Patil Institute Of Engineering & Technology, Pimpri
76	242	1064	Deenbandhu Chhotu Ram University Of Science & Technology, Murthal
77	242	1065	Finolex Academy Of Management Technology, Ratnagiri
78	242	1066	Shrinathji Institute Of Technology & Engineering, Nathdwara
79	242	1067	St. Francis Institute Of Technology, Borivali West
80	242	1068	Thakur College Of Engineering & Technology, Kandivali (E)
81	242	1069	Alluri Institute Of Management Sciences, Warangal
82	242	1070	Amrita School Of Engineering, Bangalore
83	242	1071	Amrita Vishwa Vidyapeetham, Amritanagar
84	242	1072	Angadi Institute Of Technology & Management, Belgaum
85	242	1073	Bannari Amman Institute Of Technology, Sathyamangalam
86	242	1074	Caarmel Engineering College, Ranni-Perunad
87	242	1075	D. Y. Patil College Of Engineering & Technology, Kolhapur
88	242	1076	Devi Ahilya University, Iet, Indore
89	242	1077	Federal Institute Of Science And Technology, Mookkannoor
90	242	1078	Galaxy Global Group Of Institutions, Dinarpur

**Distribution By IITB to RCs**			
No.	**Quantity**	**RC Code**	**Name of Institution**
91	242	1082	Hindustan Institute Of Technology And Management, Agra
92	242	1084	Institute Of Road And Transport Technology, Erode
93	242	1085	Nirma University, Institute Of Technology, Ahmedabad
94	242	1087	Joginpally B. R. Engineering College, Yenkapally
95	242	1089	K.L.E. College Of Engineering & Technology, Chikodi
96	242	1090	K.C.E. Society, Coeit, Jalgaon
97	242	1092	K.I.T. College Of Engineering, Gokul Shirgaon
98	242	1094	Lourdes Matha College Of Science & Technology, Trivandrum
99	242	1095	M. S. Bidve Engineering College, Latur
100	242	1096	Mahakal Institute Of Technology, Ujjain
101	242	1097	Maharaja Institute Of Technology, Belavadi
102	242	1098	Marathwada Institute Of Technology, Aurangabad
103	242	1099	Medi-caps Institute Of Technology & Management, Pigdamber
104	242	1100	Mes Pillai`S Institute Of Information Technology, New Panvel
105	242	1101	Mksss Cummins College Of Engineering, Karvenagar
106	242	1106	Nitttr, Chandigarh
107	242	1107	Poornima College Of Engineering, Sitapura
108	242	1108	R. C. Patel Institute Of Technology, Shirpur
109	242	1109	Rajiv Gandhi Proudyogiki Vishwavidyalay, Bhopal
110	242	1110	Regency Institute Of Technology, Adivipolam
111	242	1111	Rvs College Of Engineering And Technology, Coimbatore
112	242	1113	S. B. Patil College Of Engineering, Indapur
113	242	1114	Sangam University, Itm, Bhilwara
114	242	1116	S. G. S. Institute Of Technology & Science, Indore
115	242	1117	Shri Vaishnav Institute Of Technology & Science, Indore
116	242	1118	Sri Jayachamarajendra College Of Engineering, Mysore
117	242	1119	Ssbt`S College Of Engineering And Technology, Bambhori
118	242	1120	St. Aloysius Institute Of Technology, Jabalpur
119	242	1121	Svp Engineering College, Visakhapatnam
120	242	1122	Techno India Njr Institute Of Technology, Udaipur
121	242	1123	Thakral College Of Technology, Bhopal
122	242	1124	Truba College Of Engineering & Technology, Indore
123	242	1126	Vignan Institute Of Technology And Science, Deshmukhi
124	242	1127	Vishwakarma Institute Of Technology, Pune
125	242	1128	Visvesvaraya National Institute Of Technology, Nagpur
126	242	1129	Vit University, Vellore
127	242	1130	Walchand College Of Engineering, Sangli
128	242	1131	Walchand Institute Of Technology, Solapur
129	242	1132	Sir Padampat Singhania University, Bhatewar
130	242	1133	National Institute Of Technology, Agartala
131	242	1134	National Institute Of Technology, Kurukshetra
132	242	1135	Periyar Maniammai University, Vallam
133	242	1136	Psg College Of Technology, Coimbatore
134	242	1137	Rk University, School Of Engineering, Kasturbadham
135	242	1138	Rajalakshmi Engineering College, Chennai

			Distribution By IITB to RCs
No.	**Quantity**	**RC Code**	**Name of Institution**
136	242	1139	Rajarambapu Institute Of Technology, Islampur
137	242	1140	Sastra University, Tirumalaisamudram
138	242	1142	Government Engineering College, Sreekrishnapuram
139	242	1143	Indur Institute Of Engineering & Technology, Siddipet
140	242	1144	Sushila Devi Bansal College Of Engineering (Kcb Technical Academy), Indore
141	242	1146	Knowledge Institute Of Technology, Kakapalayam
142	242	1148	Krishna Institute Of Engineering & Technology, Ghaziabad
143	242	1149	Lenora College Of Engineering, Rampachodavaram
144	242	1150	Sou Sushila Danchand Ghodawat Charitable Trust`S Sgi, Atigre
145	242	1151	Srm University, Kancheepuram
146	242	1152	St. Joseph`S College Of Engineering & Technology, Palai
147	242	1153	Tezpur University, Tezpur
148	242	1154	Thanthai Periyar Government Institute Of Technology, Vellore
149	242	1155	Yeshwantaro Chavan College Of Engineering, Wanadongri
150	242	1157	Sona College Of Technology, Salem
151	242	1159	Agni College Of Technology, Thalambur
152	242	1160	Anna University Of Technology, Madurai
153	242	1162	Asia Pacific Institute Of Information Technology Sd India, Panipat
154	242	1163	Avinashilingam University For Women, Coimbatore
155	242	1164	Bhagwan Parshuram Institute Of Technology, Rohini
156	242	1165	Bharati Vidyapeeth College Of Engineering, Navi Mumbai
157	242	1166	Bhilai Institute Of Technology, Durg
158	242	1168	Brcm College Of Engineering & Technology, Bahal
159	242	1170	Chitkara University, Chandigarh
160	242	1171	Dmietr, Sarod Hirapur
161	242	1173	Thiagarajar College Of Engineering, Madurai
162	242	1174	Toc H Institute Of Science & Technology, Arakkunnam
163	242	1178	Vidyabharti Trust Institute Of Technology & Research Center, Umrakh
164	242	1179	Viswajyothi College Of Engineering & Technology, Vazhkulam
165	242	1181	Vivekananda Institute Of Technology, Jagatpura
166	242	1187	Government Engineering College, Thrissur
167	242	1190	Symbiosis Institute Of Computer Studies & Research, Pune
168	242	1194	Gandhi Engineering College, Badaraghunathpur
169	242	1195	Bansal College Of Engineering, Mandideep, Bhopal
170	242	1196	Balaji Institute Of Technology & Science, Narsampet
171	242	1197	G. H. Raisoni Institute Of Engineering & Technology, Wagholi Pune
172	242	1198	Mata Raj Kaur Institute Of Engineering & Technology, Rewari
173	242	1199	G. H. Raisoni Institute Of Engineering & Management, Jalgaon
174	242	1200	Ies College Of Technology, Bhopal
175	242	1201	Islamic University Of Science And Technology, Awantipora
176	242	1202	Ratnavel Subramaniam College Of Engineering And Technology, Dindigul
177	242	1205	Mahatma Gandhi Missions College Of Engineering & Technology, Noida
178	242	1206	Bansal Institute Of Research & Technology, Bhopal
179	242	1207	Jawaharlal Institute Of Technology, Borawan
180	242	1208	Anna University Of Technology, Tirunelveli

No.	Quantity	RC Code	Name of Institution
			Distribution By IITB to RCs
181	242	1209	Kiit College Of Engineering, Bhondsi
182	242	1212	Kalyani Government Engineering College, Kalyani
183	242	1213	St. Peter`S Engineering College, Hyderabad
184	242	1214	Srinivas Institute Of Technology, Valachil, Mangalore
185	242	1215	G L Bajaj Group Of Institutions, Akbarpur
186	242	1216	Bsa College Of Engineering & Technology, Mathura
187	242	1217	Sies Graduate School Of Technology, Nerul, Navi Mumbai
188	242	1219	Prestige Institute Of Engineering & Science, Indore
189	242	1220	Kurukshetra Institute Of Technology & Management, Kurukshetra
190	242	1223	Rbs Engineering Technical Campus, Bichpuri
191	242	1224	Reva Institute Of Technology & Management, Yelahanka
192	242	1225	Bms College Of Engineering, Bengaluru
193	242	1226	Skp Engineering College, Tiruvannamalai
194	242	1228	Loyola-icam College Of Engineering & Technology, Chennai
195	242	1229	Sardar Patel Institute Of Technology, Andheri
196	242	1230	Vidyaa Vikas College Of Engineering & Technology, Tiruchengode
197	242	1231	Bhajarang Engineering College, Thiruvallur
198	242	1234	Meghnad Saha Institute Of Technology, Uchhepota
199	242	1235	Dr. Mahalingam College Of Engineering & Technology, Pollachi
200	242	1236	Excel Engineering College, Komarapalayam
201	242	1238	Maharaja Agrasen Institute Of Technology, Rohini
202	242	1240	Shri Shankaracharya Institute Of Professional Management & Technology, Raipur
203	242	1241	Nri Institute Of Information Science & Technology, Bhopal
204	242	1242	K.L.E. Society`S College Of Engineering & Technology, Belgaum
205	242	1243	National Institute Of Science & Technology, Berhampur
206	242	1244	Archana College Of Engineering, Palamel
207	242	1245	Stc School Of Engineering & Research Technology, Khamgaon
208	242	1247	School Of Management Sciences, Technical Campus, Kasimpur Biruha
209	242	1248	Shri Sant Gadge Baba College Of Engineering & Technology, Bhusawal
210	242	1249	Sri Ramakrishna Institute Of Technology, Coimbatore
211	242	1250	Sharad Institute Of Technology College Of Engineering, Yadrav
212	242	1251	Jaypee Institute Of Information Technology, Noida-128
213	242	1252	Narayana Engineering College, Nellore
214	242	1253	Ssm College Of Engineering, Komarapalayam
215	242	1255	Mount Zion College Of Engineering & Technology, Lena Vilakku
216	242	1256	Sree Dattha Institute Of Engineering & Science, Hyderabad
217	242	1257	Hctm Technical Campus, Kaithal
218	242	1258	Om Institute Of Technology & Management, Hisar
219	242	1259	N.D.M.V.P. Samaj's K.B.T. College Of Engineering, Nashik
220	242	1260	S.K.N. Sinhgad College Of Engineering, Pandharpur
221	242	1262	Apex Institute Of Technology & Management, Pahala, Bhubaneswar
222	242	1263	Techno India, Salt Lake Kolkata
223	242	1264	Shoolini University, Solan
224	242	1265	Madhav Institute Of Technology & Science, Gwalior
225	242	1266	Netaji Subhash Engineering College, Technocity, Garia

			Distribution By IITB to RCs
No.	**Quantity**	**RC Code**	**Name of Institution**
226	242	1268	Techno India College Of Technology, Rajarhat Kolkata
227	242	1269	Iercem Institute Of Information Technology, Banipur
228	242	1271	Jawaharlal Nehru National College Of Engineering, Shimoga
229	242	1272	Mangalayatan University, Beswan
230	242	1273	Gudlavalleru Engineering College, Gudlavalleru
231	242	1274	Svs Group Of Institutions, Hanamkonda
232	242	1275	B H Gardi College Of Engineering & Technology, Rajkot
233	242	1276	Sankalchand Patel College Of Engineering, Visnagar
234	242	1277	Technology Education & Research Integrated Institutions, Kurukshetra
235	242	1278	S.D.M. Institute Of Technology, Ujire
236	242	1279	Mandsaur Institute Of Technology, Mandsaur
237	242	1280	Priyadarshini College Of Engineering Nagpur, Nagpur
238	242	1282	Sri Eshwar College Of Engineering, Coimbatore
239	242	1283	Kanksa Academy Of Technology & Management, Panagarh
240	242	1284	Saroj Mohan Institute Of Technology, Guptipara
241	242	1286	U V Patel College Of Engineering, Kherva
242	242	1287	Rayat-bahra Innovative Institute Of Technology & Management, Ganaur
243	242	1288	Vidyalankar Institute Of Technology, Wadala
244	242	1289	B K Birla Institute Of Engineering & Technology, Pilani
245	240	1009	Veermata Jijabai Technological Institute, Mumbai
246	240	1022	Shri Sant Gajanan Maharaj College Of Engineering, Shegaon
247	240	1083	IIIT Hyderabad
248	240	1176	University B.D.T. College Of Engineering, Davangere
249	170	1172	Theem College Of Engineering, Boisar East
250	130	1005	Anna University
251	130	1024	Vivekanandha College Of Engineering For Women
252	130	1049	PDE Association College Of Engineering
253	130	1086	JNTU College Of Engineering Hyderabad
254	130	1088	K K Wagh Instituite Of Engineering Education Research
255	130	1103	NMIM MPSTME Shirpur
256	130	1105	Nitte Meenakshi Institute Of Technology
257	130	1115	Shivaji University Kolhapur
258	130	1141	Government Engineering College
259	130	1182	NK Orchid College Of Engineering Technology Hipparaga
260	130	1184	National Institute Of Technology
261	130	1192	MGM s College Of Engineering
262	130	1203	Gnanamani College Of Engineering Namakkal
263	130	1211	Sri Shanmugha College Of Engineering Technology
264	130	1218	Bansal Institute Of Engineering Technology
265	130	1222	Chameli Devi Group Of Institutions
266	130	1227	J.J. Magdum College Of Engineering
267	130	1232	Jayalakshmi Institute Of Technology
268	130	1239	Mohandas College Of Engineering Technology
269	130	1246	C U Shah College Of Engineering Technology
270	130	1261	MET Institute Of Engineering Nashik

No.	Quantity	RC Code	Name of Institution
Distribution By IITB to RCs			
271	130	1292	Sagar Institute Of Science Technology Engineering
272	130	1293	Seacom Engineering College
273	130	1295	Gitam University Hyderabad Campus
274	130	1296	Nagole Institute Of Technology Science
275	130	1298	Sardar Vallabhbhai Patel Institute Of Technology
276	130	1299	Dronacharya College Of Engineering
277	130	1300	Kurukshetra University Electronic Science Department
278	130	1301	K L E Institute Of Technology
279	130	1302	Sree Buddha College Of Engineering
280	130	1303	Sree Narayana Gurukulam College Of Engineering Kadayiruppu
281	130	1306	Shree L R Tiwari College Of Engineering
282	130	1311	Arunai College Of Engineering
283	130	1314	Kathir College Of Engineering
284	130	1315	Selvam College Of Technology
285	130	1316	Dronacharya College Of Engineering
286	130	1317	Government Engineering College, Bikaner
287	130	1318	Amity University Haryana
288	130	1319	Mukesh Patel School Of Technology Management Engg
289	130	1322	Charusat University Of Science Technology
290	115	8000	IIT Bombay Development Activities
291	41	8006	MHRD
292	40	1017	Pvg`S College Of Engineering & Technology, Pune
293	40	1021	Nerist, Nirjuli
294	40	1237	Mewar University, Gangrar
295	40	1267	Sri Shakthi Institute Of Engineering & Technology, Chinniyampalayam
296	40	1285	Siddaganga Institute Of Technolgy, Tumkur
Total	**100000**		
* Balance for further Distribution			

Chapter 5

Lab Testing by C-DAC (Thiruvananthapuram)

The status reports in the subsequent pages have been forwarded to IITB by CDAC. We are awaiting a further detailed report.

1. Aakash Status Report dated 22 August 2012

2. Aakash Status Report dated 30 May 2013

3. ERTL Test Report dated 15 April 2013

4. Aakash Status Report dated 8 July 2013

5. Aakash Test Report dated 8 July 2013

Aakash Project Status Report – August 22, 2012

1. Introduction

CDAC Thiruvananthapuram was entrusted the responsibility of carrying out the detailed lab testing of the Aakash tablet samples as part of the Aakash project given by MHRD to IIT Bombay. As part of the initial study 25 samples out of the 100 supplied by M/s Datawind were delivered to CDAC on 20th June, 2012. A formal project proposal for the Evaluation and Testing of the Aakash Tablet along with a Tentative Test Plan and Procedure was submitted to IIT-B on the 19th July, 2012. Project fund was received by CDAC, Thiruvananthapuram on 23rd July, 2012.

2. Work done on the project from July to August 2012

The objective of the project assigned to CDAC, Thiruvananthapuram is the evaluation and testing of the Aakash tablets. We have prepared a tentative test plan for the detailed tests to be carried out on the tablets. A first level of evaluation and testing has been done and feedback on the same was given to IIT-B on the 30th July, 2012. As mentioned in the feedback, the model of the Aakash supplied is of a lower specification which runs the Android 2.2 OS, which is found to be unstable and buggy. Several other issues with regard to the faulty hardware / software and poor mechanical design have been noted. The observations made are summarised below:

1. Android version 2.2.2 installed on the tablets provided, causes some issues w.r.t poor power management, application control and non-support of a Wi-Fi proxy, precluding downloading of apps through WLAN.

2. Observed boot failure and processor instruction errors in many of the machines.

3. Frequent system freeze observed which required hard reset using a pin.

4. Quality of the Power switch is poor, and sometimes gets recessed within the cabinet when pressed.

5. Touch screen sensitivity/calibration is erratic.

6. There is no charge indication LED on the Tablet.

7. When the device is in standby, the state-of-charge does not get updated in the Tablet screen.

8. RTC time does not get updated when the device is in standby.
9. The tablet cannot be kept in standby mode since it automatically wakes up every 5 minutes.

10. The USB drive does not work concurrently with a SD card plugged in.

11. Some of the software applications cannot be closed through the GUI. They can only be killed from the App killer. Tasks have to be forcibly closed.

12. Keyboard is not working from the USB slot.

13. No volume control button available.

14. Some background operations which seem unnecessary were found to be running (camera, Bluetooth, etc.). These seem to be eating up system resources, increasing the boot time as well.

15. PC connectivity is not provided for system checking, USB debugging and software installation.

16. Aakash Tablet model is not supported and recognised by Google Play.

3. Concluding remarks

We have identified the various tools and apps for testing including benchmark tests, devices and OS tests. We have also purchased a few similar tablets available in Indian market for comparative study and performance evaluation. We have initiated procurement of various tools for test platform and are in the process of finalisng the test procedure and setting up a semi-automatic test environment. We have also identified testing agencies / certifying authorities for carrying out the environment tests as per ISO/ BIS standards.

Detailed testing of the 25 samples received at C-DAC is in progress and an interim test report of the same shall be delivered by first week of September. Since the performance of the devices supplied is not upto the mark, we would like to use this as development for our test platform and we shall focus on the testing of the newer upgraded model which is likely to be better and could alleviate most of the problems found in the current model.

We would like to gather more details from M/s Datawind including detailed specification, internal details, reliability data of critical components etc. Hence, we could explore the areas of hardware testing which would help bring down the failure rate.

We plan to start rigorous testing of the new version of Aakash Tablet with Android 4.0 as soon as we receive the same. Since rigorous testing is done only on a small sample volume, a close monitoring at the production line by CDAC is essential to ensure the quality. For this a relations may kindly be put in place with the production agency.

Aakash Project Status Report – May 30, 2013

Eight batches of upgraded Aakash II tablets received from IIT Bombay till date.

1. 08-10-2012 – 25 nos – (Serial nos – 10001060-69, 71-79, 85-90)
2. 27-12-2012 – 40 nos – (Serial nos – 10002059-98)
3. 25-02-2013 - 50 nos – (Serial nos – 10003061-90, 10002801-20)
4. 02-04-2013 - 150 nos
5. 15-04-2013 - 100 nos
6. 25-04-2013 - 100 nos
7. 29-04-2013 - 100 nos
8. 09-05-2013 - 100 nos

It may be noted that the dispatch slips generated by Aakash Support Team do not correspond to the consignments received through C-DAC, Noida. The list of dispatch slips generated and the actual quantity received is as given in Annexure –I.

Some of the Tablets in the 5th and 7th batches had broken display screens (appears to have been damaged in transit). A total of five Tablets were damaged. Also, some of the Tablets are dead and do not turn ON. A total of about 12 Tablets are dead out of the sample of 500 numbers we have opened so far.

The packages received contain only Tablet and charger and no cables/adaptors. The tablets also do not have any serial number affixed on them.

A new variant of the Tablet viz. "Nuclear –pfdq88c" was found in some of the batches, other than the earlier models of "Nuclear X3", "Nuclear Evb" and "A13MID" from "Softwinners". Also another model of tablet; "RK2926" from "Rockchip" was found among the new batches received.

Performance testing of first 3rd batch of tablets is completed and testing of 4th and 5th batches in progress. Since, we have received a bulk of the tablets in the months of April /May (550 nos) and comprehensive testing of each tablet is done, we are unable to give a report for the entire volume of tablets received till date.

We are in the process of developing a semi-automatic test setup for testing the Tablets which would help reduce the time for testing.

Test results of the 3rd batch of tablets (Sl. Nos 10003061-90 and 10002801-20) are recorded and attached. (Aakash_Test_Report.xls).

The problems found during the preliminary evaluation of the tablets tested so far are listed below:

- Power adaptors of some are not working. Arcing sound as well as some liquid discharge found in some of the power adaptors.

- Boot problems found in some of the tablets. Tablet does not boot up, only continuously displays the Android logo in a loop.

- Some of the Tablets automatically power-ON while connecting the charger.

- Extreme heat generation (above 42 deg C) found in some while charging and after usage for 30 mins.

- "android.process.acore has stopped unexpectedly" errors occur frequently in some of the Tablets.

- Display screen of the Tablet gets garbled due to EMI, when in close contact with certain mobile phones when signal is active.

- Case locking not proper, leading to partially open cover.

- Misalignment of micro-USB connector, preventing insertion of cable.

- Misalignment of SD card slot, preventing insertion of card.

- Screen of some of the tablets are badly scratched.

- Ripples observed on LCD screen of some tablets on movement and tapping.

- Dead pixels observed in some of the Tablets.

- Battery performance of some found not upto the mark. Only gives about half the backup time compared to other tablets in the same series.

Environmental tests as per IEC/ BIS standards carried out with ERTL (South) laboratory. Mechanical tests consisting of impact and vibration test were performed. Environmental tests comprising of dry heat test, cold test and humidity tests were also performed. Report of the same attached (ERTL_test_report.pdf).

Also identified test equipment needed to undergo some of the tests in-house itself and their procurement is in process.

As informed earlier since rigorous testing is done only on a small sample volume, a close monitoring at the production line is essential to ensure the quality. For this a relation may kindly be put in place with the production agency.

Requested IIT, Bombay to facilitate in opening a contact window with M/s Datawind and also the production agencies. Manufacturing and delivery schedule still not intimated.

Also, yet to receive the detailed specification, internal details, reliability data of critical components and test QAP document from M/s Datawind.

S. Krishnakumar Rao   30-05-2013

<u>Annexure - I</u>

Dispatch Slip		Tablets Received	
Dated	**Quantity** (nos)	**Date**	**Quantity** (nos)
20-02-2013	50	25-02-2013	50
01-04-2013	20+20+40+30 = 110	02-04-2013	150
09-04-2013	20+30 = 50	15-04-2013	100
18-04-2013	20+40+10 = 70		
22-04-2013	60		
23-04-2013	40	25-04-2013 29-04-2013	100 100
30-04-2013	26+22+18+19+14 = 99		
03-05-2013	1	09-05-2013	100
22-05-2013	2+65+8+85+40 = 200		
29-05-2013	50+50 = 100		

ELECTRONICS REGIONAL TEST LABORATORY (SOUTH)
MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
THIRUVANANTHAPURAM

TEST REPORT ON: Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. O F PAGES
ERTL (S)/R/4428	15-4-13	1	5

1. Indenter   : M/s CDAC
   (Name & address of the   Velleyambalam
   Organisation)   Trivandrum

2. Indenter's Reference   : SRFNo.4428 dt 28-3-13

3. Description & Identification   : Aakash Tablet PC : 2 Nos.
   of the item   SI.No. 10001074,10002064

4. Applicable Specification   : As pes IS 9000

5. Test done   : 1.Dry Heat test
   2. Cold test
   3. Damp heat test
   4. Impact Test
   5. Vibration Test
   6. Functional check

6.

Equipment used	model	Traceability	Validity
Programmable humidity Test chamber Weiss Technik	WK 11 1000	ETDC Bangalore	28-2-2014
Electro Dynamic Vibration Shaker System	Saraswathi Dynamic	ERTL(S)	02-07-2013

ELECTRONICS REGIONAL TEST LABORATORY (SOUTH)
MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
THIRUVANANTHAPURAM

TEST REPORT ON Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. OF PAGES
ERTL (S)/R/4428	15-4-13	2	5

7.0 Test results :

Sl. No	Test condition	Specification	Qty tested	Result	Remarks
1.0	Functional Check	As per Annexure -A	Two	Complied	Nil
2.0	Dry heat test IS 9000 part-III/Sec.5-1977				
	(UUT in unpacked and power off condition) Temperature: 55 ±2 °C Duration : 16 Hrs	Shall be Conditioned	Two	Conditioned	Nil
2.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil
3.0	Cold Test(IS 9000 Part-II/Sec 4-1977 (UUT in unpacked and power off condition) Temperature: -10 ±3 °C Duration : 2 Hrs	Shall be Conditioned	Two	Conditioned	Nil
3.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil
4.0	Damp heat test(IS 9000 part-V /Sec.-1-1981 (UUT in unpacked and power off condition) Temperature: 40 ±2 °C Humidity : 95 % Duration of cycle: 24Hrs (16+8 hrs) No. Cycle : 2 Total Duration of the test : 48 hrs	Shall be Conditioned	Two	Conditioned	Nil

ELECTRONICS REGIONAL TEST LABORATORY (SOUTH)
MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
THIRUVANANTHAPURAM

TEST REPORT ON Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. O F PAGES
ERTL (S)/R/4428	15-4-13	3	5

Test results :

Sl. No	Test condition	Specification	Qty tested	Result	Remarks
4.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil
5.0	Impact test(Drop test)(IS 9000 Part VII/Sec 3 –1979,clause no. 9.2) Drop height : 22 mm (Dropping on to a face) No. of drops: 4 (Test carried out on concrete surface in stead of steel plate reinforced surface due to facility limitation)	Shall be Conditioned	Two	Conditioned	Nil
5.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil
6.0	Vibration test(IS 9000 part VIII) Frequency : 10 – 55 Hz Acceleration : 1g Sweep rate : I octave No. of Axis : X,Y,Z Duration : 45 minutes in each axis Total Duration of the test : 2 hrs 15 minutes	Shall be Conditioned	Two	Conditioned	Nil
6.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil

ELECTRONICS REGIONAL TEST LABORATORY (SOUTH) MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY THIRUVANANTHAPURAM			
TEST REPORT ON: Aakash Tablet PC			
REPORT NO.	DATE	PAGE NO.	NO. O F PAGES
ERTL (S)/R/4428	15-4-13	4	5

8. General remarks:

8.1.This test report is applicable only to the sample identified at Sl.No.3.

8.2.Test graphs of the sine vibration are attached.

ISSUED BY

29/4/13

HEAD, C S C

SHAJI. K. S
Scientist 'E'
ERTL (S), Govt. of India
Ministry of Communications & Information Technology
DeitY, STQC Directorate
Sreekariyam, Thiruvananthapuram-17

ELECTRONICS REGIONAL TEST LABORATORY (SOUTH)
MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
THIRUVANANTHAPURAM

TEST REPORT ON: Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. O F PAGES
ERTL (S)/R/4428	15-4-13	5	5

Annexure A

Functional   Test Procedure

Device shall be powered ON and allowed to boot. Working shall be checked with the display of the home screen.

Aakash Project Status Report – July 08, 2013

A total of 965 Aakash Tablets received in 10 batches till date as given below:

1. 08-10-2012 – 25 nos – (Serial nos – 10001060-69, 71-79, 85-90)
2. 27-12-2012 – 40 nos – (Serial nos – 10002059-98)
3. 25-02-2013 - 50 nos – (Serial nos – 10003061-90, 10002801-20)
4. 02-04-2013 - 150 nos
5. 15-04-2013 - 100 nos
6. 25-04-2013 - 100 nos
7. 29-04-2013 - 100 nos
8. 09-05-2013 - 100 nos
9. 31-05-2013 - 200 nos
10. 11-06-2013 - 100 nos

The list of dispatch slips generated by Aakash Support Team and the actual consignments received through C-DAC, Noida is given in Annexure –I.

The latest three batches of Tablets (batches 8,9 & 10) received during May-June have been inspected and some were found with broken displays, some were dead and do not turn ON and the power adaptors of some were faulty. The details of the inspection are given in the attached test report (Aakash_Test_Report_08-07-2013.pdf).

As reported for the previous batches, the packages contain only Tablet and charger and no cables/adaptors. The tablets also do not have any serial number affixed on them.

The batches received contain a mix of Tablet variants, comprising of "Nuclear–pfdq88c", "Nuclear Evb", "MID", "A13MID" from "Softwinners" and "RK2926" from "Rockchip".

Performance testing of 4th, 5th and 6th batch of tablets has been completed and testing of 7th and 8th batches is in progress. Other tests including functional tests and battery performance tests are also being carried out. A test report containing a summary of the results and observations is also given in the attached report (Aakash_Test_Report_08-07-2013.pdf).

The problems found during the preliminary evaluation of the tablets are listed below:

- Some of the Tablets are dead. Do not turn ON even with power adaptor connected or after charging.

- Some of the Tablets do not get charged.

- Power adaptors of some are not working. Some of the power adaptors have blown up while switched ON.

- Some of the power adaptors are faulty and the Tablet turns OFF when it is connected.

- Tablets take a longer time to charge with some power adaptors.

- Some of the Tablets intermittently produce a tick sound and then turn-off.

- Arcing sounds are heard in some Tablets while touching / scrolling the screen (with the power adaptor connected).

- Boot problems found in some of the tablets. Tablet does not boot up, only continuously displays the Android logo in a loop.

- Some of the Tablets experience frequent operating system freeze.

- Erratic OS behaviour with automatic invoking and closing of apps, menu clicks etc. experienced in some of the Tablets.

- Extreme heat generation (above 42ºC) found in some while charging and after usage for more than 30 mins.

- Misalignment of micro-USB connector, preventing insertion of cable.

- Ripples observed on LCD screen of some Tablets.

- Vertical line also present in display of some Tablets.

- Touch sensitivity of some of the Tablets are very poor.

- Some other problems like touch being insensitive in certain areas of the screen and touch press staying persistent in some points of the screen were also observed.

- USB port of a few Tablets were found to be not working

- Wi-Fi of some of the Tablets have failed.

A consolidated report for the entire volume of tablets received till date shall be prepared when the tests are completed.

S. Krishnakumar Rao

Annexure - I

Dispatch Slip		Tablets Received	
Dated	**Quantity (nos)**	**Date**	**Quantity (nos)**
20-02-2013	50	25-02-2013	50
01-04-2013	20+20+40+30 = 110	02-04-2013	150
09-04-2013	20+30 = 50	15-04-2013	100
18-04-2013	20+40+10 = 70		
22-04-2013	60		
23-04-2013	40	25-04-2013 29-04-2013	100 100
30-04-2013	26+22+18+19+14 = 99		
03-05-2013	1	09-05-2013	100
22-05-2013	2+65+8+85+40 = 200		
29-05-2013	50+50 = 100	31-05-2013	200
		11-06-2013	100

Aakash Tablet Test Report
(July 08, 2013)

1. Result of Testing completed on 3 batches of Tablets received in April, 2013

Tablet batches:
Batch 4: (Sl. nos: 10001 – 10150) – 150 nos
Batch 5: (Sl. nos: 10201 – 10300) – 100 nos
Batch 6: (Sl. nos: 10301 - 10400) – 100 nos

Total no. of Tablets tested: 350 nos

Aakash Tablets

Batches 4,5 & 6
Total nos: 350

35%

65%

■ **Tablets without problems**   ■ **Tablets with problems**

Chart: 1.1

C-DAC, Thiruvananthapuram
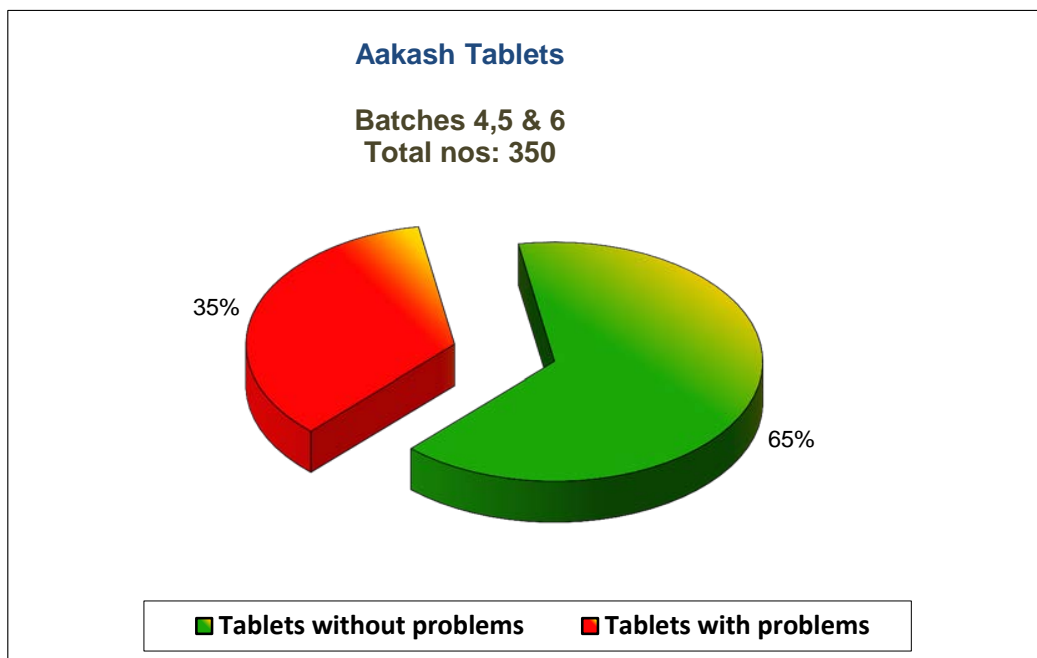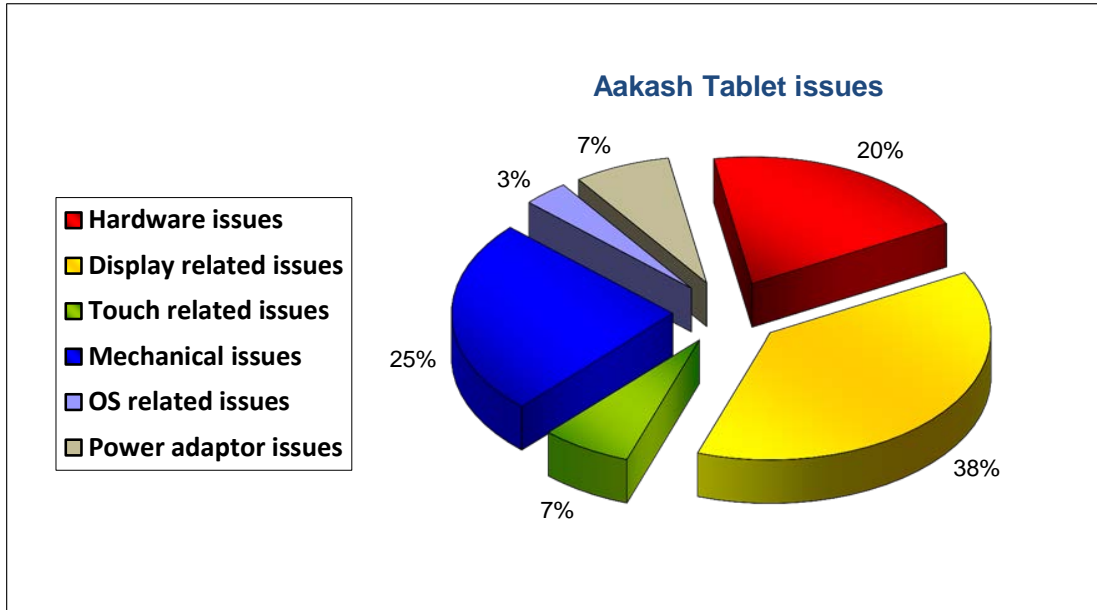
Chart: 1.2

Testing of 4th, 5th & 6th batch of Tablets – Total nos: 350		
Issues found	No. of Tablets	
Hardware issues		
Tablet dead – does not turn-ON even with power adaptor connected or after charging	7	
Tablet does not get charged – Tablets works from power adaptor but battery does not get charged	21	
USB port not working	2	
Wi-Fi not working	1	
Earphone socket not working	1	
Volume button not working	1	
Arcing sound produced while touching or scrolling the screen (with power adaptor connected)	5	
Tablet produces tick sound and turns off intermittently	3	
Tablet automatically switches ON when power adaptor is connected	4	
Over heating – tablet becomes extremely hot (above 42ºC) during charging and usage	3	

Display related issues	
Ripples produced in display screen*	92
Vertical line present in display screen	1
Touch related issues	
Poor Touch sensitivity	11
Touch insensitive in certain areas of the screen	4
Touch press persistent in some points of the screen	1
Mechanical issues	
Tablet case not properly sealed – partially opened cover	14
Tablet assembly not intact	16
Misaligned micro-USB port – prevents / hinders insertion of cable	12
Misaligned SD card slot – prevents insertion of SD card	5
Misaligned earphone socket – poor contact with earphone jack	13
Screen extensively scratched*	57
OS related issues	
Boot problem – Tablet does not boot up, only continuously displays the Android logo in a loop	2
Erratic OS – erratic OS behaviour causing automatic invoking and closing of apps, menu clicks etc.	4
Frequent Operating System freeze – system hangs intermittently	2
Power adaptor issues	
Power adaptor not working	7
Power adaptor blown up while switched ON or after short time	3
Faulty adaptor – Tab turns-off when connected	1
Adaptor with slower charge rate – longer charge time	3
Adaptor LED misaligned – indicator not visible	3

Table: 1.1

This issue has not been considered as a major problem and is not accounted in Chart 1.1

C-DAC, Thiruvananthapuram

Application related observations		
Office suite not pre-installed	327	
PDF reader not pre-installed	112	
Flash player not pre-installed	23	

Table: 1.2

2. Results of Performance tests of 3 batches of Tablets received in April, 2013

Tablet batches:
Batch 4: (Sl. nos: 10001 – 10150) – 150 nos
Batch 5: (Sl. nos: 10201 – 10300) – 100 nos
Batch 6: (Sl. nos: 10301 - 10400) – 100 nos

Total no. of Tablets: 350 nos

The Tablets received in these 3 batches are of different models containing different hardware and different builds of OS.

The distribution of Tablet brands, models, hardware and OS are shown below:

Chart: 2.1

Hardware (Chipset)

11%

89%

■ Allwinner A13   ■ Rockchip 2926

Chart: 2.2

Tablet Models

0% 4% 0%   11%

12%

■ SoftwinerEvb
□ MID
■ SV7612-RK2926
■ A13MID
■ A13-MID
□ 329

73%

Chart: 2.3

Android OS distribution

14%

86%

■ Ver. 4.0.4   ■ Ver. 4.1.1
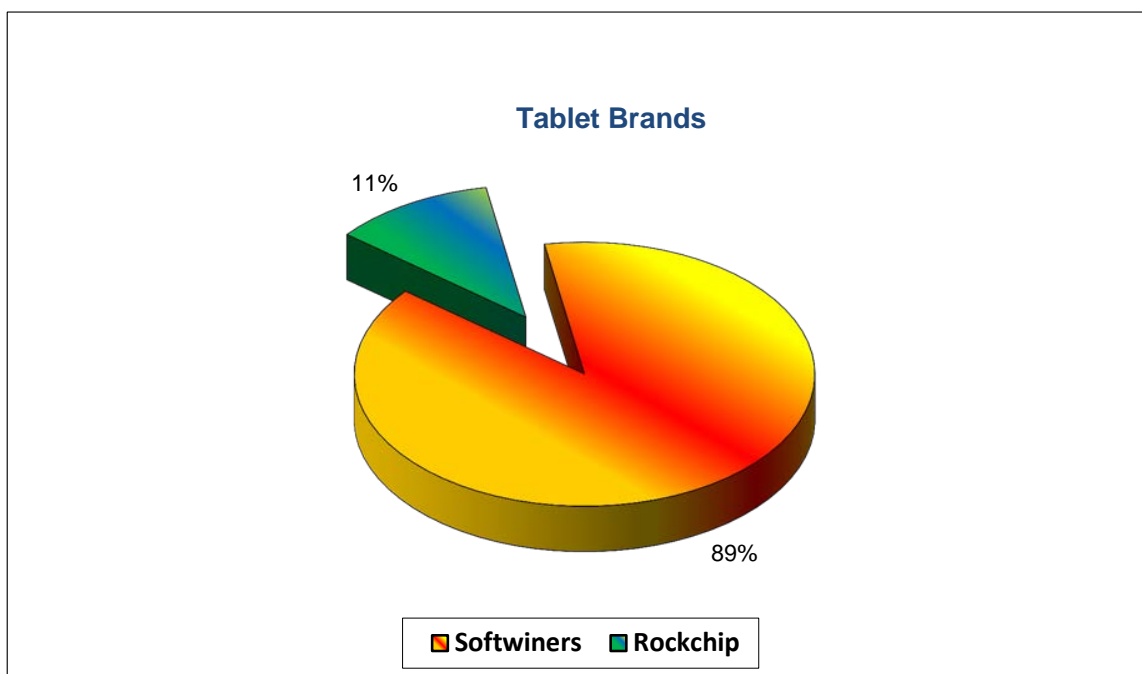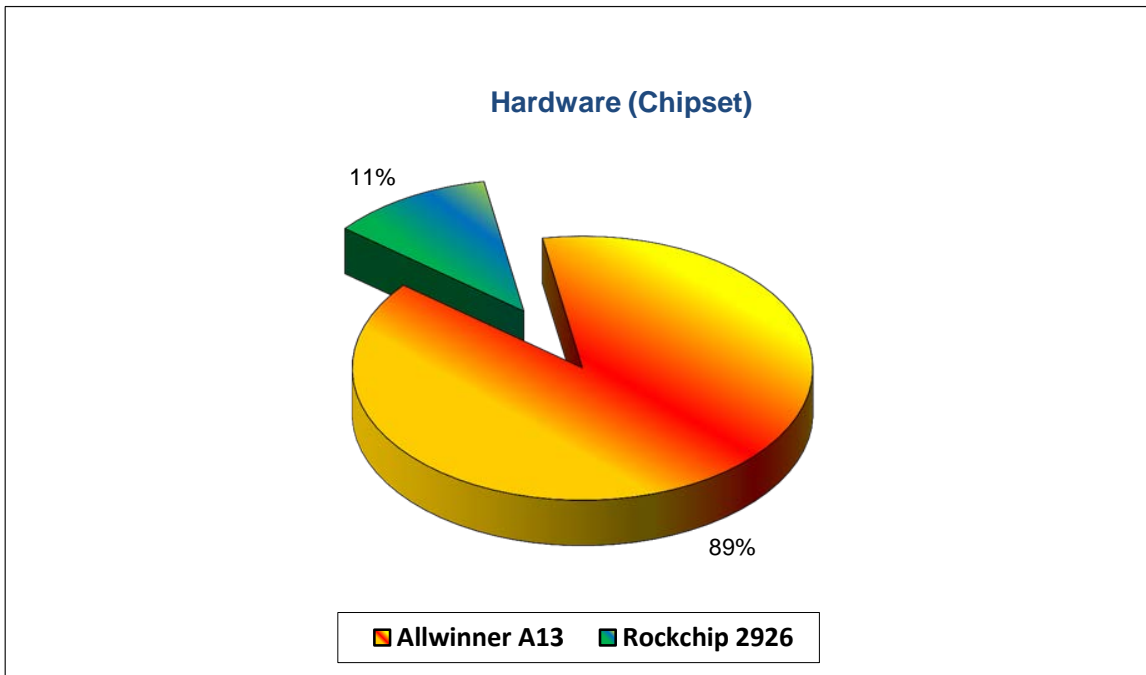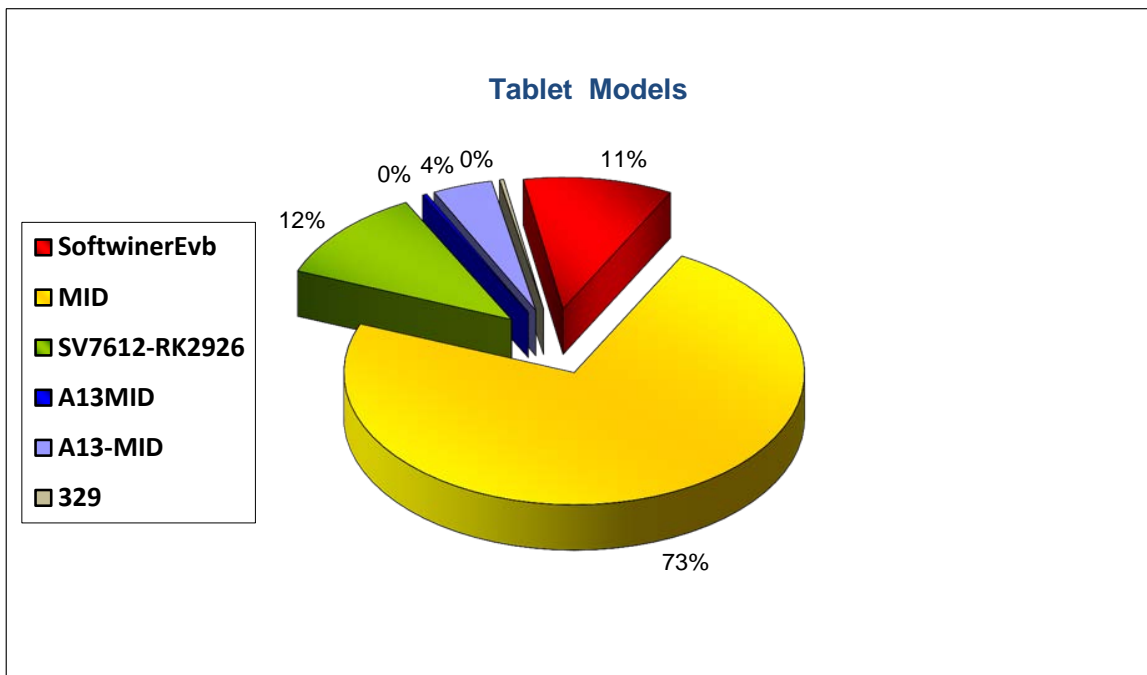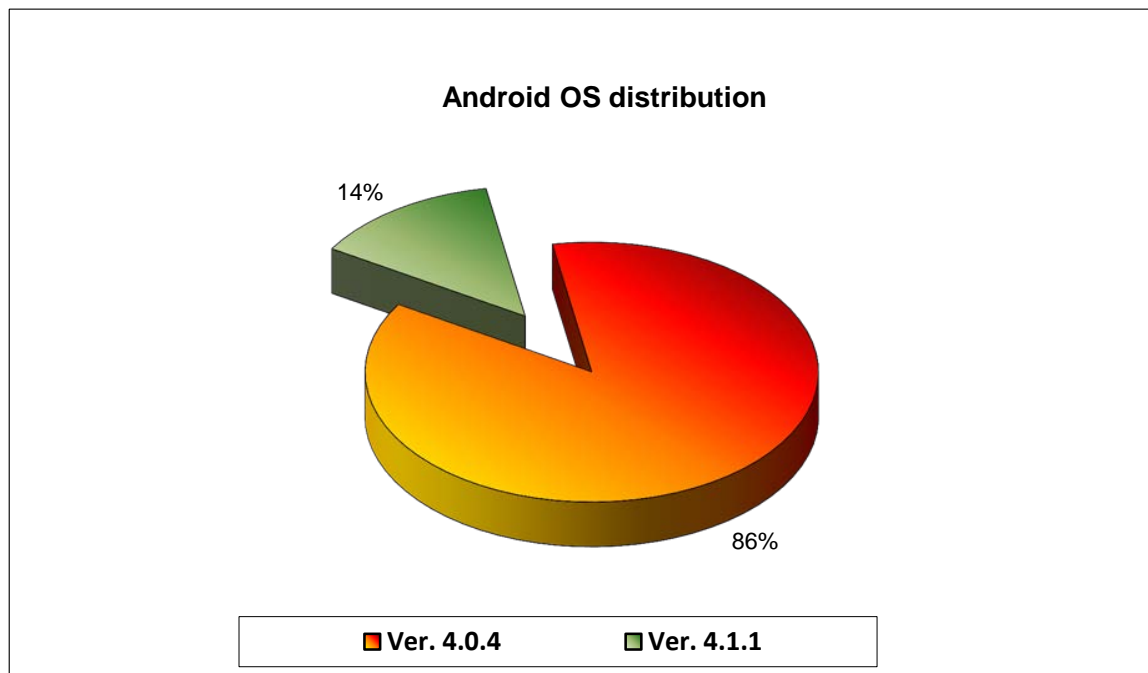
Chart: 2.4

As shown in the above charts 89% of the total Tablets tested in these batches are from Softwiners which consist of the Allwinner A13 chipset and 11% of the Tablets are from Rockchip which consist of the Rockchip 2826 chipset.

The performance for Tablets with the Rockchip chipset was found to be better which constitutes 11% of total Tablets tested. This has been reflected in the scores obtained for the various benchmark tests conducted as given below.

AnTuTu Benchmark:

AnTuTu is an Android system benchmarking tool. AnTuTu tests CPU, RAM, graphics, database, and SD card components and provides scores for each component as well as an overall score. It gives completeness, providing tests for memory performance, integer processor speed, floating point processor speed, 2D and 3D graphics performance, SD I/O speeds and a generalised database test.

The overall scores obtained for AnTuTu benchmark is shown below:

AnTuTu Benchmark

Total Score

1% 0%

10%

89%

■ < 2700   □ 2700-3200   ■ 3500-3700   ■ > 3700
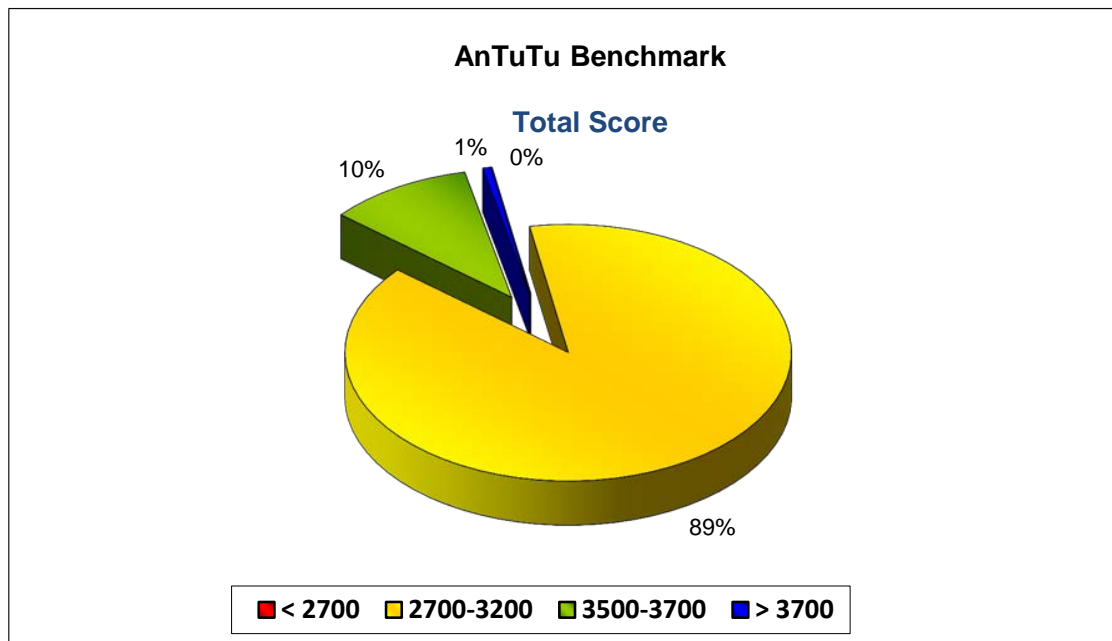
Chart: 2.5

Quadrant Standard

Quadrant is another system test that benchmarks CPU, memory, graphics and I/O. The Standard Edition computes the total score and benchmark results through the internet.

 The total scores obtained for Quadrant Standard are shown below:

Quadrant Standard

Total Score

9% 12%

11%

68%

■ < 1600   □ 1600-2100   ■ 2100-2200   ■ > 2200
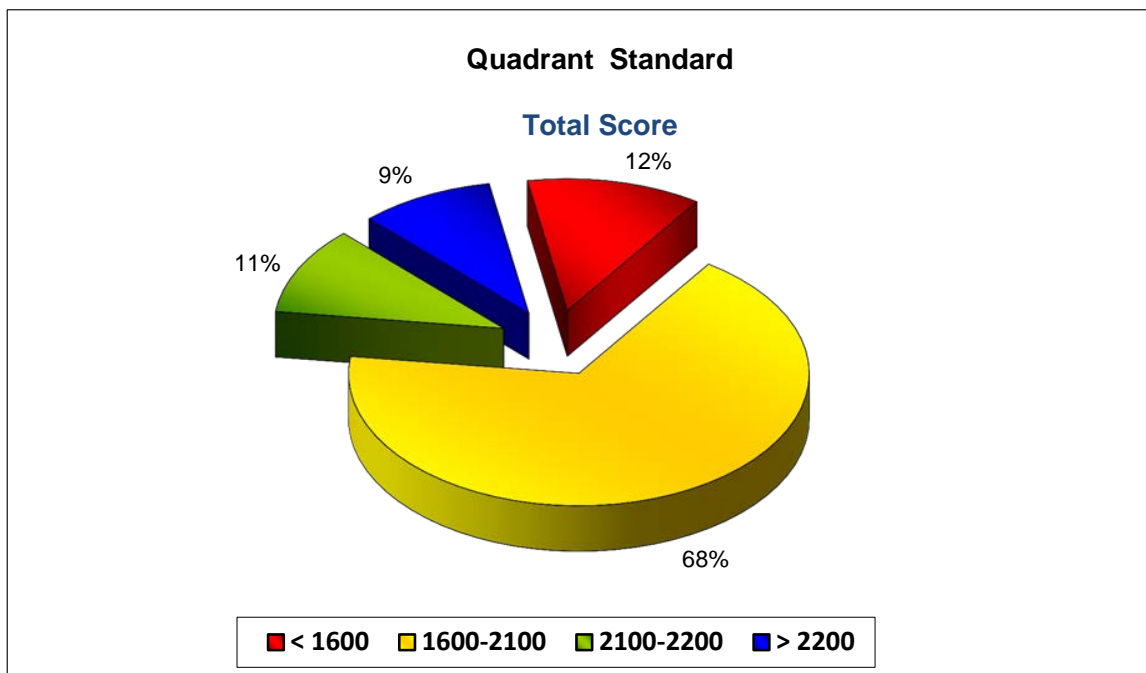
Chart: 2.6

Passmark

PassMark is a comprehensive test that objectively benchmarks the Tablet using a variety of different tests totaling seventeen standard benchmark tests that are categorised in four test suites as follows:

CPU Tests - Mathematical operations, compression, encryption, etc
Disk Tests - Reading and writing files to internal and external storage
Memory Tests - Read and Write tests
2D Graphics Tests - Simple & Complex Vectors and image rendering and filters tests
3D Graphics Tests - Simple bouncing ball test and complex scenario.

The total scores obtained for System, CPU, Memory, Disk, 2D and 3D graphics are shown below:

Chart: 2.7

PassMark

CPU Score

Chart: 2.8

PassMark

Memory Score

Chart: 2.9

PassMark

Disk Score

9%

6%

9%

76%

🟥 < 800	🟨 800-1100	🟩 1100-1200	🟦 > 1200

Chart: 2.10

PassMark

2D Graphics Score

11%

0%

7%

82%

🟥 < 700	🟨 700-1100	🟩 1400-1600	🟦 > 1600

Chart: 2.11

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PassMark

3D Graphics Score

1% 1%
11%
87%

Legend: < 400 | 400-600 | 600-700 | > 700
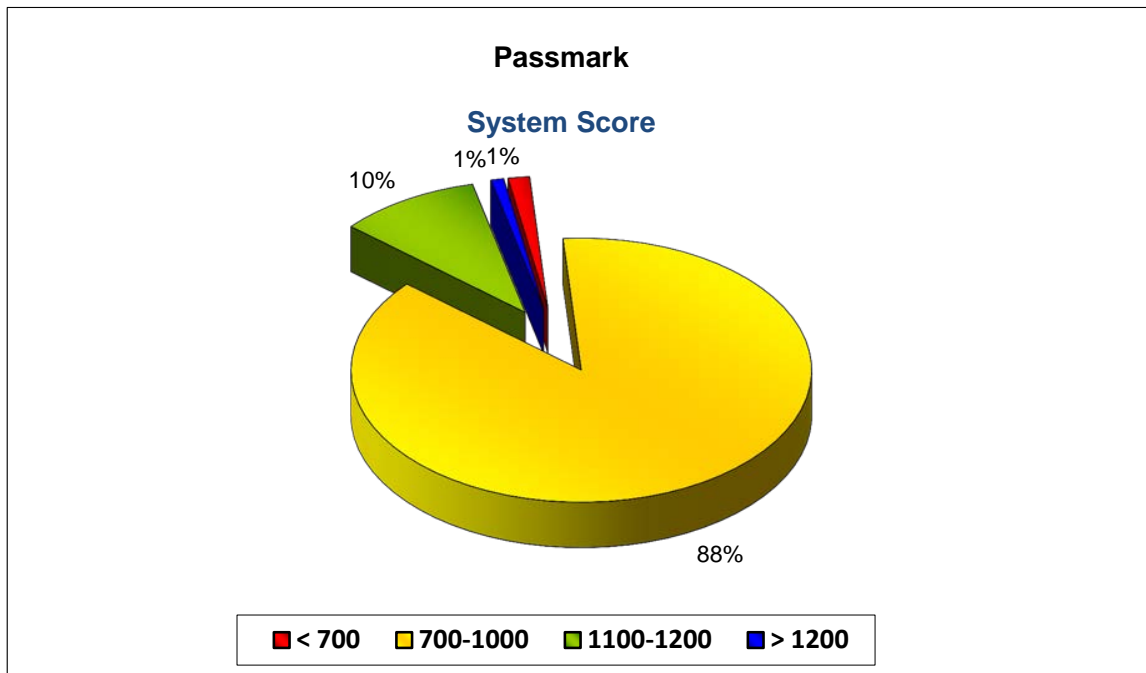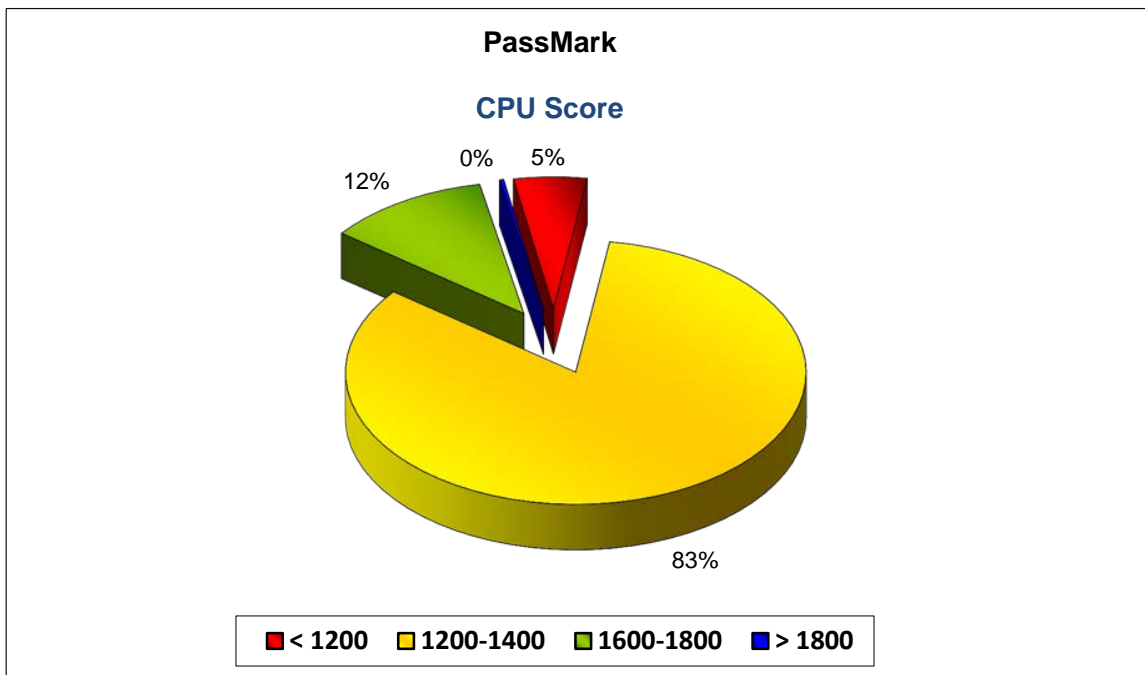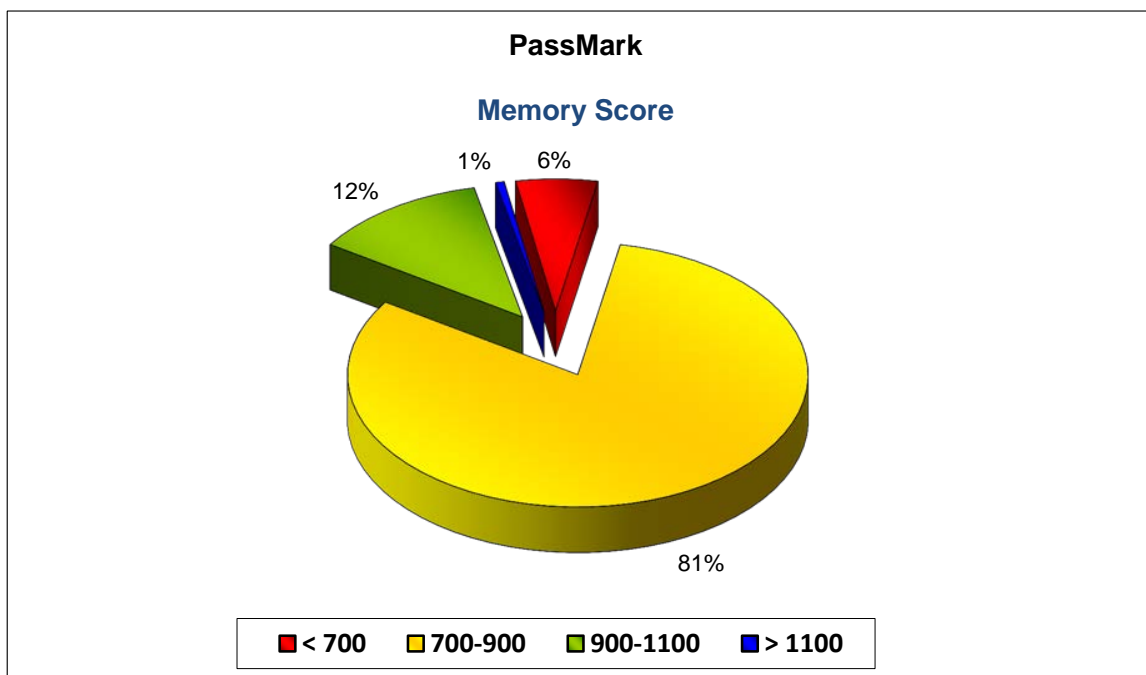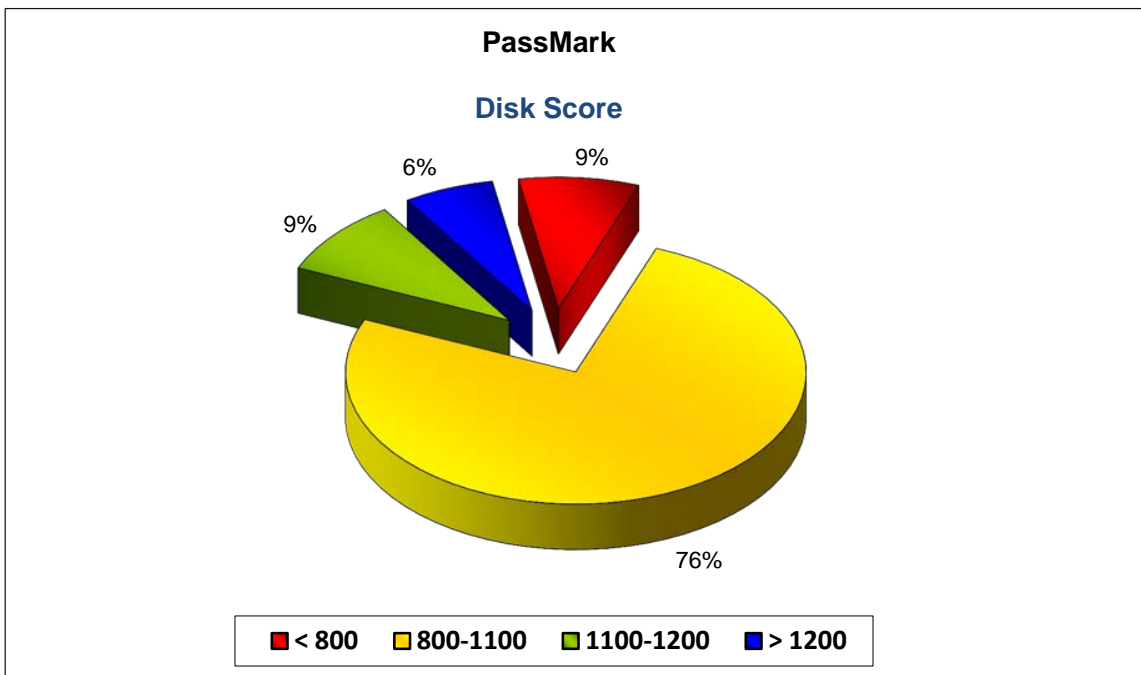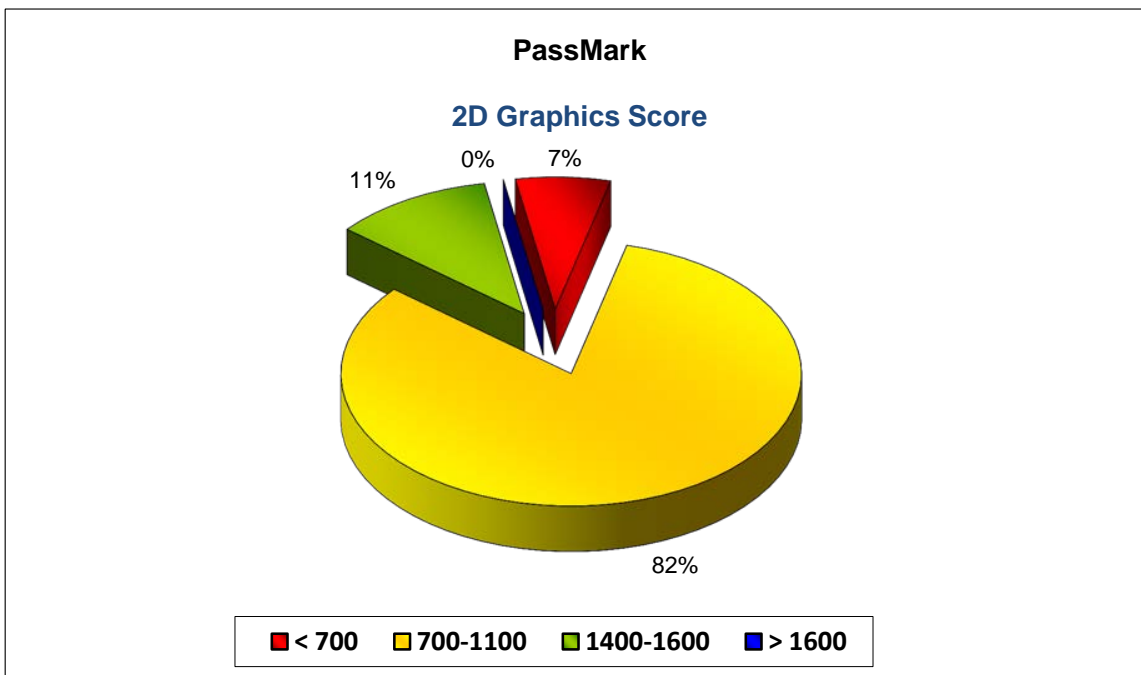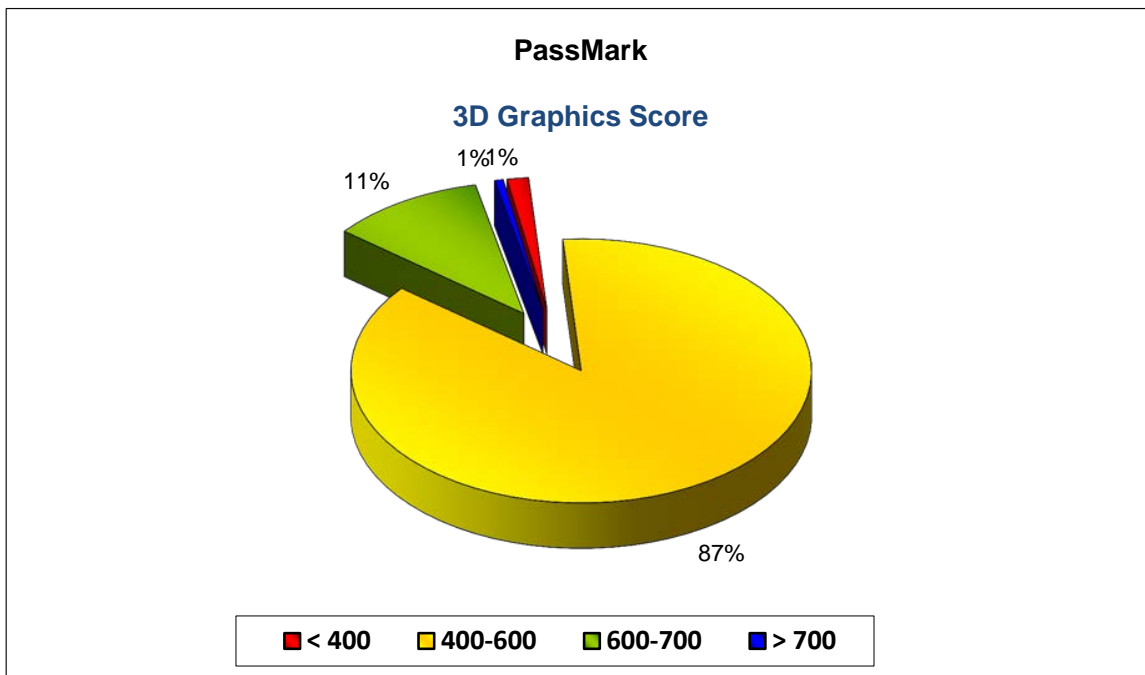
Chart: 2.12

AndEBench

AndEBench benchmark is a standardized, industry-accepted test for evaluating the Android platform performance of the Tablet.

The AndEBench scores obtained for both Native platform and Java platform are shown below:

AndE Bench

Native Score

0% 0%
11%
89%

Legend: < 1400 | 1400-1600 | 1800-1900 | > 1900

Chart: 2.13

AndE Bench

Java Score

Legend: < 1400 | 1400-1600 | 1800-1900 | > 1900
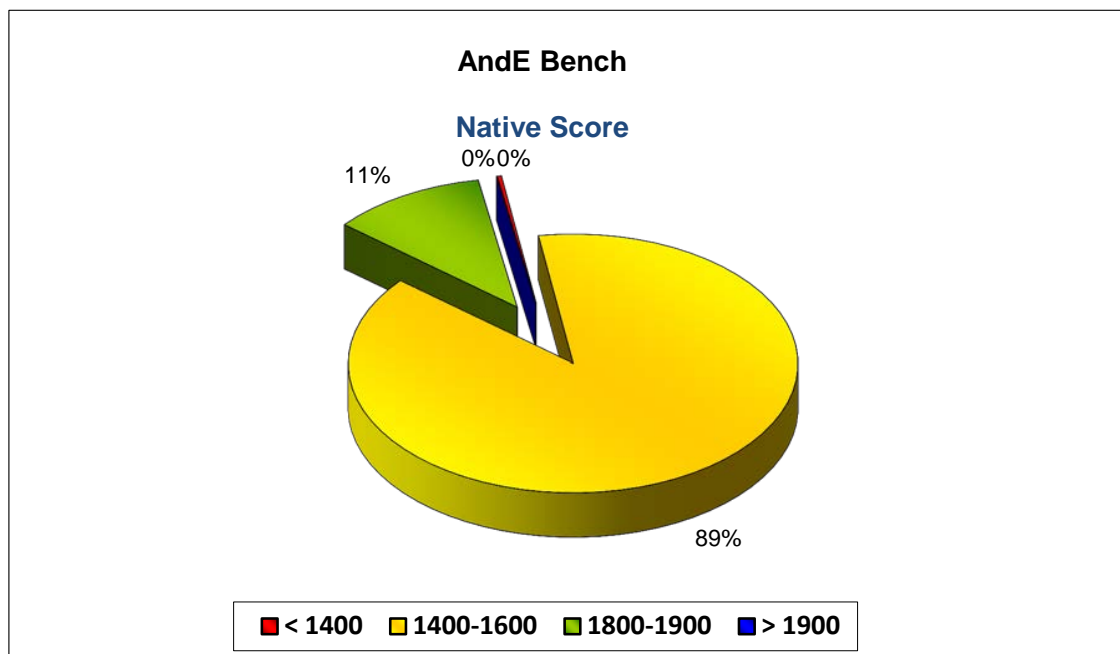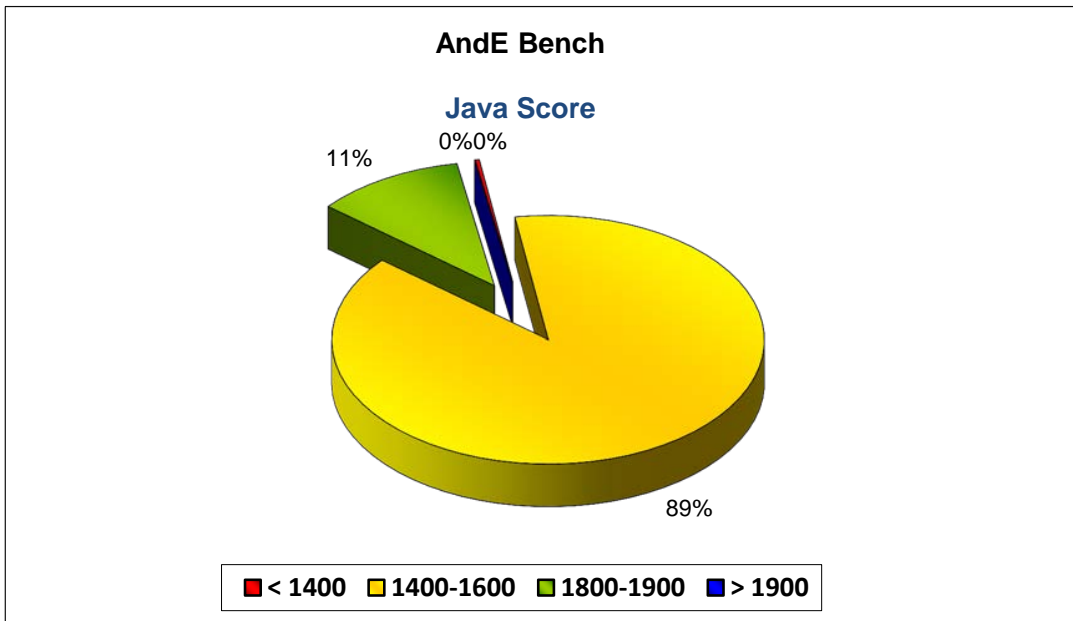
Chart: 2.14

LinPack

Linpack is a test that measures the Tablet's CPU performance. Linpack measures how fast the Tablet's CPU can calculate a series of linear algebraic equations. These calculations measure the Tablet's ability to perform floating-point calculations. Linpack results are reported in millions of floating-point operations per second (MFLOPS).

The scores obtained for Linpack with both Single threading and Multi-threading are shown below:

LinPack

MFLOPS (Single thread)

Legend: < 13 | 13-16 | 33-37 | > 37

Chart: 2.15

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LinPack

MFLOPS (Multi-thread)
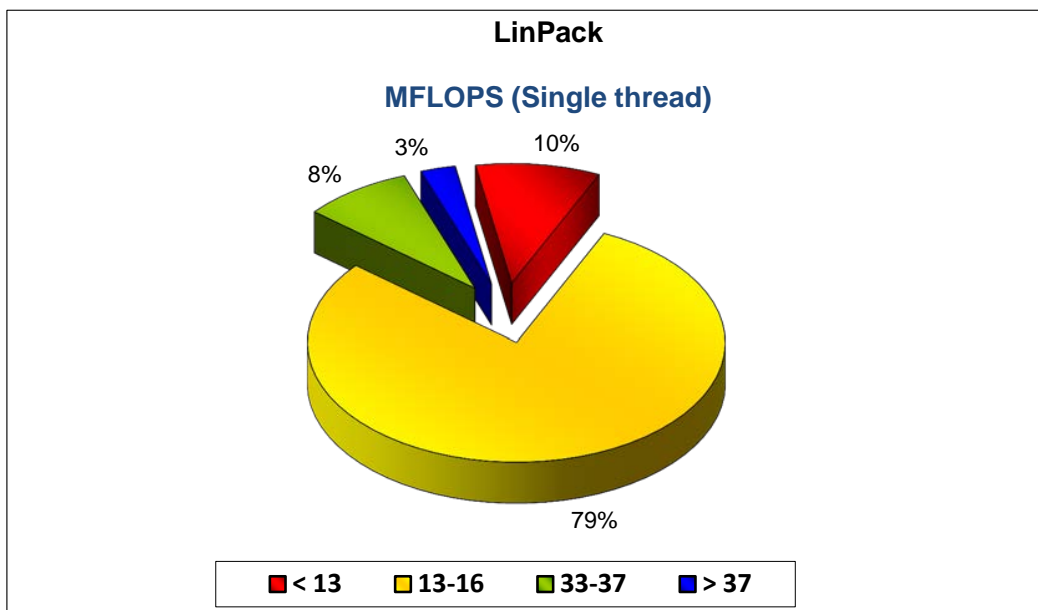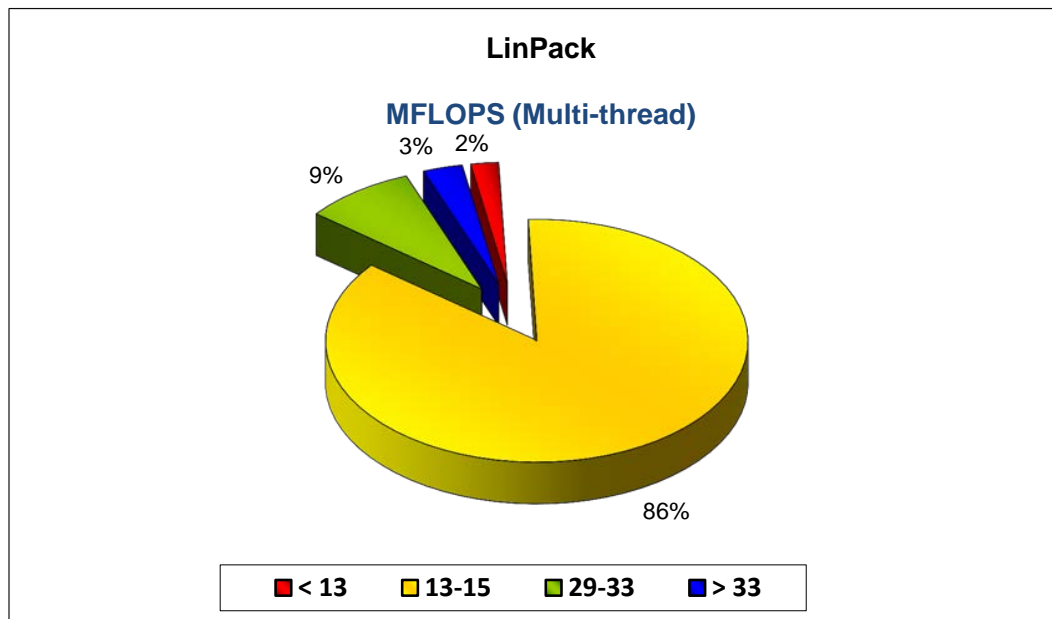
Chart: 2.16

An3DBench

An3DBench is a test that measures the Tablet's 3D-graphics performance. An3DBench measures how fast an Android Tablet's graphics engine can render a series of seven 3D scenes of varying complexity, titled thus: •Single texturing fillrate •Multi-texturing fillrate •High object count •Multiple light sources •High polygon count •Keyframe animation •(Simulated) Game level.

Each of the seven individual tests generates scores that are reported either in megapixels per second (MP/Sec) or frames per second (fps). The overall score is a proprietary numeric score, calculated from the seven individual tests.

The overall scores obtained for An3DBench is shown below:

An3D Bench

Total Score

5%   5%
13%
77%

| ■ < 6400 | □ 6400-7000 | ■ 7000-7100 | ■ > 7100 |
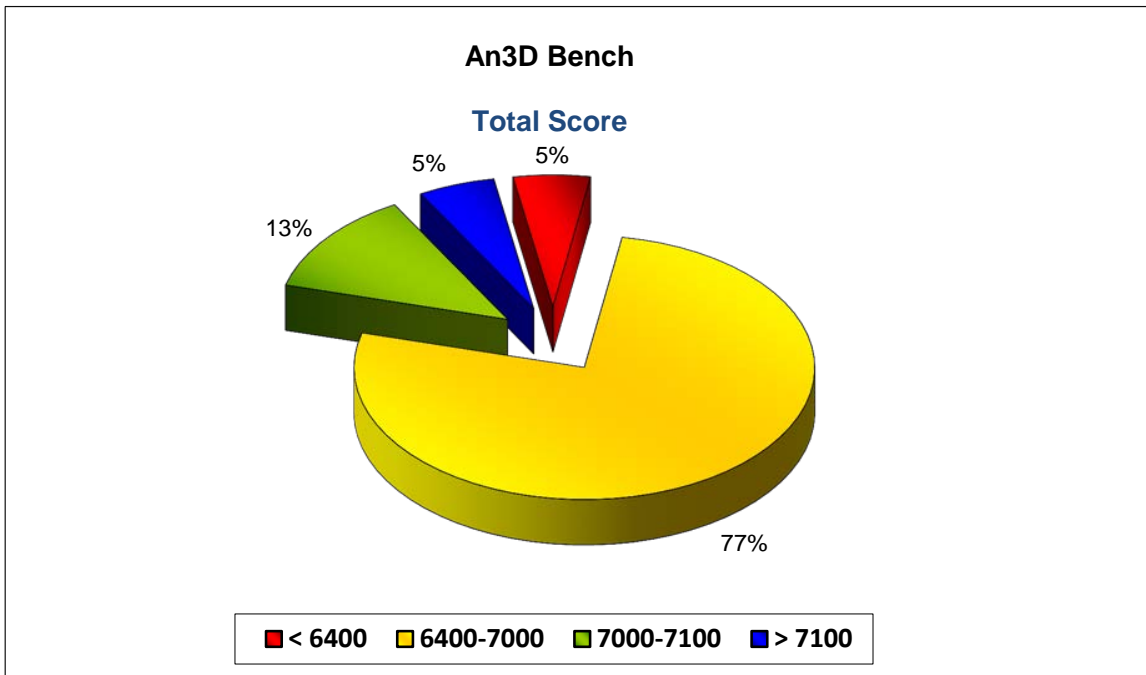
Chart: 2.17

The total scores obtained for An3DBench XL which is a more robust and enhanced version of the An3Dbench are also shown below:

An3D Bench XL

Total Score

3%
9%   3%
85%

| ■ < 20000 | □ 20000-23000 | ■ 27000-28000 | ■ > 28000 |
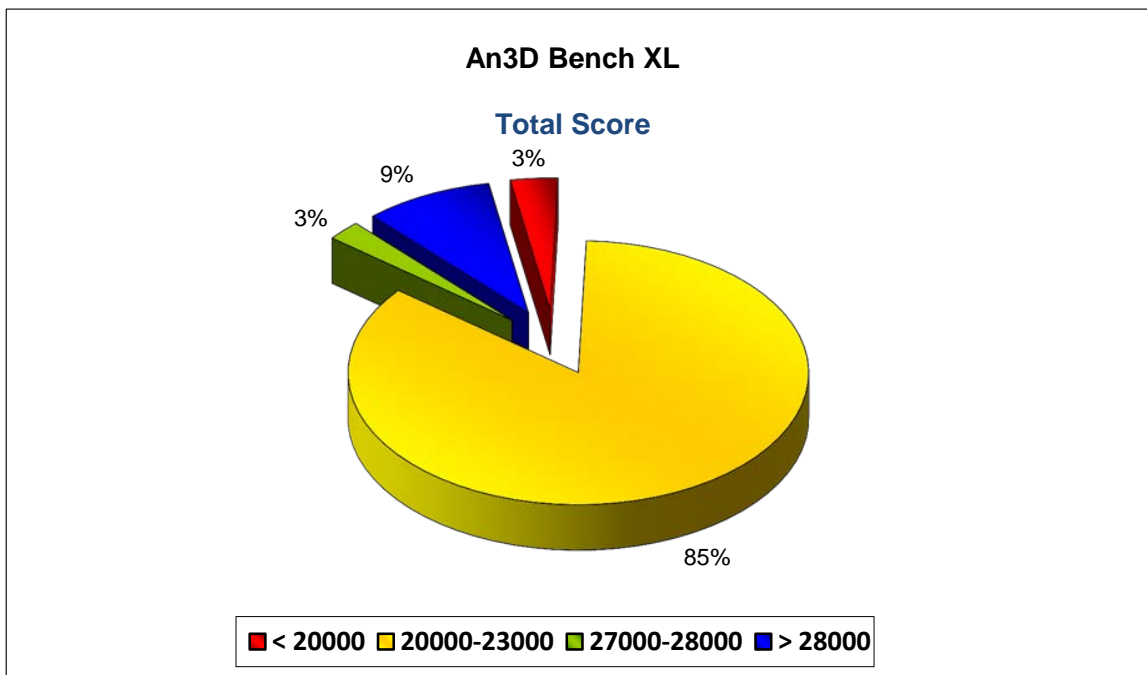
Chart: 2.18

NenaMark2

NenaMark2 is an OpenGL ES 2.0 benchmark with advanced graphical effects and high resolution graphics.

NenaMark measures performance using realistic scenes that are taken from a typical game and presents the result in frames per second (fps).

The scores in fps obtained for NenaMark2 are shown below:

NenaMark

Score (fps)

0% 2%

11%

87%

| ■ < 25 | □ 25-29 | ■ 40-42 | ■ > 42 |
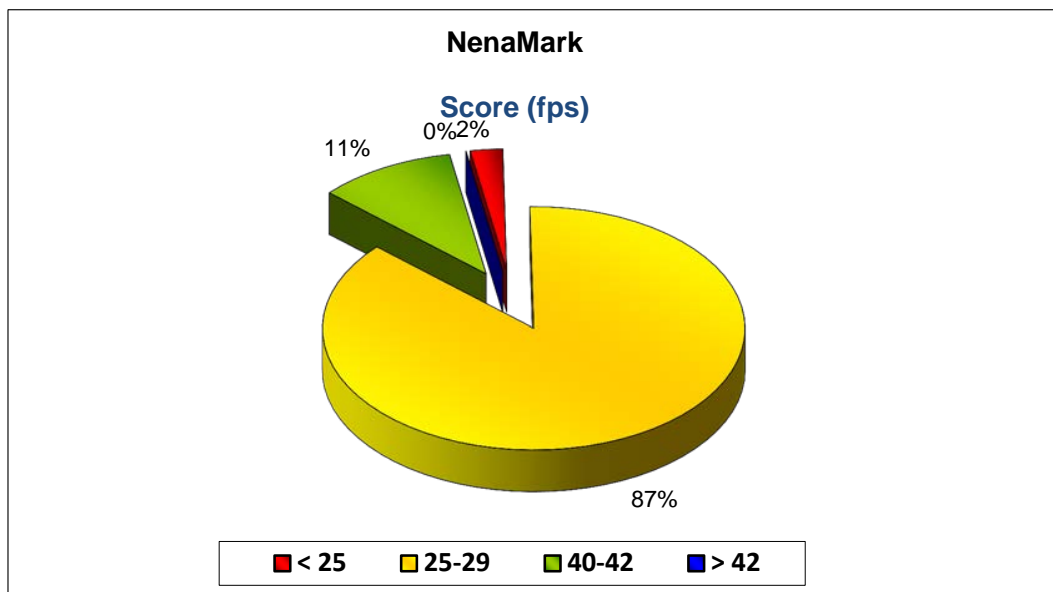
Chart: 2.19

Result of Inspection done on latest 3 batches of Tablets received in May and June, 2013

Tablet batches:
Batch 8:   (Sl. nos: 10501 – 10600) – 100 nos
Batch 9:   (Sl. nos: 10601 – 10800) – 200 nos
Batch 10: (Sl. nos: 10801 - 10900) - 100 nos

Total no. of Tablets: 400 nos.

Total no. of Tablets inspected	400
Tablet with broken displays	3
Dead Tablets	9
Faulty power adaptors	27

Table: 3.1

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Chapter 6

Results of Field Trials for Development and Testing

As mentioned in our proposal, we have conducted extensive field trials, albeit with some changes in the distribution profile.

Since we now have a large number of Aakash Project Centres (APCs), we have distributed between 130 and 280 tablets to each centre. The AADLs established by Prof. Jhunjhunwala, are also included in this list given in chapter 3. Instead of massive deployment at 10 Institutions as originally envisaged, we have limited this only to IIT Bombay and IIT Kharagpur. We have maintained sufficient stock to distribute to additional centres as these get established in regions with less number of APCs.

Each APC is engaged in the following activities:

a) Teachers participating in the T10KT workshops, conducted during vacation period, are given these tablets for use during the workshop, for conducting quizzes and for accessing e-learning contents of the workshop.

This usage has already been successfully tested in the workshop on DBMS, with over 9000 registered participants at 250 Centres.

b) Tablets are given to final year students, for projects related to further development of applications and contents.

This usage has also started. Early reports have been received from some colleges. These are included in a separate chapter. More usage will be reported within coming month, when the semester begins.

c) Tablets are given to a selected class of that college. The usage in and outside the classroom is monitored.

This usage has been extensively tested at IIT Bombay, and the results are very encouraging. Such usage in other APCs will begin with the new semester.

More importantly, a number of tablets have been deployed at IIT Bombay and the five AADLs at sister IITs for extensive development of applications and content. This amounts to very extensive field testing. These efforts include the research projects done at the level of M. Tech. dissertations.

6.1   Training and Orientation

The team at IIT Bombay acquired the necessary expertise in development of applications and content within the first 3 months of the project. Similarly teachers started using Aakash tablets in their classes in the academic year 2012-2013. In order to create a large community of teachers and students with similar expertise, the project decided to conduct training and orientation programs on a large scale.

6.2   Orientation Program for Teachers

This orientation program was conducted on 10,11 November 2012. Over 13,000 teachers from the APCs, participated in this program. On this occasion, Aakash 2 was formally launched by Hon'ble President of India, Shri. Pranab Mukherjee, on 10 November 2012. Hon'ble HRM Dr. Pallam Raju, Hon'ble Ministers of State Dr. Shashi Tharoor and Shri. Jitin Prasada, and Secretaries from MHRD, were present during this launch.

6.3   Training Program for Students

In order to train teachers and students of these colleges, we planned two training programs. The first was a 2 day orientation program for teachers, which was conducted on 10, 11 November 2012. Over 13,000 teachers from the APCs, participated in this program.

An Aakash Research Fellowship Award contest was announced for participating teachers. They were asked to form teams, and write essays on how best to utilize Aakash tablets to enhance the effectiveness of learning process, and to improve quality of education in engineering colleges. More than 2000 submissions have since been received. These are being evaluated through a peer review process.

A training program for students from these colleges, was similarly planned and conducted over 2 weekends: 23-24 February 2013, and 3-4 March 2013. More than 30,000 students originally registered for this training program. Because of the restricted lab facilities in our Remote Centres, we could accommodate only about 8,000 of these to attend the program and complete all quizzes and assignments, and they were awarded certificates. The program was greatly appreciated by the participants.

The following topics were covered in the workshop

1. Java Basics for Android

2. Introduction to Android

3. Android Environment: Installation Creating AVD

4. Eclipse IDE

5. A Simple Android Application

6. Android Building Blocks

7. User Interface and Controls

8. Resources and Supporting Multiple Screens

9. Data Storage

10. Basics of Image Handling and Media

11. Developing Web Apps on Android OS

12. Publishing your Android App

13. HTML5 on Android

14. Version control, Documentation, and various software licenses

15. Advanced Android Debugging

16. Introduction to Animation a) View Animation b) Property Animation

17. Android Canvas

18. Interactive Educational Animations on Aakash Tablet

19. Android Internals

20. Android Policy Framework

21. Android Security

22. Efficient Energy Utilization

23. Authentication Mechanism on Android

24. Handling Low Memory Scenario in Android

25. Android Permission Model

26. Data Visualization Issues on Aakash Tablets

Additionally, we also announced an Aakash Android application development contest. More than 700 students have registered for the contest, and 250 project ideas have been submitted.

6.4   Training Program for Interns

Like each year, good students from different colleges are invited to work at IIT Bombay during summer months as interns. This year, the Aakash project announced a large scale internship program. Over 3,000 students across the country applied. A total of 160 students from 80 colleges in the country were admitted to the internship program.

All these students were given extensive training in Android apllication development. Covering all the topics listed in the previous section.

In the following months, teams of interns developed several useful applications. These have been added to the Aakash repository of Open Source applications.

6.5 Development of Training Material

The video recording of all our training sessions is now undergoing post production editing. All examples and sample code used druing training, is similarly being compiled on the project Moodle. Entire training material will be released on the project portal in Open Source. This will enable the learning community across the country to freely access the material and develop experties on their own.

As planned, the content and applications developed on Aakash are released in Open Source, under creative commons license. Subsequent chapters describe the work done in this regard.

Chapter 7

Aakash Project Summaries (IIT Bombay)

7.1 M.Tech Theses Abstracts

List of Research Projects Completed between July 2012 and June 2013 by B.Tech/DD/MTech Students

Coordinated By
Nagesh Karmali

Preamble: 26 research projects on Aakash have been successfully completed. The primary research focus was on wide range of cutting-edge solutions to various upcoming technological problems in integration, content synchronization, performance benchmarking, issues in small-powered devices, effective utilization of small-computing devices in education, energy-efficient solutions for tablets, and other relevant areas. Apart from these, the focus has also been on inter-disciplinary research and development in education and teaching pedagogy.

All detailed reports along with the history of each of the projects is available at the following wiki: `http://www.it.iitb.ac.in/arndg/dokuwiki/index.php`

1. Maximising the Shared Bandwidth for Classroom Quiz Conduct Scenario in Wireless Environment

by Pramendra Singh

Abstract: In 802.11 Wireless LAN, performance of the network starts degrading with increase in number of clients. As the number of STAs increase beyond 40, performance starts degrading significantly because of increase in interference and collision. Due to this, network stops supporting any more clients. To resolve this problem, we have proposed a random batch-mode connectivity algorithm. The proposed scheme can be used for the classroom quiz conduct scenario. In this scheme, we have used the fact that in quiz scenario, STA dont need persistent connectivity with AP and the data to be transferred is of small size. With our scheme, large number of clients can be supported using a single AP. We have tested this scheme on real test-bed and results show that performance is increased many folds. Hence, in order to support large number of clients for quiz conduct, our solution can be efficiently used.

2   Content Synchronization in Aakash Tablets

by Debashee Tarai

Abstract: This project aims at developing an application for Aakash Tablet that will automatically synchronize content between tablets inside institution as well as in between institutions. This report describes about Content Synchronization which is a data distribution methodology, where selected data are automatically delivered to Tablets in real time at prescribed intervals. Proposed architecture for content synchronization application aims at synchronizing all the information and data kept in a pre-specified directory of a tablet to and only to the authorized tablets along with keeping a back up in the central server, thus establishing consistency among data contained by individual tablets.

3   Content Synchronization Architecture for dissemination of Media Contents between Institutional Hubs and Student Tablets

by Gyanranjan Shial

Abstract: The aim of this project is to synchronize student's and teacher's files with each other. For this I am developing an android application which is using a secure FTP server for central storage i.e. institutional hub and some number of tablets and a teacher's PC for this architecture. Here the application will help students and teachers to share their question papers, assignments and answer sheet and tutorials(may be video file or presentation slides) via a FTP(vsftpd) server. The application is also providing all the features and security for student's as well as teacher's contents.

4   End-to-End performance Analysis and Scalability of Tablets

by Deepak Jayanth

Abstract: The Growing popularity of wireless devices such as tablets, smartfones demands more advancement in the wireless LAN technologies. Although these wireless routers are rated at a throughput of 54Mbps,100Mbps,etc., the maximum throughput observed is typically of range 20 to 30 Mbps and it keeps on decreasing as the number of connected people to it increases. Wireless classrooms applications are limited simply by the wireless router's speed that can be guaranteed to simultaneously connected wireless users. This paper identifies the bottlenecks in connecting large number of wireless users(typically of 100+) in situations such as wireless classrooms to a single access point. This paper also examines possible approaches to reach that target.

5   Experiments and Testing Clicker application on Aakash using WiFi

by Abhishek Zanane

Abstract: This project aims at testing and experimenting Clicker application on multiple Aakash tablets in WiFi environment. It endeavour to facilitate connectivity of maximum number of tablets in wireless medium for conduct of Clicker quiz by using various network topology. Detailed testing experiments were carried out for measuring throughput for Clicker application on WiFi tablets and laptops. Effects of interference from other existing Bluetooth

devices and Wifi Access point in the vicinity were also considered during communication.The available TPLink wireless router was also compared with other DLink wireless router to compare of the throughput of the router. In the project Clicker code was also analysed and smoe improvements are suggested to improve throughput of the application. Clicker quiz was conducted in real time environment for various occasions to observe transmission and reception of Clicker data to all Aakash tablets (maximum of 100) participating in the quiz. Access Points and Wireless routers were tested for its features like Maximum data transfer rate, Channel utilisation Received Signal strength. Various topologies for connecting wireless routers in quiz hall were also tested to provide reliable connectivity to all tablets.

6   Classroom teaching using handheld devices

<div align="right">

by Neeraj Dhariwal

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Abstract: Considering the increasing class sizes and rapidly improving technology, the use of handheld devices can add great value to classroom teaching. This project aims at introducing the use of tablet PCs in the classroom for the purpose of teaching and learning and to replace the traditional whiteboard based teaching system with this new system. This document describes a new classroom teaching system with the use of tablet PCs without using whiteboards. The idea is based on the growth of hand-held devices e.g. tablet PCs which can be used to make notes during a class by directly writing on screen with the help of a stylus pen. The system provides an alternative for both whiteboard and notebooks, as it facilitates the students to see what the teacher is teaching on their own tablet PCs at any point of time. At the same time, it allows them to make notes on their own screen on top of the teaching material received from the teacher. The project aims at enhancing the students' ability to concentrate while attending classes by making them free from copying the contents of whiteboard in order to make overall classroom teaching more effective. It also attempts to reduce teachers' overheads, e.g. taking attendance. It allows the teachers to monitor each student's progress individulally, and testing any students at any point of time by sharing his screen with the students.

7   Prediction of Endsem Marks and Grades

<div align="right">

by Pavan Kotha

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Abstract: Education today is influenced by technolgy evolution on one side and requirements of society on other side.The main mission of our educational research is to solve the problems of society and give better education to everyone.To satisfy the increasing demand for technical education, computers and web are being harnessed.Currently there are many e-learning platforms which provide online education.No current e-learning platform is concentrating on improving the performance of student.This survey provides some key insights of improving the performance of students by predicting endsem marks and grades apriori and discusses about designing aspects of an effective online course.

8   Automated Segmentation and Tagging of Lecture Videos

by Ravi Raipuria

Abstract: Now a days, Many universities provide free lecture videos for distance learning education. It is very difficult to browse within those videos for a particular topic of interest. Generally, video lecture duration ends up about 90 to 120 min. To make best use of this, an efficient content retrieval mechanism is required for searching the keyword in lecture videos. However, The problem is not to find lecture in video archive rather than finding the proper position of desired keyword in video stream. Our aim is to develop a content-based retrieval tool for providing efficient browsing within lecture videos.

9   Intelligent Tutoring System in SCORM Framework

by Subhasmita Mahalik

Abstract: An intelligent tutoring system (ITS) is a computer system that aims to provide immediate and customized instruction or feedback to learners, usually without intervention from a human teachers[1]. Sharable Content Object Reference Model (SCORM) is a collection of standards and specifications for web-based e-learning[2]. It defines communications between client side content and a host system called the run-time environment, which is commonly supported by a learning management system. SCORM also defines how content may be packaged into a transferable ZIP file called "Package Interchange Format". Communication module of ITS falls under the SCORM RTE, SCORM SN together with SCROM CAM can handle the functionalities of the pedagogical module. Student model can be implemented through Tracking Status Model and SCROM RTE Data Model.

10   Information Visualisation on Tablet PC - Implementation & Issues

by Sanobar Nishat

Abstract: Visualization is an abstract representation of data element and information in some se-mantic form. Information visualization techniques have been studied by many researchersand are developed in many forms for medium to large size display devices. Increasingdemand of hand-held devices (e.g. Tablet PC, PDA (personal digital assistant), smart-phone etc.) necessitate the development of innovative visualization techniques suited forsmall display devices. Though, these devices pose several limitations to transport theexisting visualization techniques on Tablet PC, PDA and mobile phones. Some of thelimitations of these devices are small screen size, limited computation power,and limitedmemory.This work provides a brief overview of the information visualization techniques andinteraction mechanisms, designed for hierarchical data for medium to large displaysize. The work also explains issues and modification in transporting the existinginformation visualization technique, on small screen devices, particularly on TabletPCs. An experimental approach is used to compare four well-known visualizationtechniques including Space Tree, Hyperbolic Tree, Icicle Plot, and Treemap, for displayinghierarchical data. The designs are evaluated on three criteria i) task completion time, ii)task correctness, iii) user interaction and satisfaction, and iv) understanding of designtopology. The result suggested that Space Tree visualization is preferred over othervisualization for searching tasks while treemap is preferred for topological and comparisontasks.The work also demonstrates the implementation of a browser-based tool for visualising hierarchical data on discussed visualisation techniques. The tool allows

user to share,explore, and analyse data. A file uploading feature is also incorporated in the tool whereuser cannot only view data from database but also from an external file. Currently, onlythe excel file format is supported by the tool.

11   EMMO Implementation for Proxymity

<div align="right">

by Anurag Sharma

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Abstract: e-learning is becoming a revolutionary force for improvement in education standards and quality. Present availability of e-learning is in the form of repositories for educational content which encode the content of presentation and video but not the information the content conveys, resulting in lack of learning personalization. This dissertation discusses the use of structured model, EMMO as a basis for semantic based multimedia content sharing. It is cumbersome for students to search through an entire video, or across many videos, in order to and portions of their immediate interest. It is desirable to have a system that takes user-given keywords as query and provides links to not only the corresponding lecture videos but also to the section within the video. It should also allow the teachers to author new educational content. An attempt has been made to make a system which could store the lecture videos in a tagged format and make it available to the learners over the World Wide Web. The system also provides the user the ability to author new content in the form of lectures and courses.

12   Design of Compressed Cache in Android

<div align="right">

by Subbanjaneyulu Reddy

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Abstract: Abstract Android is a software platform and operating system for mobile devices, based on the Linux kernel. Memory is a scarce resource in embedded systems like Android. The complexities and resource demands of modern embedded systems such as Android smart phones are constantly increasing. Increasing memory often increases packaging costs, cooling costs, size, complexities and power consumption. At low memory situations Operating System swap some of the pages to swap device, usually secondary storage to find some free memory in RAM. Android does not have swap space as the secondary storage is Flash memory, which suffers from wear leveling property. When there is a scarcity of memory, Android Low Memory Killer kills some of the processes to free the memory. Compressed RAM is a technique where pages are compressed and stored in the RAM itself. Objective of the Compressed RAM project is to use part of the RAM as swap device. The pages swapped to this device are compressed and stored. Hence the effective memory of the device increases. This Thesis investigates traditional Compressed RAM approach and designed a new approach for Compressed RAM called as enhanced Compressed RAM. We have simulated both the approaches where we are able to double the number of pages stored in compressed area than in traditional approach.

13   Security issues in NFC and its countermeasures

<div align="right">

by Arpit Jain

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Abstract: The aim of the project is to make Near Field Communication(NFC) more usable by finding the security issues in NFC and the countermeasures available. First stage of the project includes the survey of relay and other attacks in NFC and the methods such as network location awareness, Distance protocol etc used to mitigate such attacks, and also

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studied various applications where NFC can be used effectively. Earlier NFC is used for transaction purposes as it provides secure transaction because of shorter range, but this shorter range can also be used for more precision in Indoor navigational system. This is the main focus of second stage of project, to come up with the new Indoor navigational system which finds the user location using NFC receiver and based on that helps the user to navigate inside building. At the initial stage, surveyed various other technologies like Wi-Fi fingureprinting, GPS, Network location provider etc used for navigational purposes, but GPS cannot be used inside building and the other two methods are not good if the precision is very high, as the technology used for user location works on a larger range. At this point NFC is the best approach that can be used with location erorr of $+/-5$cm which is very less.

14   A Policy Enforcement Framework for Android

by Kaustubh Keskar

Abstract: In this project, our aim is to design and implement a context-aware, multi-user policy enforcement framework for Android. User should be allowed to define fine-grained context-aware policies using this framework. Context-aware policies depend upon various context attributes like time, location, battery, etc. The framework should be implemented in such a way that only trusted third parties (schools, teachers, parents) should be able to define policies for the device. Trusted third parties are to be considered at different priority levels to decide which policies to enforce in case of policy conflicts. In some of the existing frameworks, policies can be defined and enforced remotely using mediums like SMS, Bluetooth and WiFi. SMS is a paid service, Bluetooth has very limited range and use of WiFi requires continuous polling to the server, which drains the battery quickly. Our enforcement framework should make use of push-based solutions like GCM,to allow users to enforce policies remotely.

15   Enhancing Permission Model of Android

by Nitin Satpal

Abstract: The Project aims to change the Permission Model of Android to make it protected from the attacks from the third party apps. The current Permission model is coarse-grained and is vulnerable to various attacks. A new privacy mode has been made to appropriately modify an app's access to the various private information stored in the phone. By using the model proposed by "TISSA", user will be able to control an untrusted apps access in a manner to specify what types of private information are accessible to the app. User can change the legitimate permission to "Bogus" or "Empty" so that the bogus or empty result will be returned to app respectively. Other than this, we are also concentrating on various Attack detection mechanism in Android Phones. We will compare various mechanism on the scale of performance, time, efficiency etc. and will proposed a new efficient solution for attack detection.

16   User Authentication Mechanisms on Android

by Anshita Agarwal

Abstract: This project aims at developing an application for Aakash Tablet that will perform continuous authentication based on Face Recognition to authenticate the user of the tablet. The application will ask the user to first train the face recognizer by capturing certain number of images. Once this is done, the application will then check whether the trained

face matches with the face of the user currently using the tablet or not. If the face doesn't match the application will lock the device. The user will then have to enter a passcode to be able to use the device again. The application performs recognition automatically after the intended duration of time preventing the illegitimate user from using the device even after device has passed the initial unlock challenge.

17   Energy Efficient applications for low powered devices

by Anjali Singhal

Abstract: The smartphones, now a days, are not only used for the basic purposes such as calls, etc. but also for many different applications for many different purposes releasing everyday for navigation etc, hence constraint on energy consumption has become huge bottleneck. We study various techniques to improve the battery life focusing on application level so that developer of each application can build the application such that energy consumption of his application can be optimized reducing the burden on battery of the device. Researchers have provided many solutions to optimize energy consumption that includes detection of energy bugs, battery virtualization, also various optimizations for different kind of applications. We also study for network intensive applications, CPU intensive applications, etc many approaches to optimize the energy consumed, considering energy-performance trade-off. For these optimizations, developer should have clear idea of where the energy is spent inside his application so we also discuss various tools and techniques available to model energy consumption. Hence, our project aims to detect the energy bugs present in the android application precisely by using IFDS/IDE Solver and provide further algorithms so that these bugs could be taken care by the users as well.

18   Page Replacement Mechanism for Small Foot-Print Database in Android Devices

by Pratik Patodi

Abstract: Android devices are becoming popular due to their lower cost and increased integration with Google services. Open Source Andriod-SDK encourages the development of vari- ety of applications for mobile devices. Mobile devices uses flash drives as their memory resource. Considerable amount of data needs to be stored and organized for these ap- plications. Flash drives have certain limitations for writing data. Database logging adds a major bottleneck against the fast response time of update transactions, especially for large update transaction, since a large amount of log should be flushed during commit. In this report, we propose a new page replacement technique and compares it with existing approach used by androids native database, SQLite. An overview of adaptive logging approch is also provided in the report which can be further used as an enhancement.

19   Effective Handling of Low memory Scenarios in Android

by Rajesh P.

Abstract: Android contains so many Empty applications inside RAM. Activity Manager Service and Low memory killer kills some of the applications in low memory scenarios. My project objective is to reduce number of applications gets killed in low memory scenarios and reduce the response time of user interested applications. So we implemented an application named Apps Logger which helps to capture list of user interacting applications and

periodically predicts a list of applications which are more interested to user based on recency and frequency(last one week). We modified the android source code of Activity Manager Service(AMS) to provide features like do not kill user interested applications (received from Apps Logger application) till free memory is less than some threshold and one more feature like consider the free memory size before killing an application. Android memory management unit also plays vital role in great success of android among other operating systems. Memory is a very limited resource especially in embedded sys- tems like phones and tablets. Android contains modified Linux kernel for handling low memory scenarios and other issues. Out Of Memory (OOM) killer in linux kills some of the processes in low memory scenarios. This report gives details on different set of problems in OOM killer. Activity Manager Service(AMS), Low Memory Killer(LMK) in android kills some of the applications in low memory scenarios along with OOM killer. In low memory scenarios we should not kill user interesting or user frequently accessing applications. If we kill any user frequently accessing applications, then we need to load those applications, if user wants to access those applications in future. Load operation is costly, it takes nearly 3-5 sec to load an application, as it varies from one application to others. So if we can predict user interesting or future accessing applications using user log history, we can reduce number of applications gets killed in a period of time. We devel- oped AppsLogger application, which predicts the user interesting applications using log history. We modified traditional AMS source code in android 4.2, such that AMS do not kills user interesting applications received from AppsLogger. We are succeeded to reduce x% number of application gets killed in a period of time using log history as compared with traditional approach. We are succeeded to reduce avg response time of accessing any application as y% , z% in log based exponential,linear approaches as compared with traditional android approach.

20   Minimizing Boot Time of Android Based Devices

by Nimit Kalaria

Abstract: Smart devices are becoming popular day by day due to its different features. These different features have their own initialization time which affects the boot time of the device. Boot time of the device should be minimal. Smart devices like phones, tablets are used by different people of different fields like industries, entertainment, students, etc. Where devices should boot quickly. Thus, it is necessary to minimize the boot time of smart devices. Boot time of the device can be minimized by either using a better hardware, or by optimizing the device boot sequence. Boot sequence contain Zygote class preloading, package scanning and starting of system and third party application by Activity Manager. We will optimize the device boot sequence by optimizing these individual part. For experimental setup we have selected an Open Source Android based emulator.

21   Finding Issues in Clicker and Suggesting Solution Approaches

by Arpit Jain and Sailee Jain

Abstract: Clicker is a student response system used to capture responses from a live audience in real time. It is a quiz application which helps teachers to evaluate students as well as to give them feedback regarding their performance by generating the reports based on the previous records of quizzes of every student. There are certain networking issues and functioning problems clicker which lessens its usefulness. This report focuses on these problems and their solutions proven with the help of experiments conducted. Also major

part of work includes the integration of clicker with moodle in order to improve its usability and accessibility. We present an application that provides access to moodle not through web but via android interface.

22 Encouraging class participation using Tablet-PCs

by Raj Agrawal and Naveen Bansal

Abstract: The diminishment of class participation among students is the aftermath of various factors like cultural diversity, class size, gender difference etc. Efforts have been made to introduce computer technology, particularly the use of Table-PCs in education system to encourage participation. The conventional way of students' participation and evaluation is only limited to objective approach, in which the students are only asked multiple choice type questions (MCQs). Whereas subjective type discussion, where complete information flow among students can be achieved has not been encouraged due to overhead in evaluation and other logistic constraints. Experiments are conducted to demonstrate the importance of class discussion and improvement in students understanding. The approach is to present a student discussion forum which will provide an automatic evaluation method of students, participated in the discussion. The purpose is to obtain the students class participation rate and understand their academic need. Certain limitations of this approach have also been discussed in the report.

23 Database Recovery Mechanism For Android Devices

by Raj Agrawal

Abstract: Android devices are becoming popular due to their lower cost and integration with Google services. Open Source Andriod-SDK encourages the development of variety of applications. Considerable amount of data needs to be stored and organized for these applications. Flash Memory is well adapted to store any type of data and provides secure services in a mobile devices. But many cases of application failure, can corrupt data in flash Memory. This report compares two most popular recovery algorithms used in Database Management Systems, i.e. shadow paging and log based. The report also highlights the benefits of using shadow paging for flash memory devices. An overview of adaptive logging approch is also provided in the report.

24 Graphics On Tablet

by Dhananjay Ambekar

Abstract:Tablet computers have grown enormous number of users in last few years. These slate styled devices use touch screen as main user interaction component. Tablets provide more mobility and comfort when compared to laptops. Tablets have become users premier choice device for information access. As a part of information visualization, Graphics on tablets and related technologies have become one of the important aspects in the field of tablet computing. This report discusses different visualization techniques along with method of implementation. Later part contains a discussion on visualization tool and Study of technologies in Aakash II tablet.

25 Small footprint Database on tablet

by Nilesh Birari

Abstract: Advancement in technologies lead more use of mobile technology. In recent technological advancement in devices and communication technology makes the way for data-driven applications, where these applications can access data from anywhere, anytime. However many technical challenges are there. In this report, we will study architectural model of the mobile database system, and will identify the requirements for a mobile database and introduce the design consideration for critical requirements. On the basis of this, we analyze the functionalities of existing commercial databases, and state the consideration of some features for Small footprint databases.

26 Issues in Performance of Wireless Routers & Open Source Firmwares

by Sukh Deo and Prashant Kumar Singh

Abstract: Wireless router is a device, that provides Internet connection without ussing wired link. It performs as a wireless LAN. But, problem is how to increase the performance of a wireless router? First, we discuss the main issues that is related to performance of a wireless router. Second, we can choose good wireless router based on the requirement. Third, we can extend the wireless protocol for increasing the performance of wireless router.

   To increase the performance of wireless router, we can upgrade the firmware. Firmware is a piece of software that provides services to hardware. We can simply say, it is a piece of software for some hardware. When we purchase any router, its hardware may be capable of providing many features but the manufacturer simply decides not to provide these wide range of features just to keep things simple and they sell the routers with these features at a much higher price.

7.2 Arterial Pulse Analyzer

In the virtual lab project, we have developed a low-cost Arterial Pulse Analyzer which provides run-time display of arterial pulse waveforms during the test, as well as provides analysis of the waveforms in digitally storable format. Several parameters are computed from the waveforms, which serve as indicators of cardiac health. In this way, the device serves as a low cost alternative to an ECG. The setup is portable, and consists of 2 straps, one each for the radial and brachial artery, with piezoelectric sensors mounted on them. Signal processing and analysis is done using Python on the Aakash. This system is portable, requires minimal power, and costs less than Rs 1000, and the technologies employed are free or open-source. We intend to deploy this as an automatic cardiovascular screening device for public health centers in developing countries; such centers typically lack access to medical experts and diagnostic devices for cardiovascular diseases. The device is undergoing extensive testing at public health centers in rural Maharashtra and at major hospitals in Mumbai including KEM, Hinduja, and Tata Memorial Hospital. A youtube video on this device, may be found at `http://youtu.be/YR46jAflfUI`

7.3 Microscopy on the Aakash

In virtual lab project, we have also managed to interface low cost digital microscopes to the Aakash; this has excellent potential as a learning device for school children who wish to learn about structure and morphology in biological samples and of different materials. The microscope is a Chinese make, available at a cost of Rs. 4,000. It has been interfaced using arduino board on the Linux operating system, running on Aakash. We have conducted pilot workshops in schools, where the children used this device to see the details of leaves, feathers, etc. The school children really liked this device. A youtube video of this is available at `http://www.youtube.com/watch?v=xd2SPvfejRA`

7.4 Galla-on-Akash

Galla, developed by the Developmental Informatics Laboratory(DIL) at IITB, is designed to empower small (kirana) retail stores with the tools of information technology, to conduct their business more efficiently and flexibly. It supports tasks such as billing, cash flow, customer credit tracking, inventory, and vendor account management. Galla lets the shopkeeper retain his current business practices such as personalized service and credit to customers, while harnessing the benefits of information and modern practices for decision making in traditional shops. Several prototypes have been tested in scores of shops, and a proof-of-concept system has also been developed on the Akash platform.

7.5 GATE on Aakash

This year, for the first time, we did away with the printed version of the verification lists for the GATE exam in the IIT Bombay zone. A verification list is the set of candidate data including photographs and signatures, against which the invigilators can check suspect Admit cards. It is the authoritative copy of the candidate data for the GATE exam. By using a custom developed Android application for Aakash, the IIT Bombay zone saved printing 15,000 pages of paper, besides the added advantage of being able to search for specific candidates with one click, based on various parameters such as candidate name, date of birth, etc.. Paper lists

have to be searched sequentially. All users reported a positive experience with this application. The GATE team is now planning on implementing this across the country, in the future.

7.6   ekShiksha

http://www.it.iitb.ac.in/ekshiksha/

Bringing to life content prepared by the best minds (NCERT textbooks) with interactive exercises and experiments, is the primary objective of this initiative. Any school/institution can register with the site and download content for distribution to their students through their own labs provided they agree to provide us valuable feedback. All students can access the content absolutely free of cost.

Additionally, the initiative attempts to provide a ready to deploy methodology for companies and philanthropists to directly benefit the students in a measurable manner. The activity believes that government alone cannot meet the needs of 400 million children under the age of 18 and we need a concerted public/private initiative to provide a glimmer of hope to millions of underprivileged children. All the active lessons developed under this initiative are being ported to Aakash. All of these work on a browser.

7.7   OSCAD

http://oscad.in

Oscad is an open source EDA tool for circuit design, simulation, analysis and PCB design. It is developed by the FOSSEE group at IIT Bombay. Oscad is built using open source software, such as KiCad, Ngspice, Python and Scilab. One can do the following using Oscad : create a circuit schematic, generate netlist and simulate it; do PCB design and generate Gerber files; add models and subcircuits; generate differential equations of analog circuits and solve them through Scilab.

Oscad runs on Ubuntu Linux and a few flavours of Windows (XP and 7, at present). We have written a book that explains the use of Oscad. The book, Oscad examples and Spoken Tutorials that explain the use of Oscad are all available for free download from http://oscad.in. Oscad runs on Aakash, the world's lowest cost tablet.

7.8   Spoken Tutorials

An article written by Prof. Kannan Moudgalya, in the communications of CSI, best describes the spoken tutorials. All spoken tutorials have been ported on Aakash, and work seamlessly on the device. The article is reproduced below.

A spoken tutorial is a an audio-video tutorial that explains an activity performed on the computer. An expert explains the working of a software, by demonstrating it on the screen, along with a running commentary. A screencast software makes a movie of the entire activity, both the screen and the spoken part. This movie is the spoken tutorial. The running commentary can be in English or in any other language.

Spoken tutorial is a recording of an actual session. As a result, it can capture every step that is required to explain an activity. This completeness, combined with an accompanying audio-video tutorial makes the spoken tutorial the best way to document and to explain a software or a computer based activity. Creating a document in any other way is inefficient. A ten minute video, for example, can have about 100 screen transitions. Imagine the work involved in taking screen shots and using them to create a pdf document.

The size of the video created is of the order of 1MB per minute, for a 800x600 screen size in normal resolution. The file size needs to be small for transmission through low bandwidth and also to pack a large number of tutorials on a CD, meant for countrywide circulation.

We have been using this methodology to create a series of tutorials in open source software families, such as LaTeX, Scilab, GNU/Linux, ORCA and Python. We have selected the duration of a typical spoken tutorial to be about ten minutes long. Although only a small topic can be covered in ten minutes, by stringing them together, one can come up with study plans that are capable of teaching advanced topics as well.

Our approach involves the creation of a script before creating the video, just as a movie is based on a script. It is possible to translate the script into other languages and use it to change the audio part only - screen shots continue to be in English. The effort required to change the audio is only about 5% of creating the original. For example, visit http://spoken-tutorial.org/Xfig_Spoken_Tutorials and see the Gujarati link for Simple diagrams. This method has the potential to reach out to people weak in English, while not compromising on the employability.

Spoken tutorials can also be used to bridge digital divide. For example, one can use it to explain how to write emails, how to buy train tickets online, and how to open a bank account. One can explain how to do a web search and locate low cost agricultural loans. We can also make available information on primary health care and first aid. Finally, unlike print ads, the Internet based ads can be more easily located. The government has mandated all government agencies to issue Internet based ads for recruitment. In my opinion, not having access to IT makes one a second class citizen. Spoken tutorial has the potential to empower every child in our country.

The target audience for a spoken tutorial is a remote child, working alone at midnight without anyone to help her. This is the only time when she will get time to study, after completing all her chores. In order to make this technology accessible to her, we restrict ourselves to free and open source software (FOSS) only. The low cost tablet PC to be launched by MHRD soon, will make the required hardware also within her reach.

The task at hand is huge. Creation of 10,000 original spoken tutorials and to dub them into 20 Indian languages seems to be a good target to set. We have an honorarium of ' 5,000 to create one original tutorial and Rs. 1,500 to dub it into a local language. Required funds are available through a generous grant from the Ministry of Human Resources Development (MHRD).

Although extremely easy to create, quality has to be ensured to make the spoken tutorials useful. Thus the targets make the spoken tutorial project a mammoth task. To do this in a reasonable time, participation by many people in a collaborative manner is indispensable. How to ensure quality when the creators could be disparate people, such as students, housewives and unemployed, seems to be a good R&D problem to address in the area of educational technology. This is a problem our group has been working on for the past three years.

I will now highlight the collaborative nature in creation and use of spoken tutorials. Let me begin with the creation. The sequencing of the tutorials and their content is to be decided by an expert. The script for an individual tutorial can be written by a person who knows that activity well - she need not be an expert in the entire software. Novice check of the script is an important requirement of our process. A novice who has validated a script can create the tutorial through screencast, and also get paid for it. Our project must be one of the few that pays a person to learn.

Using a novice to do the check and to encourage them to create the tutorial increases the number of people available for the project. Moreover, this makes even the beginners wanted and actively helped by the experts. Contrast this with the procedure to interact in FOSS forums, where the beginners are nobody and a wrong question could invite the wrath of the experts and may even force the novice to leave FOSS completely for good.

We came up with the idea of novice check after interacting with the office bearers of the Web and Coding Club at IIT Bombay. Although there are more than 1,000 members in this club, not more than about 5% are experts. It will be interesting to try our methodology and see if we can encourage a large number of beginners to become experts in select areas. The above discussed problem of expert- novice interaction is universal and hence our model can be deployed in any college, for example.

Let me now talk about translation and dubbing. We need people who have a good command over a language to do the translation. We have found the people from the previous generation to be mature and capable of providing good translations. Unfortunately, they are not necessarily comfortable in giving the voice and dubbing, as this involves the use of technology. This is where our younger generation comes in. Although may not be good in translation, they are quite comfortable in speaking and using modern technologies. We have honoraria of ' 1,000 and ' 500, respectively, for translation and dubbing of a ten minute spoken tutorial.

This approach allows difficult technologies also be made available to languages with low population, such as Sanskrit and Boro. One need not have experts in the domain. What is required is for one to translate only the spoken part. I would like to point out another form of collaboration that has happened in dubbing. The creator of PHPacademy has agreed to give his video tutorials on PHP/ MySQL to be used by our project. Our PHP programmers, who hail from rural areas, have found it difficult to transcribe and create the script of these tutorials, as the accent is difficult to follow. The school going IIT Bombay campus children have had no difficulty in transcribing, however. The fact that they are raised in a city and exposure to English from early childhood makes them eminently suitable for this task. As a matter of fact, they also dubbed the tutorials in Indian English. These tutorials can now be used by anyone who aspires to be a web designer, irrespective of their command over English and irrespective of the quality of teachers they have. This shows the effectiveness of collaboration - contribution by a few people, even children, can help the entire society.

How does one learn through these tutorials? Open the tutorial, reduce the size of the screen and keep it in one corner of the desktop. Open the target software by the side. Listen to a command in the tutorial, pause and practise on the software. If the command works, go to the next one. If not, rewind and listen to it again. Repeat until the entire tutorial is completed. One needs a head phone and a computer for this type of learning. It allows every participant to learn at their own pace and in their own language. As these tutorials are created for self learning, the domain expert need not be present to conduct the workshop. The organiser of the workshop only needs to know how to use this material. As a result, anyone can conduct these workshops. We have validated this approach through student club organised workshops in a college in Alwar, Rajasthan and SASTRA university in Thanjavur. We provided the instructional material through a CD and moral support through Skype. We also conducted online exams, before and after the workshops and gave certificates. The Alwar students showed an 85% improvement after the workshop. Moreover, all of them passed the second test.

Using ORCA spoken tutorials, our staff member Krishnakant Mane conducted a workshop for visually impaired children at IGNOU, Delhi. Although there were a lot of chaos in the morning, such as computer not booting, head phone not working, etc., in the morning, there was a pin drop silence in the afternoon, as everyone was learning on their own. Those who lagged behind would have completed the unfinished tutorials on their own, at home. For the last three weeks, we have conducted spoken tutorial based workshops at IIT Bombay. We ran the LaTeX workshops every day, from 6 pm for two hours. More than 200 students went through these workshops, half of them being Ph.D students. We have now started linux workshops. Once again, there is an enthusiastic response from the campus community.

A word about the conduct of these workshops is in order. We have come up with a set of instructions to be followed in the workshop. The participants have to follow them strictly. For example, we ask the participants to use the command pdflatex only to compile the LaTeX documents. If instead they try the command latex and get stuck because TeXNicCenter does not know how to locate the resulting dvi file, we claim helplessness. In view of this, one can say that our process is rigid. But if one wants to learn LaTeX in two hours, there seems to be no better way. Moreover, this approach allows non-experts also to conduct the workshops, an important requirement for scalability. This approach will also allow one person to handle a large number of participants. The only help the organiser has to give is to point out what instruction is not followed and to ask the participant to start the 10 minute tutorial from scratch. If the organiser gives domain dependent answers, we need to worry about their competence. Moreover, as there could be many types of questions and difficulties, many experts are required in every workshop.

We have completed about 400 tutorials. We are now trying to get partners who will share our enthusiasm to create the content and to organise workshops. We are now working with a startup at IIT Madras and an NGO in Bengaluru. We hope to generate at least 600 more tutorials and conduct 100 spoken tutorial based workshops by 31 March 2012, the last date for funding by MHRD. But there are indications that this project will continue, as the National Mission on Education through ICT that is funding this project is likely to continue in the next plan period as well.

We invite all readers to participate in our project. We also need the state of the art technologies. A summary of this project is available at http://spokentutorial.org/What_is_a_Spoken_Tutorial.

7.9 Aakash Lab

Aakash Lab

PROJECT STATUS

Outline

Aakash Lab is dedicated to developing software applications for the Aakash Tablet.

Our team at Aakash Lab has been involved in activities ranging from:

- Benchmark testing of the first lot of Aakash tablets
- Design and development of android based software applications for the Aakash tablets
- Conducting training workshop on Android Application programming.

Implementation Plan

1. **Requirements-gathering** from various stakeholders including faculty members.
2. **Software** design and collaborative software development on gitHub.
3. **Testing** including usability tests for user interactions.
4. **Porting** of applications from Android 2.3 to 4.0 ICS.

Team

The task distribution within current team size of 12 members is as follows:
Project Manager: Parag Tiwari
System Admin: (Saurabh)
- Maintain the Aakash Lab server and take periodic backups.

Software Engineers: (Ajay, Vivek, Ninad, Pradnya, Raeha, Tushar, Nilesh, Praveen, Sreelekha and Arun)
- proxyMITY and proxyMITY-WiFi: Raeha, Nilesh, Ninad
- proxyMITY web publish (HTML5) on desktop: Ajay, Vivek
- Robo Controller on Aakash: Nilesh
- DiaSlate on Aakash: Arun, Ninad
- Video Chat Application on Aakash: Pradnya
- Aakash Tech Support Portal: Tushar
- Aakash Developer Portal and HTML5 based activities: Nilesh
- XML Edit tool on Aakash: Sreelekha
- Video Transcoding application: Vivek

- MOOC prototype based on edX: Ajay, Vivek, Praveen

Current Status

- **Aakash Android Application Programming Workshop:** We successfully conducted a 4 day workshop for engineering students of 245 Remote Centers across the nation in March 2013.

- Student participation in the workshop:

Registered Participants:	30,119
Confirmed Participants:	17,564
Certificates awarded:	8,252

As a part of this workshop, we have an ongoing Android App Development Contest which will end on 24th July 2013.

Students registered for the Contest:	1,475
Teams Registered:	708
Project Outline submissions:	250

- **Aakash Tech Support Portal:** We have implemented an automated ticket based issue tracking system to handle technical queries related to Aakash Tablets. We are currently in User Acceptance Testing (UAT) phase.

- **edX based MOOC prototype course:**
We have installed the edX Platform on local servers, and hosted a 2 week dummy course to explore in-built functions and features provided by edX.
We are helping Prof. Ganesh to implement a Data Analysis course using edX for his Anganwadi initiative.

- **proxyMITY on Aakash Tablet:**
proxyMITY enables students to access quality lectures of reputed teachers, for effective personalized learning: anytime and anywhere. proxyMITY has two versions : sd-card version and Wi-Fi version. Lectures are tagged for topic wise navigation, and there are features like Bookmarks, Subtitles, and Lecture video transcripts.

Prepared by: Parag Tiwari
Date: 20th June 2013

7.10   Clicker

Clicker for Aakash Tablets

PROJECT STATUS

Outline

Clicker software is a student response system in which the instructor can make presentations, launch a quiz, conduct live polls, and generate results on bar graph. Using this system, students can write exams, ask questions, and view results instantly.

The purpose of this software project is mani-fold:
- To develop two different versions (web-based and native) of clicker software on Aakash. The web-based version is further classified into two different forms: local mode and remote mode; whereas native is further classified into with Wi-Fi and without Wi-Fi (using Wi-Fi Direct).
- To Benchmark both the versions and constantly monitor the output.
- Prepare user manual and videos to guide the users of clicker software.

Implementation Plan

1. Interact with the faculty to understand their teaching methodology.
2. Prepare and integrate modules within the project according to the discussion.
3. Test the newly added features with faculty students, staff, and participants of workshop, for usability.
4. Analyze the feedback and modify/optimize the code.

Team

Project Manager: Rajesh Kushalkar

The current team size is eight, coordinated by Tushar Kambli
The task distribution is as follows:
UI Designer: (Hitesh)
- Create UI Design as per existing code flow.
- Discuss and finalize the UI design with other team members.
Programmers: (Varun, Dipti, Rajavel and Gobinath)
- To work on each module of the project independently and later integrate it with the project.
- Discuss the issues which emerge while testing the application and resolve them.

- Optimize the code.
- Commit the code to the clicker server using svn through eclipse.
- Assign/Monitor tasks related to form layout and adding other features of the application to Chetan, Sachin ,Harshvardan and Kirti.

Current Status

The third version (Clicker Ver. 3) of this software has been launched.

Initially, we tested our software with CS101 students at IIT Bombay.
Later, it was made available for all 250 remote centers. Out of these, more than 180 remote centers configured the software successfully.

We have collected response from more than 1000 tablets simultaneously.

Benchmarking of the software on Aakash, happens at regular intervals which further helps us eliminate issues related to Wi-Fi.

Currently, the native version of our software is under development which uses technology of tablet-to-tablet communication without using Wi-Fi access point. It integrates audio plug-in instead of typing the query on Aakash.

Currently, the team is preparing user manual and videos related to configuring clicker software, which will be later made available to all remote centers.

A completely new UI of version 3, is under development.

7.11   3D Animation Content for Aakash Tablets

3D animation content for Aakash tablets

PROJECT STATUS

Outline

The purpose of the team is three fold:
- Investigate the type of 3D animated content, which can be used on Aakash, (in terms of pedagogy and technology)
- Test various methods for the content creation
- Publish about the successful methods for easier replication by others

Implementation plan

1. Interact with the teachers to understand their teaching plan
2. Shortlist the concepts/activities which 'require' 3D content
3. Prepare a teaching plan for the selected concepts
4. Create paper prototypes and test with teachers and students for usability
5. Create actual 3D content and port it on the tablet to test it
6. Analyze the feedback and create the final content for the tablets

Team

Current team size is six members. This includes three animators, two programmers and one manager.
The task distribution is as follows:
Animators: (Sneha, Amit, Pankaja, Yashodeep, Bipin)
- Create paper prototypes and test them with sample population
- Create final 3D imagery

Programmers: (Nitin and Pooja)
- Provide the desired interactivity options to the respective 3D animations
- Devise optimization techniques for displaying smooth motion on the tablet
- Suggest guidelines for the animators for modeling and texturing of 3D models

Manager: (Ajit, Sameer)
- Provide pedagogy and visual design inputs
- Facilitate the infrastructure and logistic support
- Oversee the content creation process and document it for further reference

Current status

Meeting with the teachers in the respective schools was held on 10th June 2013. The teaching plans were discussed, and a few suggestions were recorded.

However, prior to the meeting, few sample animations have been initiated to test the 3D interactivity on android tablets. These are based on the content created already for Project OSCAR, to save on creation time. These topics are:

- Magnet attracts objects made of iron
- Circuit for explaining the flow of current
- Structure of some sample molecules (HCl, CO_2, $Mo(CO)_6$)

The tests are being conducted for the topics mentioned above on Aakash as well as Google Nexus, to see the comparison. We propose to test the display issues based on the complexity level of the 3D models. This will help in coming up with guidelines for creating 3D content for android tablets.

Two topics emerged out of the discussion with the teachers from the schools at Pandharpur. These are:
1. Working of human ear
2. Construction of an atom

Currently, the team is busy in studying information about these topics from available resources (free and paid, both). Later, a pedagogy strategy would be decided for the 3D content to be created. Implementation plan, as mentioned earlier would be followed for creating the content.

Prepared by Sameer Sahasrabudhe
August 6th 2013

7.12   School Education

Aakash R&D Group

PROJECT STATUS

Outline

- Digitization of school textbooks using ePUB3 technology
- Testing of ePUB3 readers for digitized textbooks
- Using Aakash in schools
- Development of school textbooks for Maharashtra Govt.
- Teachers' training for using Aakash in schools
- Audio transcription of lectures, using software

Implementation Plan

- Select subjects and standard. Evaluate ePUB, or find alternatives. Work with other organizations for regional language support, and ePUB technology.

- Test and evaluate readers such as Aldiko, Ginden, SASTRA (PUSTAK) and Helicons.

- Identify schools for training their teachers. Coordinate with other stakeholders like CDAC, MKCL

- Plan for using our workshop and Aakash remote centers to train school teachers from nearby schools.

- Evaluate the accuracy of transcription software, to determine the manual effort required to complete the transcription.

Team

Manager: Dr. Madhuri Sawant
Team members: Ganesh Hegde, Pankaj Patil, Yougansh Sharma, Barani M., Charu Chaudhari.

Current Status

- Currently two team members are working on interactive books for SSC Board IX std. science and math in ePUB3. Due to unavailability of good ePUB reader for Aakash, we have shifted from ePUB3 to HTML5 with good results. Video, quiz, images are embedded in the text, making it interactive. We have also been able to insert flash files in .swf format.

- Aldiko supports only ePUB2 books. Ginden, an open source reader supports ePUB3 but has other issues. SASTRA University's PUSTAK reader has potential, but needs further work before we can port it to Aakash as ePUB3 reader. We also tested Helicons Books trial version. It also has a lot of limitations, and needs improvement.
- We identified four schools in Pandharpur in Maharashtra for the pilot. We conducted a workshop for the teachers on 10 June 2013, at IIT Bombay. This was to understand their present teaching methodology. WE have held meetings with CDAC and MKCL for development of interactive lessons on Aakash before the commencement of the pilot project in July.
- The Education department of Maharashtra state is interested in teachers' training on difficult topics of science, math, and English. We have a Remote Center in Pandharpur, and we have interacted with the schools through it. WE can use A-VIEW technology for this. Addl. Chief Secretary is discussing this entire project with Balbharati (State Textbook Bureau), and SSC Board Chairman.
- We are using Dragon Tool software to transcribe lectures. This software requires "speaker training" for increasing the accuracy. We are trying this with prerecorded lectures of known speakers.

7.13   Pilot projects in schools

As mentioned in the project proposal, IIT Bombay has already embarked on deploying Aakash tablets in selected schools, to study their use in school education. Three separate segments have been chosen for this pilot study. The ongoing efforts are briefly described below.

7.13.1   Shikshan Pandhari

This is the flagship effort of the school pilot. It attempts to deploy and use Aakash tablets in four schools near Pandharpur, a well known pilgrimage town in Maharashtra famous for ts Vitthal Mandir. Class 9 students of 4 schools in villages near Pandharpur, have been chosen for these trials.

It is interesting to note the strength of technology infrastructure in this region. National Knowledge Network (NKN) has established high-bandwidth connectivity through a node at an engineering college 'SVERI' in Pandharpur, and also a very powerful Wi-Fi connectivity to cover 'last-mile' to these four schools. An initiative led by Dr. Kakodkar and Prof. Takawale, is attempting to reform education in rural areas in Maharashtra. I had suggested to both Dr. Chindambaram and Dr. Kakodkar that, the Aakash pilot deployment can be dovetailed to these efforts. Use of tablets in schools, for possible distance learning, was first demonstrated at the first conference on NKN, held at IIT Bombay. 10 tablets each were distributed in the four schools. An interactive lecture was delivered to the students, from the conference venue. At the end, an on-line live quiz was conducted, which the students in different schools answered using Aakash tablets. Their responses were collected through the NKN network, collated, and presented to the conference attendees in less than 10 seconds after the quiz ended. A brief report on the activities in the Pandharpur pilot is produced below.

7.13.1.1   Aakash Pandharpur School Pilot Project

The project is led by by Dr. Madhuri Sawant, Sr. Research Scientist and In-Charge Aakash School Project

Project description
MHRD sponsored Aakash school pilot project aims to enhance quality of education in rural schools through use of Aakash tablets as a teaching/learning tool for teachers and students. This pilot project is confined to ninth standard students of SSC board four Marathi medium schools and sixth standard students of another school to improve performance in primarily Science and Math subjects. The tablets are given to all the teachers teaching one of the above mentioned subjects and to all the students. The tablets are loaded with curriculum based interactive text books lessons in eBook format along with other content comprising of videos, animations, quizzes and test papers. These rural schools from Pandharpur region of Sholapur district of Maharashtra state were selected for this pilot project mainly because of the availability of the high speed internet. All these schools are connected by 1 GBPS NKN network. Access points were deployed in the schools to create Wi Fi environment within classrooms.

Project Coordinators
Prof. D.B. Phatak - PI of All India Aakash Project
Dr. Madhuri Sawant : In-charge -Aakash School Project

Tablet distribution
Total 285 tablets were distributed in Rural Pandharpur area as per the chart given below.

Sr. No	School Name	Tablets Delivered
1	Lotus English School, Kasegaon.	15
2	New English School, Anawali.	50
3	Shri Sitaram Maharaj Vidyalaya, Khardi.	70
4	Darling Vidyamandir, Chale.	75
5	Daulatrao Vidyalaya, Kasegaon.	75

Although it was decided to give one tablet each child and distribute total 300 tablets to students and teachers, due to excessive demand from all ninth standard students from all the schools finally the same number of tablets were shared among 577 students. In three schools two students shared one tablet but in two other, three students shared one tablet. When the news of Aakash tablet distribution spread in these villages, even students who left school after eighth standard again enrolled themselves in the schools and started showing lot of interest in learning syllabus.

Steps taken
Before launching of this pilot, all the teachers were invited to attend one day workshop at IIT Bombay to understand their current methodology of teaching these subjects and the difficulties they faced during teaching abstract concepts. Based on their feedback, a training program was designed and content was prepared.

One day prior to launch, the team visited all the schools, tested Wi-Fi network, met with teachers and students and explained the intention of conducting this pilot in their school. We had to install Firefox browser on all the tablets since Aakash default browser couldnt connect to FTP server to access the content.

Launching of Aakash Pilot project
The most ambitious Aakash school pilot project was finally launched on 9th July, 2013 in all the five schools on the same day. The tablets were distributed to all students and teachers. The half day training was conducted for all the teachers on use of tablet as a teaching device in a classroom.

The team visited every school and students were trained in batches on use of Aakash tablet to access the content ported in tablets internal memory as well as from the server using WiFi network. The learning curve of the students was very sharp as lot of students learned to download content from the server, read the text book lessons ported on the tablet and also learned to use other tablet features such as use of camera, video, audio recording etc. Their performance was far beyond our expectation. Overall it was a delightful experience for all the students and teachers to get connected to the world they had never seen before to extract the information of their choice.

Performance measurements

- We have collected eighth standard annual report of each student, have given quizzes after each lesson, teacher will conduct quiz after completion of each lesson, the data will be collected and analyzed. These marks will be compared with their previous performance.

- We have given group projects to the students; they will use tablets to complete these projects and submit these projects in a months time. This will help us in knowing their ability to collaborate, cooperate and maturity in understanding of technology for learning. At the end of this academic year, based on these results, we will draw a conclusion that if use of tablet has improved their performance and overall development.

7.13.2 Experiment for using Aakash in Hindi Medium School

We have selected a school in a small village 'Bhikangaon' in the state of Madhya Pradesh. This schools has a specialty 'green-building', for which the electricity needed is generated by solar energy. Prof. Chetan Solanki of the department of Energy Systems at IIT Bombay, has been experimenting with Solar-charged lamps for use by village children in that school and nearby villages. A large project for providing a Million such lights to village children, has been just approved with him as Principle Investigator.

At our request, Prof. Solanki has developed a solar chargers which will charge both, a lamp and an Aakash tablet. 1,000 such chargers and lamps have been ordered. These and the tablets will be deployed in the school for 5th and 9th standered students. They will be taught Mathematics and Science in Hindi. Content creation work for this task, has just started. An Aaksh Project Centre is located nearby, in an engineering college in Borwan. This college has agreed to coordinate these efforts.

7.13.3 Experiments in Unorganized School Education

It was felt that Aakash deployment should also be tried amongst children and who are unable to attend regular school, but are desirous of obtaining education. One such group was recently located in Hyderabad, Andhra Pradesh. Prof. ——, who is an adjunct professor in IIT Hyderabad, runs a family trust which operates an informal School in a temple and students at various levels routinely learn there. It is planned to deploy up to 80 tablets in this School. Educational contents will be developed in Telugu, for this effort. Since IIT Hyderabad itself is an Aakash Project Centre, coordination is expected to be smooth.

7.14 Aakash Bazaar

Aakash Bazaar is an Android application for Aakash tablet specially meant for browsing application developed for Aakash. This is a client end which searches for updates or new applications on a server. The server is running F-droid server which actually hosts all the apks.

On client end we have a repository hierarchy. When started, it search for a local server, if a local server exist, it fetches application details like name, summary, description, icon etc and displays it in a form of list. A user can click on an application to see detail description like screenshots and ratings.

7.15   OSCAR

http://www.oscar.iitb.ac.in

Project OSCAR (Open Source Courseware Animations Repository) provides a repository of web-based interactive animations and simulations, that we refer to as learning objects (LOs). These learning objects span topics in science and engineering at the college level, and maths and science at the school level. Students and teachers can view, run and download these learning objects. A large collaboratibve community has been created to contribute to this Open Source repository. These animations are now being ported to Aakash.

7.16   Attachment for Aadhar Authentication on Aakash

Aadhar authentication is the process wherein the Aadhar number, along with other attributes (demographic/biometrics/OTP) is submitted to UIDAI's Central Identities Data Repository (CIDR) for verification; the CIDR verifies whether the data submitted matches the data available in CIDR and responds with a yes/no. No personal identity information is returned as part of the response. The purpose of authentication is to enable residents to prove their identity and for service providers to confirm that the residents are who they say they are' in order to supply services and give access to benefits. The purpose of the project is to make an optical assembly for Aakash tablet so that it can be used in place of the current fingerprint scanning devices and to get a clear image of a fingerprint by using the tablet s camera itself, and this fingerprint is in turn used for the authentication of the Aadhar Id, taking into consideration the cost of the optical device. Also an Image Enhancement Software is developed which will optimize the providedimage. More specifically the system is designed in order to reduce the cost and to use the camera on the Aakash tablet for the purpose of fingerprint scanning. Once completed we will try for its application on other tablets and phones as well.

7.17   Linux on Aakash

Android uses the same Linux kernel optimized for embedded devices and excellent memory management. Though it has an easy to use GUI, it is generally not suited for everyone, especially students. This serves as a strong motive to port GNU/Linux on Aakash. Although GNU/Linux uses the same Linux kernel, its file system differs completely. It gives us complete freedom to explore every part of software as well as hardware. The best part is, the GNU applications allow the curious learner to read the code and find out the way the applications work. If one is dissatisfied with the application, one is free to download the source code and modify it to suit. He or she can even go on and share their modified code with the community, provided they acknowledge the original authors and attach the same GNU license with the code. This is where Android lags behind Aakash: most of the popular free apps are closed source in nature. The article written by Srikant and Sachin in communications of CSI is given in the subsequent pages.

Article

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GNU/Linux on Aakash

Introduction

In the January 2013 issue of Communications of CSI, the article "Genesis of Aakash" had explained the events leading to the creation of Aakash this has been explained by Moudgalya, Phatak, Sinha, and Varma. In this article, we will explain the work that we undertook to port GNU/Linux in native mode on Aakash.

Android is a great platform, it's free, and easy to learn. Most of us will acknowledge the use of Google's Android on Aakash, but not everyone. The reason is that Android is not designed to run GNU apps, although it is based on Linux Kernel. This means that one has to rewrite all useful apps on a new platform, using only Java programming language. Beside these restrictions, Android also tracks user activity, and apps may contain ads which are difficult to manage.

The first version of Aakash that we worked on came with the Android Ice-cream sandwich version. It looked nice with a visually pleasing user interface. It had multiple desktop support, efficient menu applications, perfectly suited for any touch based device. On scanning through, we came across the picture gallery, calendar, messaging, contacts, clock, etc. These applications come by default with any Android device. The first question that came to our mind was, 'Is this what will go to our students? What will they do with it?' Most school going children would be unaware of how to use these apps, and instead would play around with drawing tools, games, and other items, which they are familiar with. Sadly no Android device comes with preinstalled educational applications by default.

Furthermore, Android was not intended to serve educational purposes. It was created to serve as a mobile operating system. An operating system with GUI specially designed for calling and messaging, which improved as it evolved. Several applications in Android were written by developers across the world. With time, its user interface was optimized, making it easier to use. Until now, Android was largely used as an entertainment operating system. It is well suited for those who just want their work to be done without knowing what goes within. In contrast, Aakash is specially meant for education: we don't want our student to stop with playing games; nor do we want to restrict them to the development of another `Angry Birds' kind of game. We want them to learn, read, write, and carry experiments on their device. This device should be considered equivalent to any desktop we use today. We aimed to give them a full fledged device to help, play, and experiment without any limitations.

Why GNU/Linux (where Android lags)

Android uses the same Linux kernel optimized for embedded devices and excellent memory management. Though it has an easy to use GUI, it is generally not suited for everyone, especially students, as explained above. This serves strong motive to port GNU/Linux on Aakash. Although GNU/Linux uses the same Linux kernel, its file system differs completely. It gives us complete freedom to explore every part of software as well as hardware. The best part is, the GNU applications allow the curious learner to read the code and find out the way the applications work. If one is dissatisfied with the application, one is free to download the source code and modify it accordingly. He or she can even go on and share their modified code with the community, provided they acknowledge the original authors and attach the same GNU license with the code. This is where Android lags behind Aakash: most of the popular free apps are closed source in nature.

Moreover, because of the licensing restrictions, it is not possible for us to distribute useful Android Apps with Aakash, since we have to get permission from the creator of each App individually. Each one may want different agreement forms to be signed. A bigger problem is that most creators of popular Apps are difficult to locate and hence, the mails to them will go unanswered. GNU/Linux, on the other hand, is especially designed for such campaigns.

Porting

On exploring the hardware of Aakash tablets: we realized that this relatively new SoC from All-winner has support for GNU/Linux, which although limited, was sufficient enough to start our work. In pursuit of a development board needed to start our work, we looked around and finally decided to open the device itself. We asked the vendor for pin numbers that were needed to obtain the transmit data(Tx) and receive data(Rx) pins out from CPU. This information is required for debugging. With the help of a USB to serial converter, we connected the pins to a computer using an USB port. Our hardware team managed to get those
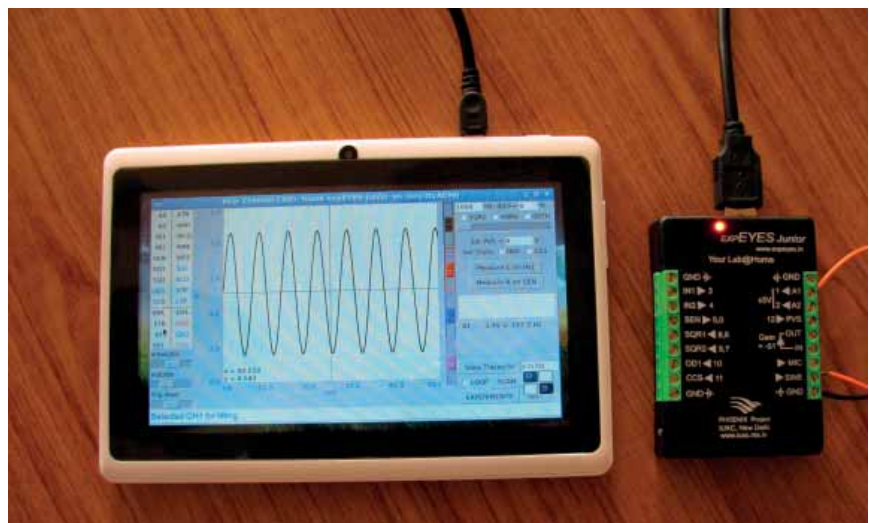
pins out, after which and our development device was ready. Without the serial out, it is difficult to track the booting process.

We had two choices, either to let the GNU/Linux boot from its internal memory(NAND flash) itself or to let the complete OS boot from an external SD-card. Fortunately the All-winner chip has a facility to boot the OS from the SD-card. Interested learners can boot GNU/Linux from SD-card without touching any part of Android.

We started compiling the boot loader. The boot-loaders on embedded system are different, and in Aakash the complete OS has to boot from the SD-card. Then we went on to compile U-boot. It is the uboot binary file on SD-card, which makes the SD-card bootable. After successfully loading, the uboot finally calls on the kernel to initialize hardware. We used minicom to view all booting processes. The next major challenge was the Linux kernel. It is the most important part, as all the hardware and applications ultimately depend on it. If the kernel successfully detects all the hardware, then we can proceed further to test the file system. If not, we need to fix it by analyzing Android kernel logs, keeping in mind all the hardware and configuring the same in our present kernel. Thanks to the open source community, we found forked versions of original Linux kernel maintained by All-winner team.

We used the default cross-compiler as suggested online. It gave compilation errors and the compilation process failed frequently. This is the same cross-compiler that is readily available in Ubuntu's repository. After many trial

we decided to use the Codesourcery's cross-compiler tool-chain. We have used these tool-chains in the past. To set up Codesourcery's tool-chain, one has to register before downloading its binary. After downloading, it has to be installed and a custom path to the tool chain has to be set in order to compile the kernel. We first used the Debian root file-system, which we got online. The script.bin file was not fully compatible with Aakash. It took us some time to extract Aakash's own script.bin file and to change its default parameters to make a running kernel and root file-system. Merely modifying script. bin file was not enough, some kernel modules like WiFi and touch have to be auto-loaded while booting. These changes have to be made in the file-system path / etc/modules to make them work. With all those changes, we had basic version running in a week.

On Aakash, GNU/Linux boots from micro SD-card and the file-system reside within the SD-card. Both Android and GNU/Linux operating systems are completely isolated from other. The good part is that we can access all the Android's content from GNU/Linux.

Enabling touch was a major challenge, as we have never worked on touch before. Initially when tried to interact with the tablet using touch on Debian, it didn't respond. We had to go through Android's log-cat and dmesg to identify the touch screen driver, which we found out was focal-touch(ft5x_ts). When it was enabled as a module, it worked but we had to disable the multi-touch feature in the file. Currently Aakash has three

touch screen drivers, of which two work.

For an application like ExpEYES (explained below) and Arduino, which uses an USB-to-serial interface for interacting with the hardware, we had to enable kernel support for Communication Device Class(CDC) ExpEYES as ACM device. On the device level, it is detected as Abstract Control Model(ACM) drivers. The Linux kernel detects /dev/ttyACM0. Also for ACM to work, generic USB support should be enabled in the kernel.

On the desktop, we can pass arguments to the kernel, ask kernel to load some modules, disable misbehaving modules and so on. Similarly we can pass arguments to kernel on an embedded device using script.bin file. On Aakash, pre-customization, module loading for wireless networks, setting display resolution, loading touch drivers, etc., can be done using script.bin. Although script. bin is a binary file, actual editing can be done by converting it to fex format.

Ubuntu as GNU/Linux Distribution
With the Linux kernel in place, now was the right time to decide upon file system . We tried Debian first, but due to lack of hard-float support in Debian Squeeze release, we dropped it. We also tried Debian Wheezy but we were uncertain about of pre-release versions. The best choice left to us was Ubuntu, which is known for being easy to use amongst newcomers and advanced developers alike. It has a great package-manager, using which one can install required packages both from command line and using graphical interface. Hence we agreed to use Ubuntu.

We started with Ubuntu-12.10 core arm hard-float distribution. When uncompressed, it consumes around 100MB only. We used the ch-root environment to configure package-manager, basic network tools, user applications and a desktop environment.

Before putting the file-system to actual use, the compiled kernel and its modules were placed in /lib/modules
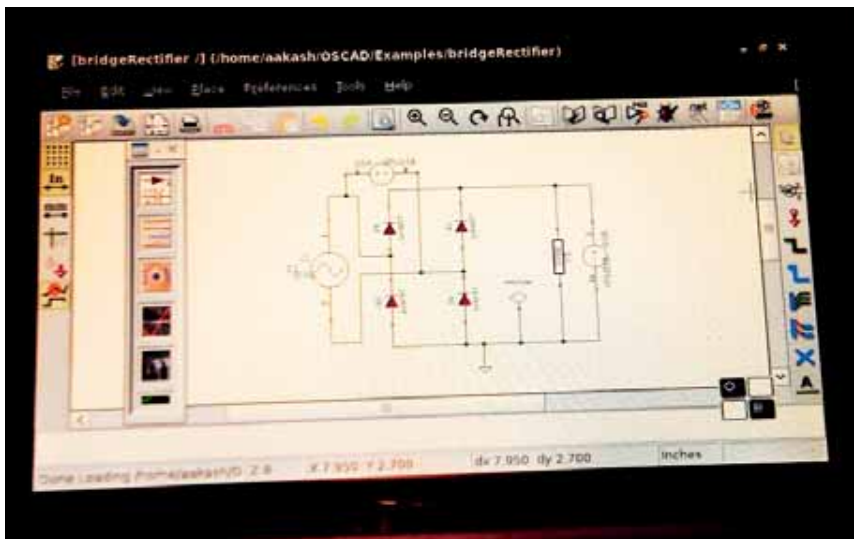
directory of the file-system, where all kernel modules reside.

The next challenge was the Desktop environment. We tried Unity, KDE Plasma, XFCE, MATE, enlightenment (e17), and Gnome-3, all of which need around 120 MB RAM with some hardware acceleration, except e17. After considering the options we finally decided to go with LXDE(not Lubuntu).

The Ubuntu-core file-system includes only basic utilities and a package-manager (apt-get). Comparing with a Desktop version, it does not even have a basic networking tools like ping or root user utilities, such as sudo. Ubuntu Boot-splash screen, Desktop-Environment, screen savers, UbuntuOne sync, daemons, etc., consume a lot of memory. We compared memory consumption of each process before installing one in core file-system. For example, Ubuntu's default Desktop-Environment(Unity) consumed much more memory than LXDE. By discarding these overheads, we finally managed to boot Ubuntu in less than 50MB RAM. We also made a few customizations on open-box and gtk2.0 to make it touch friendly.

Applications

We focused largely on educational applications. With repositories in the path, one can easily install any application of one's choice. We pre-installed some popular and useful applications. The first application we installed was Onboard, to serve as the virtual keyboard. Next we installed the LibreOffice pack. Although it's a bit heavier than AbiWord, its features make it worth installing.

Scilab-5.3.3 was also installed and tested. Both numerical and graphical calculations are executed much faster than on Android(https://github.com/androportal/APL-apk). More than 150 Scilab textbook companions (http://scilab.in) are now available in our latest builds. A Scilab textbook companion is a listing of code that implements worked out examples in standard textbooks. Arduino, an open source hardware with Gnoduino IDE, has also been tested and included.

ExpEYES is a hardware and software tool for learning and exploring science experiments. It supports 50 experiments for high-school and above. For interacting with the hardware, we have a Debian package called ExpEYES Junior. This is a tablet version alternative for ExpEYES in desktop.
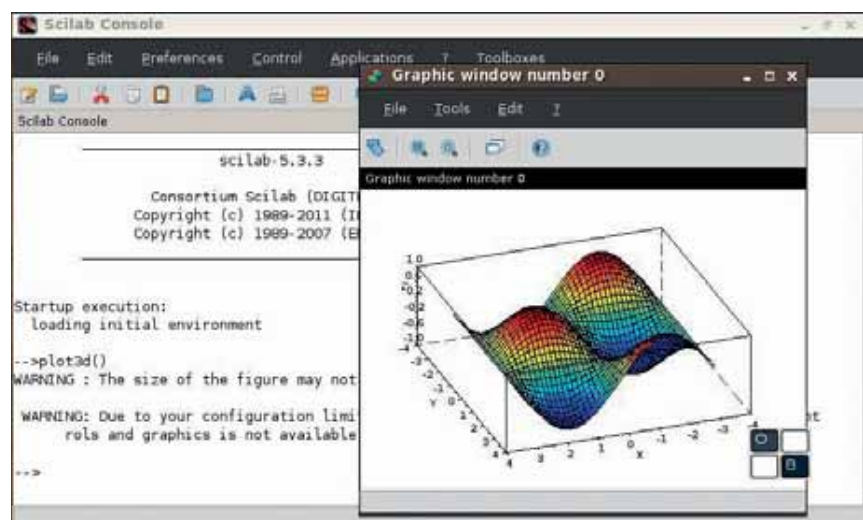
OSCAD is another open source EDA tool, acronym as Open Source Computer Aided Design. It has been developed using several open source tools like KiCad, Ngspice, and Scilab at IIT Bombay. Python-TKinter is used to program its front-end. Since tools such as KiCad, Ngspice, and Scilab already run on Aakash, OSCAD's installation procedure was similar to any other desktop running GNU/linux. Aakash's capability to run Electronic design tools is demonstrated by the fact that OSCAD runs on it.

We also installed iPython-notebook for scientific computing, and Mayavi2 for 3D visualization of data.

Conclusion

After these customization process, we now have Ubuntu 12.10 with Linux kernel version 3.0.57 working on Aakash. It is suitable for educational as well as entertainment purposes. For programming and development one can attach an external keyboard and mouse, if one is not comfortable with virtual keyboard. One can see all the features and application of a typical desktop computer on Aakash. With ExpEYES and Arduino working, one can perform hardware interfacing with any other hardware. GNU/Linux on Aakash provides opportunities to experiment on a portable device. With 1 GHz processor and 512MB memory, it has the potential to run any other GNU applications. Currently we have image targeted for 8GB SD-card of which first 16M FAT partition is dedicated to bootloader(uboot.bin) and script.

bin file. 1GB is used as swap file-system in case if the actual RAM gets used up. The entire file-system along with install applications and other utilities consumes around 3GB space. Approximately 3.5 GB is left free for storage and other installation to user. The capacity of the SD-card can be expanded up to 32GB.

Contributing to Project
We look forward to seeing GNU/Linux enthusiasts contribute to this project. Please visit our github page for detailed documentation on porting of Aakash. There are many open issues, such as, brightness control, sleep mode, touch drivers, etc. We have documented our work at http://androportal.github.com/linux-on-aakash/.

Aakash Application Development Competition
In January 2013 issue of Communications

of CSI, we had announced a competition based on Aakash, for both Android and GNU/Linux operating systems.

This competition aimed to encourage students and individuals across the country to come up with innovative applications that could be used on Aakash. The source code of each application will be released as free and open source. The Application can be Android or GNU/linux based.

More that 1600 participants registered for the Aakash application development competition. These participants are from various engineering colleges and universities across India. We asked those participants to re-group in teams consisting of maximum 5 people, and re-submit their project proposal. On the basis of project description, we have shortlisted 140 teams, whose work will be developed further. Any updates related to competition will be posted on http://aakashlabs.org/compete.

Traditionally all applications running on GNU/linux desktop should also run on GNU/linux on Aakash. But one must ensure that the application is touch friendly and consumes minimum RAM. The Aakash team at IIT Bombay is willing to help the participants: for example, the participants: for example, the participants can send their application to us for testing.

We still have many open issues on GNU/linux port. Before contributing, we expect the participants of the competition to go through our GNU/linux porting documentation on github page http://androportal.github.io/linux-on-aakash/.

We are in need of developers who are interested in GNU/Linux system. They must have sound knowledge of Linux kernel and working of various GNU/linux distributions. ■

Srikant Patnaik He is a developer, teacher and motivator. His first contribution to FOSS came as a simple 8051 Programmer for Linux, available at sourceforge. He served as a Lecturer at Loyola academy, Hyderabad. Later joined IIT Bombay as a Research Assistant in FOSSEE project. He contributed in Porting of GNU/Linux on Aakash and also associated with Android app to run Scilab and other programming languages. His interests include blogging, designing circuits, bridging software and hardware.

Sachin Patil is currently working as a Linux System Administrator in Indian Institute of Technology, Bombay. Apart from System Administration, he has also gained some experience in Android and embedded systems. He, along with Srikant Patnaik, has ported Scilab — a software for Numerical Computation on 'Aakash', a low cost access device project funded by NMEICT, Govt. of India. He is also interested in customising GNU/linux distributions. Beside Ubuntu, his other favourite GNU/linux distro is Slackware, which he likes to work on because of its simplicity and robustness.

7.18   8051 Emulator

8051 Emulator application is an integrated development environment bringing together a variety of resources required for embedded systems. Intended audience for emulator are students learning embedded systems specifically 8051 microcontroller.

Students can use 8051 Emulator for learning 8051 microcontroller. This application facilitates the student to interface different circuits on ports of the microcontroller, write assembly code as per requirements, and execute the code written. After execution of code, virtual hardware displays behavioural animations, which is in close resemblance to the real 8051 Board. This application helps students to learn basics of 8051 microcontroller without buying actual 8051 development board.

7.19   Interactive Lesson Builder My Point

The Interactive Lesson Builder is developed for the teachers and students to teach/learn concepts of Cartesian coordinate system to plot the vales in graphical format through interaction using Aakash. The product is divided into five basic modules namely C-Plane, plotting, scaling, line and quiz-it. C-plane denoting Cartesian Coordinate Plane is explained in this module, further it includes practical life example to explain the concept of graph, x and y axes and quadrants explanation. Plotting module explains process of plotting a point on Cartesian Coordinate System. Scaling explains process of finding and using scale for a graph. Line module explains different process of plotting a point on Cartesian coordinate system such as using equations, using slope etc. Quiz-it module provides a vast number of randomly generated questions. It has choice for two levels of quizzes i.e. basic and advanced. It comprises of interactive quiz, multiple choice quiz. It also generates a test report on the submission of the quiz in the form of a pie-chart. It also has provision for teachers to test the students on the concepts learnt. The tests can be conducted at any level that the teacher desires i.e. basic or advanced. This ensures that the student has understood basic concepts very well before moving on to advanced concepts.

7.20   Audio video classroom interaction

It creates the interactive classroom environment between instructor and students using audio and video (A/V) using Aakash tablet. Students can raise their doubts using AV at any time and this tool becomes very handy for large classroom interaction.

7.21   Clicker Native Application

It provides instant feedback to teacher in on-going lecture in classroom by conducting quiz, raise hand, poll. Report statistics is useful to analysis of students performance.

7.22   Peer-to-Peer Communication

It creates peer-to-peer communication between student's tablets and instructor tablet using WiFi-direct. They can share the files and can do instance chat between group owner (instructor) and clients (students). This will reduce the over head of extra hardware (server and WiFi setup) and its maintenance.

7.23   Visual Programming for Android using Blockly

The motive of this project is developing ideas and logic for coding among school children interested in DIY electronics or new to embedded programming. It enables students to implement a code using jigsaw puzzle like blocks with no worry about syntax. Presently it supports Arduino boards.

7.24   All Terrain Vehicle with Data Acquisition System and GPS tracking

Development of Multi-Terrain vehicle capable of detecting environmental conditions with the help of multiple sensors attached. Aakash tablet interface can control the robot as well as can monitor sensor data with video streaming. Further development includes terrain adaptation and stabilising of the vehicle.

7.25   proxyMITY

proxyMITY helps users to get access to quality lectures of reputed teachers, for effective personalized learning. They have the flexibility of studying anytime, anywhere, and at their own pace. proxyMITY has two versions : sd-card version and Wi-Fi version. Lectures stored on a sd-card or on a local server can be viewed respectively with these versions. Other than viewing the lectures, there are certain other functionalities for effective learning like Tree functionality to view the contents of the lecture, Bookmark feature to tag a particular part of the lecture for further reference, Transcripts to view the text file of the lecture along with the video.

7.26   DiaSlate(Slate Application)

The DiaSlate application true to its name is developed as a digital equivalent of a real time slate. It is an amalgamation of UML Diagrams and Slate. DiaSlate is an Android Application that implements an intelligent canvas interface that aids learning, work and fun. It has 2 parts, one emulating the slate and the second a user-friendly way of drawing UML diagrams. It aims to replace the handheld slate and chalk. The application caters to all age groups.

7.27   Video Conferencing

The software Video Chat is an application that will be used by general users to do chat, le share, voice calls and video calls using Aakash tablet. Also audio and chat conferencing facility has been provided. To make a call both the users need to be registered at the server. This communication is via wi- and will incur no expenditure to the end users. Communication between any two users will be enabled as long as both are logged-in at the server.

An application Server is required to register the users and maintain the information regarding the MAC and current IP addresses of all the logged-in users. The clients may be connected to same network . Server may be connected to either wi- or LAN.

7.28 Aakash Developers Portal and Enhancements to Aakash Tech Support Portal

The Aakash Portal is an online Portal, which is divided into two modules, Aakash Tech Support and Aakash Developer Portal. Aakash Tech support provides an Aakash tablet users a platform to discuss the technical problems that they face with the tablet. Discussion Forum, FAQ, Chat, Submit-Issue, View-Issue, Report-generation and feedback features are provided to the users to help him/her to solve their problem.

The Developer Portal is an online platform which brings developers together and facilitates application development and improvement. Developers can view and help in existing Aakash project or provided new ideas and discuss on them .Discussion-forum for developer ,Developer-blogs,Video-lecture and Study-material,Platform to share your new idea ,also you can view existing project and Downloads provide application file developed by Aakash Project Team.

7.29 Mathematics Playground

Mathematics playground is a project that aims at creating interactive activities for basic mathematics concepts through computer animations. Mathematics being the biggest hurdle for maximum number of children, we try to make their learning easier by having interactive interfaces using notes, coins, images, sticks, bundles and many more. This is thus achieved by developing an interactive platform, where students shall be provided with a Virtual classroom / lab environment.

7.30 Online Physics Laboratory

Online Physics Laboratory aimed to provide high quality interactive content for school education. By means of this project we aimed at designing Interactive Physics activities using Action Script 3 (PIE FRAMEWORK) for the school which going kids. is happening around us. From Rising of Sun to Cooling of Fan, From Changing seasons, to walking on ground, From Mirrors to Electricity everything is Physics. Extention of PIE to PIE 2.5 and then created a viewpoint so that any experiment can be seen from any place with help of camera by setting its position, thus created 3D motion. Another provision which we created is to make text drag and droppable anywhere on the screen so that the text we use is visually pleasing.

7.31 Explore Chemistry

The Virtual Chemistry lab is an interactive simulator of a chemistry lab. It lets a user perform experiments, by making use of actions like pour, wash, heat etc on standard laboratory equipment like bottle, flask, pipette, beaker etc, in a manner similar to how they are performed in a real laboratory. It allows the user to set up an experiment, by dragging equipments and/or chemicals from store and dropping them onto the workbench. While the user performs an experiment all his actions get saved in an XML file. Lastly, VCL lets a user play demonstration experiments, for the purpose of learning, with options to pause, resume, forward step and back step the demo. In these we have developed 69 interactive learning objects.

7.32   Living Biology

The project included the conversion of NCERT biology lesson of various classes into interactive HTML pages for better learning. Based on the textbook content various interactive flash activities using the PIE Framework also have been developed to help the student visualize the concepts and take fun quizzes.

Once the student goes through the concepts, the next purpose of the project was to develop a question bank through which we present questions to test the knowledge acquired in the school for all standards in a particular topic. The software developed allows the questions to be presented under a topic tree where a student can select any of his/her favorite topic and can also be used by teachers for adding new topics and questions. Thus overall contribution from the society is encouraged in the project Moreover, new functionality has been implemented to make the interface more user-friendly.

7.33   Know Our World

In this we have developed interactive learning objects to explain the biological concepts in a easy and playful manner. For testing and observing the learning graph, a adaptive testing module is also developed.Standard testing provides an interface which allows the customization of the test by the user. The questions are presented to the user based on his specifications of topic, number of questions of each topic and the difficulty level. This helps the user to test his ability across various sections and topics in various difficulty levels. User can also time the test and check his efficiency in various topics.

7.34   Graphical interpreter - Buddhuram Dumbo in action

The Graphical Interpreter is intended as an educational tool that helps students better understand basic computer architecture. The application is intended to initially execute C commands. The architecture of the system is intended to be neutral in order for the application to be extensible. The application is intended to be a stand-alone application that will function without the use of a server. It is also intended as a cross platform tool that can be run over a variety of platforms.

7.35   Robot Application

The application is developed to control the FIREBIRD V Robots motion, using the AAKASH tablet. The use of virtual joystick in the application, makes the control smooth and efficient. An IP camera mounted on top of the FIREBIRD V Robot gives continuous video streaming, and the video can be seen in the application window. Simultaneously we can control Robots motion

7.36   Aakash Programming Lab

Aakash Programming Lab (APL), provides programming environment for C, C++, Python, and Scilab on the tablet. It allows the users to write, open, save, compile, and execute programs of C, C++, python, and scilab. The program when executed generates and displays the output

on the screen. This gives the user the flexibility of performing programming tasks on the fly(without using a Personal Computer).

7.37 GNUKhata

GNUKhata is a Free Accounting Software which can be deployed by both profit making and non-profit making organisations. The advantages of GNUKhata are:

- It is lightweight and scales up with large volumes of data

- It is robust and can be used on a wide variety of data categories

- It is modular, thus facilitating addition of extensions for different tasks

- The user interface is designed to be intuitive and friendly even for beginners

- The reports are displayed on browser and can be printed or saved to PDF

- Deployers will find the implementation easy to achieve.

- GNUKhata is a free software, sometimes referred to as free and open source software or FOSS

7.38 Aakash Business Tool

Aakash Business Tool is a portable accounting platform on Android intended for Accountants and Students. It provides an easy to use interface specially for students and newbies who have just started accounting. This initial version covers basic account management, creating vouchers and report. Its back-end is based on Python framework. Some features of Aakash Business Tool:

1. Managing Organizations

2. Maintaining books of accounts

3. Recording, cloning and editing transactions

4. Recording of transactions under particular project

5. Generating reports such as Ledger, Trial Balance(Net, Gross, Extended), Profit and Loss Account, Project Statement, Cash Flow and Balance Sheet

6. Bank Reconciliation

7. Rollover

8. Export report in PDF/CSV format

9. Import/Export of organization data to other device

7.39   FOSSEE - Free and Open Source Software in Education

FOSSEE is an acronym for Free and Open Source Software in Education. Through this funded project, a few faculty members at the Indian Institute of Technolgy Bombay have been promoting the use of open source software in India. We have been promoting open source software, such as Scilab [1], Python[2], OpenFOAM [3] and COIN-OR. We have also created an open source Electronic Design Automation tool called Oscad [4],[5]. We create instructional material and conduct workshops [5] for students of higher educational institutions. All the instructional material and the content required to conduct the workshops can be downloaded from the above mentioned resources free of cost.

We briefly explain some of the activities of the FOSSEE team here. Scilab is an excellent open source alternative to Matlab. We have created a large number of self learning videos called Spoken Tutorials [6] and trained a large number of students using them. We have created about 200 Scilab Textbook Companions that provide Scilab code to all the worked out problems of 200 standard textbooks. We have extended the above approach for many other open source software systems, such as Python, Oscad (open source alternative to OrCAD), OpenFOAM (open source alternative to Fluent), etc. We also help with the migration of labs from proprietary software packages to open source alternatives. We have organized many Python conferences in India. We have trained close to 150,000 students in the past two years in some open source software or other, absolutely free of cost.

[1] http://scilab.in

[2] http://python.fossee.in

[3] http://cfd.fossee.in

[4] http://oscad.in

[5] Y. Save, R. Rakhi, N. D. Shambulingayya, R. M. Rokade, A. Srivastava, M. R. Das, L. Pereira, S. Patil, S. Patnaik, and K. M. Moudgalya, Oscad: An open source EDA tool for circuit design, simulation, analysis and PCB design. Shroff Publishers, Mumbai, 2013.

[6] http://spoken-tutorial.org

7.40   Textbook Companion on Aakash

The Textbook Companion effort at IIT Bombay, funded by NMEICT, creates code for solved examples of standard textbooks using Free and Open Source Software, FOSS. These are created by students and the faculty of colleges from different parts of India. Students who create these books are given an honorarium of Rs. 10,000 for each companion and their teachers who helped review are given an honorarium of Rs. 5,000 per companion. This effort is coordinated by the Free and Open Source Software in Education (FOSSEE) group at IIT Bombay. FOSSEE and Aakash teams have many common staff members. The FOSSEE team has created a submission portal that allows the code for each example to be uploaded individually. It is possible to download from the Scilab website maintained by the FOSSEE team (http://scilab.in) the code for one or more examples individually or for an entire book, absolutely free of cost. Textbook companion is a valuable resource for educational community. From the view point of convenience, web based Scilab engine has been created by FOSSEE.

For enhanced performance and safety, this facility has been ported by the FOSSEE team to the GARUDA Grid, with the help from the GARUDA Team at CDAC, Bengaluru, see http://cloud.scilab.in/. The Aakash team has ported the Scilab Textbook Companion to

Aakash. Now Aakash tablets can be distributed with 200 Scilab Textbook Companions. Assuming that each textbook companion has code for 100 worked out examples of a standard textbook, we can provide Aakash tablets with 200x100 = 20,000 sets of code, all in a micro SD card costing less than Rs. 200. It is possible to extend this strategy for several other FOSS as well, some examples being Python and Oscad.

7.41 Methodology to create optimized 3D models using Blender for Android devices

Authors: Nitin Ayer, Pooja Bhawar, Sameer Sahasrabudhe.
Submitted at: T4E 2013, IIT Kharagpur

Use of Low Cost Access Devices (LCADs) using Android platform is on the rise for educational purposes. A lot of (proprietary) 3D animated content for LCADs is available. Open source content would be useful in dissemination of knowledge. 3D open source content for desktops comprises of high-poly models providing realistic visuals. Since LCADs have lower hardware configuration, these models (having high mesh-density) cannot be used.

Methodologies to port 3D content to LCADs are primarily used in the gaming industry. These are unsuitable for educational visualizations, as they hamper functionality and precision of the objects. Instead, building the models from scratch, with an objective to use them for LCADs is desirable. We present a methodology to create optimized 3D models for LCADs. We present preliminary test results of reduction in file sizes and mesh-density of the models. We also present data for the reduction of loading time on LCADs.

Chapter 8

Aakash Projects at RC Colleges

The project description submitted by the teachers of the Remote Centers(RCs) have been last acquired on 25 July 2013. As most Remote Centers have received the tablets only towards the end of the previous academic year, a lot more work is expected in the coming year.

8.1 Categories of Projects

A total of 173 porjects are being done at various RCs. The table given below, lists the number of projects in different application categories.

No.	App Categories	Count
1	eBooks/Learning	28
2	Security and Authentication	10
3	Physical Safety	3
4	Robotics Controlled / Hardware	6
5	Mathematics	9
6	Science	12
7	Network	8
8	Graphics (Drawing / Designing)	5
9	Utilities	42
10	History / Geography	1
11	Language	9
12	Image / Video	3
13	Speech / Signals	4
14	Quiz	8
15	Finance	3
16	Others	24
	Total	175

Table 8.1 Application Count

107

8.2   Summaries of Project Descriptions

These summaries are compiled from the Moodle Forum created for the uploading project related information by RCs. The same order has been used. The given order does not have any other connotation. These submissions are collated as submitted by the Remote Centres

8.2.1   Kalyani Government Engineering College

RC-1212
by Kousik Dasgupta - Wednesday, 7 August 2013, 2:14 PM

8.2.1.1   Design of User Authentication Modle for Bluetooth Piconet/WiFi Using Aakash Tablet

The main objective of this research is to design and implement a user authentication application for Bluetooth piconets/WiFi that can be used to address the issue of the device being a security risk when the device owner losses it.

i) To highlight on architecture of the Bluetooth/WiFi so as to understand the core protocols and how they work.
ii) To identify security risks and vulnerabilities associated with Bluetooth piconets/WiFi and their mitigation mechanisms.
iii) To design a user authentication model for Bluetooth piconets/WiFi users.
iv) To implement user authentication at the application level.
Team Leader : GOPA MANDAL (Enrollment Number: 22901)
Members :
1) DEBABRATA CHOWDHURY (Enrollment Number: 23257)
2) SUPRIYO BANERJEE (Enrollment Number: 23218)

8.2.1.2   Development of User Interace in Aakash Tablet for Online Sharing of Mechanical Department Resources

Intranet in the Mechanical Engineering Department may be set up with a departmental server, and Aakash Tablets would be connected to that. Any student or any other person of the college may use departmental e-resources like under graduate and post graduate projects and theses, conference proceedings, various other reading materials as would be made available from teachers and other sources, etc. Detailed Plan:
1. One departmental computer would be chosen as the server in which all the available soft copies of undergraduate and postgraduate projects and theses, conference proceedings and other open source reading materials will be stored.
2. Provision for updating e-resources from time to time will be incorporated.
3. Then User Interface as an Android apk for accessing the resources will be developed.
4. Then they will be tested and installed in the Aakash tablets.
5. Provision of WiFi will be made covering the Mechanical engineering Department through the funding of IIT Bombay.
6. After completion of the above steps, a presentation based on the use of e-resources through Aakash Tablets will be given to the students.
7. After that, access to these e-resources through Aakash Tablets will be facilitated.
Team Leader: Dr. Santanu Das (Enrollment No. :27797)
Members:

1) Arijit Dutta (Enrollment No.:32063)
2) Sirsendu Mahata (Enrollment No.:36924)
3) Arup Kumar Biswas (Enrollment No.:26628)

8.2.2 SIES Graaduate School Of Technology

RC-1217
by preeti Godabole - Thursday, 25 July 2013, 3:15 PM

8.2.2.1 Intelligent Tutor

Teaching and learning process can be improved using intelligent tutoring system (ITS). ITS will help in teaching a concept to students through problem solving with his/her pace. ITS can be used for personalized teaching. ITS will present a problem to student to solve and guide at each intermediate step by giving feedback, hence keeping the record of student progress. Android app designed to solve the problems on "finding LCM of 2 numbers" and further plans to design tutors for booth's algorithm for multiplication of n-bit binary numbers to aid the students understands the algorithms.

8.2.3 Sasurie College of Engineering

RC-1044
by Selva Brindha S. - Monday, 15 July 2013, 3:49 PM

8.2.3.1 Design of a Humanoid Robot Controlled using the Aakash Tablet

A Humanoid robot is a robot with its body shape built to resemble that of a human body. They are used as a research tool in several scientific areas. It is a perfect substitute for a human to perform tasks like personal assistance, at homes and in factories wherein working conditions for humans can be fatal. But controlling module for the humanoid robot though its wireless nowadays but comes in large size and is difficult for transportation. In this project, the controlling of the humanoid robot is done using wireless technology, with Aakash tablet used as a controlling module for the humanoid robot. The proposed idea if implemented will be the first official humanoid robot controlled by the Aakash tablet.

8.2.3.2 College Phonebook

This report discusses the result of the work done in developing COLLEGE PHONEBOOK on android platform. It aims at the development of the application framework for providing information of students studying in a particular department. It displays the name of the student, phone numbers of each individual student studying in the department, and the integration of various tools developed during the execution of the project. In the recent trend mobile-phones have become soul-mates for public. They are making use of mobile-phones for every single need. Right from calling, texting, tracking, listening to music and so on. Many new applications and technologies have come into existence these days, which people are using very effectively. Still many are looking forward for new technologies in mobile-phones as we know android is an open source.

8.2.3.3   Bus information

The application we are developing is about Bus information. It is an android application used to find out the details of bus number. This application is used to get the bus details along with the distance between the source and destination and the frequency of buses. Usually people may not have idea about all the bus timings and bus numbers. Hence this android application is used to make easy search. It saves a lot of time. This application is very much useful for people who have no information about buses. All this information is available offline and no internet connection is required. All we have to do is to store the information in database. This project is based on the database in which we can store and retrieve all the information regarding the route numbers and what all we require.

8.2.3.4   Employee Monitoring System

It is an application which can able to trace the location where the employee is located and show them on maps. The main objective of this application is to locate the employees and trace them on maps so, it is very flexible and it is also user-friendly application. In this app the service application which runs on the background is installed on the employee mobile, and at the admin side the monitoring of employee and tracking the location on maps will be done. The Broad caste receiver, maps service concepts are implemented. As soon as admin sends message on the employee mobile application, that application will get the message and sends back the longitude and latitude values and admin application will get the values and displays the location of employee on the map.In client side mobile (i.e., the employee mobile) the service application will be installed to get the longitude and latitude values in such scenario from the admin side the details of particular employeeWill be store in the database, when a particular message from the admin application is sent to the employee mobile the service application will rectify the message of admin application.

8.2.3.5   Citizen Card System

The Project 'Citizen Card System' gives us the information about the citizen in any country. A Citizen has unique Id to find out the personal information in each and every department or service wherever a citizen goes. This information can be found out by the unique Id of the citizen. If any citizen wants to utilize the services or utilities by the Government or Private organizations, he has to go to each and every department with different Id for that particular department. Instead, a citizen card helps in having all the utilities and services under one unique Id. This system not only help us to know the information about the services or utilities but also it gives the information about the character of the citizen in credit rating. This System consists of the modules like Personal Information, Credit Rating, Banking, Insurance, Tax, Provident Fund, Electricity, Telephone, Gas, Movies, Municipality, RTO, Voting, Passport, Travel Agency etc.

8.2.3.6   Friend Mapper

In current system, in order to find out the location of friends, user need to call and ask friend about his where abouts. The proposed system will help user to find out friends locations as well as the distance from users location. The proposed system will also allow user to see all friends on Google map as well. The application Friend Locator on Mobiles solves all these problems. It offers below services:
1. Allows user to select friend for his location updates.

2. Uploads users current location at specific frequency.
3. Get friends current location
4. Shows friends location on Google Map.
5. Shows distance in kilometers for friends away from user
6. Socio Travel

Android based vehicle sharing application for mobiles. People traveling to same destination can share their vehicles with others using this application. Very useful in a country like India where people are facing Fuel Price Hike frequently. So vehicle sharing can help save some fuel, also helpful for environment protection as well as people can meet people of their interest using this application.

8.2.3.7 Vehicle Tracer

This topic handles the tracking and identification of the vehicles which a user needs to track, by providing the simple parameters such as registration number or the unique entities of the particular vehicle. This android application makes the tracking in two stages, in the primary stage the application gives the instant information about the vehicle by providing the initial detail of the registration number of the vehicle.

This initial service can only identify the place at which the vehicle is registered and this is just an offline procedure in which we dont need a network connection and the network connection is only required when the secondary stage of the application, which gives the whole basic details of the vehicle such as owner name and address, vehicle model, registration year and other details. This android application can be elaborated by connecting this to the GPS and pinpoint the location of the required particular vehicle.

8.2.4 Rajalakshmi Engineering College

RC-1138
Place: Chennai
by Benedict Jayaprakash Nicholas - Monday, 15 July 2013, 10:41 AM

8.2.4.1 An Enhanced Learning and Assessment Tool for Visually Impaired

Team Members
Bhuvaneswaran B
Poonkuzhali S
Swaminathan B
Benedict Jayaprakash Nicholas

Project Summary This proposed project strengthens the visually impaired people's learning and assessment capabilities using Aakash Tablet and addresses the problems that visually impaired people have on navigating and reading information from the web pages. In addition to that, reading contents from the web page, this project involves an exclusive text editor and a cost efficient smart Braille keyboard. This will be implemented by using a multi-modal approach of combining visual and audio technologies. The first prototype of these interfaces has been developed based on the results of the user requirements capture conducted with visually impaired people. This project uses interactive blind editor and an economic Braille keyboard with dual keyboard and Multi language support. It also comprises of an automatic alert system that increases usability and minimizes the occurrence of errors.

Hardware Requirements for Development
Processor : Intel Dual Core and above
RAM : 2 GB
HDD : 100 GB
Speaker : Normal Multimedia Speaker

Software Requirements for Development
Operating System : Linux
SDK : Android
IDE : Eclipse

Hardware Requirements for Deployment Tablet : Aakash
RAM : 4 GB
Keypad : Numeric (Optional)
Cable : USB

8.2.4.2 SAVIOR:Speed, Accident Detection and Emergency Service System on Android Smartphones

Team Members
Anand Raj A
Arthi R
Hariharan R.

Supervisor Name
Rajesh Kannan G.

Project Summary
The Commission on National Road Safety reveals that at least 13 people die every hour in road accidents. Rash driving has claimed many a number of innocent lives. Thus, there is an acute need to look into this issue. Keeping this point in perception, our project proffers to reduce these accidents by exploiting the advent of the new technologies. This application named Savior is basically an android application that is GPS based which calculates the speed at which the vehicles are moving and intimates the drivers whenever they exceed the safe speed limit. It also produces an alarm that alerts the people walking on the road side. The main feature of Savior is that it detects the accidents and makes an automatic call along with the information about the approximate location of the accident to the ambulance service, police station and the person of concern (whose number is stored and preconfigured in the mobile). Accidents hurts but safety does not. The salient features of the application helps to reduce accidents and if it occurs (at adverse conditions) it at least facilitates an immediate medical assistance with a low latency.

8.2.4.3 Cafe Internet(Restaurant based Application)

Team Members
Harish S.
Harivignesh S.
Kabilesh P.M.

Project Summary

Customer satisfaction is the key to success for any business. In a restaurant, the traditional hand-waving method for calling services is inefficient often leading to many complaints. The Restaurant Management System increases operational efficiency through use of an intentional wireless communications system and a statistical data processing unit. The communications system increases customer satisfaction by leaving electronic devices at each table which the customer can use to request for a server. A data processing unit allows managers and owners to easily monitor restaurant functions and employee progress. To make this system a reality, Android devices such as tablets or mobile phones are placed at tables which are connected to WIFI Hotspot at the restaurant. The Wi-Fi enables local area communication with all devices in the restaurant with the system where admin work with. The Android application at phone enables the place orders and tracking them. The Web based admin part handles the request from android app. The System provides a new trend of changing technology and enables higher degree of satisfactions to restaurant.

8.2.4.4 QuizApp: An quiz application for board examination students

Team Members
M. Anandraj
T.M. Sridhar
P. Ramadevi
Rajesh Murugesh

Project Summary This proposed project strengthens the students and increases the interest for their board examination and various competitive examination preparation using Aakash Tablet. The students can both attend the quiz off line and online, by online the student can participate competition with the other students for the self assessment and also to be monitored by the teacher. The quiz works with three time attack slow, medium, and Rapid fire, for the students not to get bored by attending the quiz the options and question will be selected randomly from the question bank stored in both online and offline database.

8.2.5 B. H. Gardi College of Engineering and Technology

RC-1275
Place: Rajkot
by Prashant Maheta - Saturday, 13 July 2013, 7:10 PM

8.2.5.1 Home Makeover

Home Makeover is aimed for comforting the common people. As the name suggest home makeover that means renovation of home in different way. Home Makeover is android based application in which user can modify their home in their own way.
User can place the objects like sofa-set, frame, maze, change color of tiles and walls etc in their own way as they want. This project also provides import/export facility along with camera. In this project the 2D pics is converted into 3D pics through converter to give the view of home. The software used in this project for 3D view is Googlesketchup and Creo2.0.
Guided By: Prof. Prashant D. Mehta, Team Members : Arima Sharma, Drashti Raval

8.2.6   Sarvajanik College of Engineering and Technology

RC-1043
Place: Surat
by Keyur Rana - Wednesday, 10 July 2013, 6:33 PM

8.2.6.1   Tracking the object using Multiple Access Points

Project work, identifies location of object, which is equipped with embedded hardware, attached with it, using surrounded multiple access points, in indoor scenario. It scans signal strength of multiple access point in vicinity and compares, these values with earlier stored values, at virtual grid points on map of building/floor. It also sends such details to server, which is connected via Wifi network and one of the access points surrounded to it. So device runs matching algorithm which is based on calculating minimum Euclidian distance from various grid point measurements and hence identifies optimal grid point. This grid point is finally displayed as location of device/object. The positioning algorithm is based on the above deterministic Method which comes under the category of Location Fingerprinting Method. Server calculates location and displays on map. At server side php as programming language and My SQL data base is used to store data of object to be located.
Guide : Prof. Niteen B. Patel, Team members : Shah Rajvi, Patel Bhakti, Agarwal Simple, Parekh Shailja.

8.2.6.2   MyELib

Main objective of this project, MyELib, is to provide library members with ease of access to library formalities from anywhere at anytime. This project is all about the library. Only the library members will be able to use its functionality, as members need to login to access the system. MyELib application will list members details along with books list issued by them. Library members will be able to view, search, demand/request for books. If the book is not available then they can request for the book and the books will be allotted on the bases of first come first serve. Book should be issued by next 24 hours of request or demand. Fine management will also be there. The book availability and the fine remainder will be given either through SMS or Email. Library members will also be able to give suggestions and complaints.
Team Members : Ms. Hawagauri Mulla, Ms. Eva Kapopara

8.2.6.3   CrackIT

CrackIT is first-of-its kind tablet application in its category with facility to practice any competitive exam (Of MCQ Format). Its really an outstanding way of preparing own self for any kind of exam.

It is a platform where with a predefined formatted question-set, you can prepare yourself for any MCQ based exam. One can load content from various question banks now exclusively available across the Internet using this Android app. CrackIT is solely built in such a way that user has the provision to create exam on his own and can rate him or her self by giving those exams into this incredibly simple and amazingly helpful app. One can track his progress by seeing the previous results. CrackIT is beautifully designed and having a pleasing interface. Here, Students have one more reason to love their Android Tablets!

Subject teacher can prepare question bank file and give it to students to perform their self evaluation. This can be equipped with MAC bound so that only Aakash tablets can use that

question bank. Features
Create the exam from the question paper.
Choose the timeline of exam by yourself.
Get your results and track your progress after every test youve attempted.
Take timed and un-timed tests.
Featured question banks are handpicked by user himself to let him practice by his own level.
On-the-go it can be furnished with few amazing features like Online Test and Multimedia questions based test.
Developed by : Mr. Rahu Kalkani, III Year Student, Computer Engineering Dept, SCET, Surat.

8.2.7 Government College of Engineering

RC-1003
Place: Salem
by Salma Mehajabeen.S - Wednesday, 10 July 2013, 3:18 PM

8.2.7.1 Learning Through 3D Cooperative Environment

The proposed module is to teach the kindergarten children through 3D cooperative environments. The environment is planned such as to create high-quality interactive e-learning content which can be published on the Internet, Learning Management Systems (LMS), CD-ROMS and other devices. It would determine the important elements of learning skills. The module will have 6 sets which would teach on I can. By the end of the course the kindergarten kids will be able to collaborate and cooperate the course. The module teaches the kids such as I can Share I can tidy up I can Say sorry I can be quiet I can say please I can say thank you These might seem to be simple but it is very essential. The module is framed such that the 3D cooperative environment may be with both British as well as U.S. accent and with their sign languages. Its done in a play mode.

8.2.8 BRCM College Of Engineering and Technology

RC-1168
Place: Bahal
by Narender Kumar - Tuesday, 9 July 2013, 2:59 PM

8.2.8.1 Aaksah Tablets for School Education

In the project we will create tutorials for the subjects like Hindi, Science and History, Math for High School Education. These tutorials will help the students for better learning and shows improvement in secondary education. This will make the students think beyond and apply the skills in the development of new project work.

Implementation Strategy: It's easy to implement by assigning group of student's one subject each group and monitoring weekly their progress.

8.2.8.2 Aaksah Tablets for Engineering

In Embedded System (ESD) Lab : Most of the ESD Labs exp. are done in 8051, PIC Micro Controller's Assembly Language by using suitable program. By Loading Cross Assembler of 8051 Micro Controller, simulation program may run, for ADC, DAC, Stepper Motor, DOT

LEDs etc. For Connection to actual Hardware for demonstration purpose, USB port of Aakash may be connected to Hardware boards having USB Compatibility.

Implementation Strategy: We have to make an complier for Android but as new Aakash capable enough to work on ubuntu So we easy make complier for Embedded System (ESD) Lab.

8.2.8.3 Aaksah Tablets For Farmer

Progressive information to Rural Farmer in the fields of Horticulture, Seasonal Crops Development and Vegetable Farming.etc. Implementation Strategy: For this we required Reliable information of various crops in our area. For this information we have Haryana Agriculture University (Hissar) which will provide us all the required information. Next step will make an interactive android application which will provide all information required for the crop development. We also make provision in that application to interact weekly with Agriculture scientist of Haryana Agriculture University (Hissar). This Application also make possible interactive Lect. Series to educate the Rural farmer. The role of Aaksh doesnt end here but it also provides an interactive platform to interact agriculture scientist directly through Aakash. This is like "Krishi Darshan" (An Popular TV Programme on DD National) but more interactive and Informative.

8.2.9 Federal Institute of Science And Technology

RC-1077
Place: Kochi
by Bejoy Varghese - Saturday, 6 July 2013, 9:54 AM

8.2.9.1 Smart Class

Smart Class is a complete e-classroom solution , this application can be used for doing evaluation activites such as tests , quiz , assignments etc . and teachers can also give notes by this application. This applications works in moodle server . Moodle server is hosted in a server and the admin can add the teachers , students and courses . So teacher can do a online course and enroll their students and give them the material and online tests etc..
Target Audience:This app is mainly aiming at students and teachers at secondary and higher secondary levels .

8.2.9.2 First Aid

The First Aid app is a simple android app that provides inital care that might be taken as first aid in case of any emergency. The app presents a list of symptoms and set of actions that might be performed for the illness or injury The application has a search bar which provides the user option to search for the particular illness. The search bar also houses a auto complete feature wich provides a list of commonly enterd queries. Once the user touches the search button the details about the injury, it symptoms and care to be taken are presented to the user.
Target Audience:Anyone

8.2.9.3 Wikimedia Search

The "wikimedia search" is an android app that attempts to bring together the various different services provided by the wikimedia such as the wikipedia, wikibooks, wikiquotes etc. The app has a search bar where the user enters the query and a set of buttons corresponding to different

sites where the query can be searched such as wikipedia,wikiboos etc. After entering the query, the user touches the button where he or she wants to search the topic. The app dynamically fetches the content from the internet and presents to the user.
Target Audience:anyone

8.2.9.4   Baby Care

Baby Care is a guide for mothers . This app will give necessary information about cares and diets during pregnancy periods . And diets and vaccination details for babies after birth This application run with a static database and gives necessary information on clicking the corresponding buttons.
Target Audience:This application is aimed at women who are pregnant and have small babies.

8.2.9.5   Tastebuds

It is a cook book, with a large collection of both indian and Italian foods, that can be done at homes, for a great time with the family. Its pretty simple, u can open the app to a menu where u can select either Indian or italian, from there u get an index, of which u need to search the recipe in the search box, drop down menu and then ''next" gives the detailed recipe. It has the ingredients required, and procedure.
Target Audience:Budding cooks- house wives and children who love to experiment.

8.2.9.6   Assignment Support

This application helps to share an assignment to a batch in a common WiFi network easily on the click of a button. this also enables a common discussion platform for teaches and students have a UI based on mobview of html page, type the data on the form in the application and press sent button, it will share everything entered to all in the wifi network.
Target Audience:teachers and students

8.2.9.7   Linux Tutorial

An application that helps one understand about basics and advanced features of GNU-UNIX based operating systems Various options are provided on the home screen of the application.To understand about any feature of linux based systems,user can choose and browse through the required options.
Target Audience:Anyone using linux based operating systems will find this application useful to get information on various basic and advanced features of linux.

8.2.9.8   Attendance

An application that allows teachers to mark and store attendance records of various batches Add a new batch in the menu. Select required batch and date Record the roll number of students where absent Save the record Previously saved records can be viewed also.
Target Audience:All teachers in any institution

8.2.9.9   Wolframalpha Math

Wolframalpha math is a free android application that generates answers to questions in real time by doing computations on wolframalphas own vast internal knowledge base.The main aim behind this application is to make all systematic knowledge immediately computable and

accessible to everyone. The app mainly focuses on simplifying mathematical computation and or serving as a mathematical reference source The app has a very basic layout with a text box ,where queries can be entered in, and an option to download a mathematical keyboard for easier query input.once the user gets the keyboard he or she can now use it to easily enter in queries into the text box.once the query is entered the query is sent to the wolframalpha servers where it is computed and the result is immediately displayed to the user.
Target Audience:Students,Teachers or anyone in need of an answer regarding Maths.

8.2.9.10   Advanced Calculator with Graph Plotting

Advanced calculator that does scientific calculations with maximum accuracy and the plotter that comes along is very helpful for plotting the curves for the scientific functions Calculations can be done as a normal calculator. To plot graph go to menu-¿Advanced. Type your function here (with the help of variable x). Now goto Menu-¿plot. You will be promoted to set initial value , final value and step value. Now click submit that's it.
Target Audience:Students, common people

8.2.9.11   NPTEL Client

NPTEL provides E-learning through online Web and Video courses in Engineering, Science and humanities streams. This application can be used as a client to access NPTEL. Switch on the app with internet connection. You will see the courses available and names of IITs. You can choose between IITs and courses. Now you will be prompted to list of available videos. Click on any video]. That's it.
Target Audience:Students, Educational enthusiasts.

8.2.10   VIT University

RC-1129
Place: Vellore
by Rajasekar Natarajan - Friday, 5 July 2013, 3:11 PM

8.2.10.1   Simulation Methods and Tools for Biologist using Aakash Tablet

This project focusses on the development of multi-scale, multi Physics modeling and simulation methods and tools that help biologists build,simulate and analyze complex biological systems, simulate their dynamics and analyze their functions. Typical biological models include gene expression models, Protein interaction networks and cell cycle models.

8.2.10.2   Development of Android Application using Aakash for Switching between AC Power Line and Solar to Charge a Notebook Battery

Aakash based power switching between ac Power line and solar to charge a notebook battery.It is proposed to develop android application using Aakash for switching between ac Power line and solar to charge a notebook battery.Real time ECG monitoring using Android based mobile devices.It is proposed to develop android application using Aakash for real time ECG monitoring.

8.2.10.3 Development of Job Portal Application using Aakash Tablet.

In the case of the Job application instead of finding friends the user is trying to locate a temporary job in the vicinity, so they can work for a few hours and make some money. The premise is that employers looking for temporary/ permanent help have entered available jobs, descriptions, hours, and offered wages in a web-based that is accessible. Using Aakash tablet android application anyone looking for a few hours work can use the job portal application to access that database look for jobs in the immediate area, communicate with friends about potential employers and potential jobs and call the employer directly if they are interested in the position.

8.2.10.4 Home Automation System Design Using Aakash Tablet

A home automation system integrates electrical devices in a house with each other. Devices are connected thro a computer network to allow remote access from the internet. Through the integration of information technologies with the home environment, systems and appliances are able to communicate in an integrated manner which results in convenience, energy, efficiency, and safety benefits. This task is taken as objective and solution is attained using Aakash Tablet.

8.2.10.5 Business Plan Assessment tool design using android for Aakash Tablet

The tool aimed to be developed will be a comprehensive questionnaire from the perspective of the investors in small business The relevant questions pertaining to the business plan of the aspiring entrepreneur will be put in a quiz format. After answering all the questions related to a Particular section each section will be rated. Each section will have a rating on a five point scale. After all he ten sections of the business plan have been answered on the basis of the question answered. The interpretation of the final score will indicate the preparedness of the plan to be presented for pitching before the investors.

8.2.10.6 Air pollution Monitoring System

The Air Quality Monitoring system designed using Aaksh tablet is targeted for the measurement of a specific gas. Also the scope of accessibility of this system is focused to the users with proper internet connectivity. The system serves best to the users with proper internet connectivity as well as an Android device or a web browser.

8.2.10.7 Creating Demo Model for Electrical Subjects

Various aspects of basic semiconductor devices their operation and applications in microelectronics Can be taught with the help of teaching aid to the students. Hence, I hereby proposing to Develop an Android based app that has embedded Animations and virtual demos for electrical engineering subjects. The Project will be done in the frame as mentioned in the undertaking and will be released as a open source app thro Creative Commons license.

8.2.10.8 Bat Inspired Micro Air Vehicle

The primary objective of this research project is to Develop a flapping wing aircraft that is inspired from nature, especially from BAT. This flapping wing MAV can have many significant advantages Over fixed and rotary wing systems. Small size MAV is capable to fly in caves, tunnels, buildings, Stairwells, shafts and thus can be significant value in military as well as non-military purposes. This work is carried out using Aakash Tablet.

8.2.10.9   Design and development of health state monitoring of infants

Based on the challenges presented to the sensor designer in the health state monitoring of infants there is tremendous need for developing a novel heart beat and pulse monitoring system with high reliability, accuracy, and cost effectiveness. In this regard, there is a new proposal to develop a demo model for the proposed system using the application of Akash tablet for signal display to the user by developing a suitable apps for the tablet.

8.2.10.10   Design and Development of Tier Pressure Monitoring System for Automotive Applications

Based on the challenges presented to the sensor designer in the automotive industry there is tremendous need for developing a novel tier pressure monitoring system with high reliability, accuracy and cost effectiveness. In this regard there is a new proposal to develop a demo model for the proposed system using the application of Akash tablet for signal display to the end user by developing a suitable apps for the tablet.

8.2.11   Rajarambapu Institue of Technolgy

RCID-1139
Place: Islampur
by Savita Prashant Patil - Friday, 5 July 2013, 12:01 PM

8.2.11.1   Students Attendance Application

Students Attendance Application will be an android application to be developed for daily student attendance in schools, colleges and institutes. It facilitates to access the attendance information of a particular student in a particular class. The information is sorted by the operators, which will be provided by the teacher for a particular class. This system will also help in evaluating attendance eligibility criteria of a student.
Here the first module is admin which has right for creating space for new batch, any entry of new faculty, updating in subject if necessary, and sending notice. The second module is handled by the Subject teacher which can be an operator. A teacher has a right of making daily attendance, generating report.

8.2.11.2   Students Assessment Application

At the institute, there are so many activities happening in between the student and the teacher. There is continuous assessment of the students through different assessment methods. These evaluation marks are needed to be accumulated and converted to give final marks and grades for the student.
So, we develop an application where a teacher has an access to information of batch of students. The teacher requires filling the information about the evaluation of the student. This information will be getting saved on the server. The final grading can made available as a report for the teacher.

8.2.11.3   Implementing MANET using Aakash

Aakash tablets are basically wireless smart devices. The devices are able to join communication networks using WiFi. A mobile ad-hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. Each device in a MANET is free to move

independently in any direction, and will therefore change its links to other devices frequently.

So, we can build a Mobile Adhoc NETwork (MANET) of Aakash tablets for collaboration in academic environment for various purposes.

Presently MANET research community largely depends on network simulators like NS2, OP-NET, QualNet for experimentation of various research ideas in MANET. The Aakash tablets being mobile wireless devices can be used as MANET nodes. This can make practical implementations of research ideas possible.

The work is in planning phase to build MANET of Aakash tablets. Each Aakash tablet device is having unique identity which can be used as address of the device. The standard routing protocols like DSR will be implemented in these devices for routing purpose.

8.2.12   KIIT College of Engineering

RC-1209
Place: Gurgaon
by Preeti Aggarwal - Friday, 5 July 2013, 7:19 AM

8.2.12.1   Development in Android Coverflow UI Widgets

Coverflow Widget is a widget that enables a graphically impressive way of representing images and thumbnails. It was first introduced in the apple iOS and also exists as a separate class in iOSs Standard Development Kit that can be extended and used. The basic coverflow widget is a horizontal scrolling list of child images which are beautifully arranged.
In Android there is no such predefined APIs for designing a coverflow.
In this project two widgets are developed till now, Vertical Coverflow and Semicircular Coverflow, which are different versions of a widget used in the apple iOS known as coverflow.

Hardware
This project can be used in any android enabled phone with the following minimum hardware:
Processor above 500 MHz, should be ARMv5 or higher version of it.
256 MB RAM
256 MB Memory storage

Software
This project can work on the following version of android:
Android 4.2 and Android 4.1 "Jelly Bean"
Android 4.0 "Ice Cream Sandwich"
Android 3.0 "Honeycomb" not available (since it was not a public open-source release)
Android 2.3 "Gingerbread"
Android 2.2 "Froyo"
Android 2.1 "Eclair"
All the work has been done in Java Programming Language and xml by using the Eclipse Integrated Development Environment (IDE). We use the Android Software Development Kit (SDK) which includes a variety of custom tools that help us develop mobile applications on the Android platform. The most important of these are the Android Emulator and the Android

Development Tools (ADT) plug-in for Eclipse.
Gaurav Kotwal B.Tech Final Year

8.2.12.2 Delhi Metro Alert

This is an application in android, the Google operating system for mobile devices. The design of such an application is made in slightly modified Java. The purpose of the final application is to develop an android application of Delhi metro i.e. Delhi Metro Alert. Application DELHI METRO ALERT is based on Global Positioning System (GPS). Using this software application an android phone user who is travelling in a metro can set Alarm from his/her source which will ring exactly 1km before arrival of destination. It will give alert notification with a text message indicating that destination is about to arrive. This application is useful for the people who sometimes sleep or the people listening songs through their headphones while travelling in the metro. This project also provides the Fare calculator feature through which user can calculate the fare from his/her source to the destination. It also provides a route map through which user can see the route of all metro stations. Using its search module User can search any ATM, School, Hospital, Restaurant, Mall near any metro station within one an half km or near current location.

Technology Used
JAVA
Android SDK
Tools to build Client Application
API console
Eclipse IDE
Android SDK
Real time ADB Device(Emulator)
Sakshi Khurana B.Tech Final Year

8.2.13 Techno India

RC-1263
Salt Lake, Kolkata, West Bengal
by Soumitra Sasmal - Thursday, 4 July 2013, 9:44 AM

8.2.13.1 Online Information System for Educational Institutions

Monday, 8 July 2013, 12:41 PM
The objective of this project is to make updates on college/school notice boards to be available instantly on Aakash tablet via an Android application. Any update will be spontaneous available on the application. Along with this, this application will also host a plenty of other information like academic calendar, syllabus, results etc. The application will be able to filter information belonging to different departments so that a student will get only relevant updates.

8.2.13.2 English Learning Apps Development for Slum area Literacy Programme

The apps will be used in learning the letter and vocabulary using Aakash. The English Language Apps (ELA) will looks like animated graphics with figure how the alphabet look like, the apps will also provide audio out how the alphabet is pronounced and also how it can be written in

there vernacular language (for students who know their vernacular language). For Example The Letter A by a Bengali student will be heard as Ae and he will also know how it is written and also how it looks like and its Bengali word. The letter is written in Bengali using Flash Cards. The same thing can be done in any local language but the preliminary testing will be done in Bengali only. Once this Apps is successfully developed, our 1st year students will be engaged in literacy campaign programme under NSS curriculum.

8.2.13.3 Content Based Training on Introduction to RDBMS

Storyboard design is used to design the CBT.For each page in the project, there is an individual story board layout. Each page contain text, image, audio, video, animation that will be used to make the CBT more interactive. Each page describes the individual topic of RDBMS. At last after each topic there is a practice session that is used for self evaluation purpose.
The complete CBT helps the target audience to learn basic introduction to RDBMS without any physical presence of faculty member.

8.2.13.4 Self Learning and Evaluation Strategy in Distance Education using Aakash Tablet

Initially subject wise course materials will be digitized and loaded into respective memory cards and before use it should be loaded into Akash Tab. We also load our progress monitoring software in the tablet memory.
After study of a particular module the self learning and self evaluation monitoring system can be activated through menu based options. The options will highlight Statistical measures indicating lessons completed and lessons pending. In statistical measures a student can have self analysis of course coverage.

8.2.13.5 Data Structure Simulator DSS 1.0.0

Data Structure simulator 1.0.0 (DSS) is an application where all the data structures with all its functionality are graphically demonstrated . The application will also contain descriptions of all the data structures in two different languages namely Hindi and English. The codes in the description are also written in two technical languages namely C and JAVA. The applications objective is to teach all the students how different data structures works and to give them a crystal clear concept of its working. It can also be used by teachers as manual for teaching purpose.
DSS 1.0.0 will contain all the data structure (linklist,stack,queue(circular and fifo),tree) graphically demonstrated.

8.2.13.6 Akshar

Akshar is a project dedicated to develop an intuitive JAVA IDE for basic programming learner at Secondary and Higher Secondary Level in Top-Down modular fashion. It is basically a GUI based IDE that provides an environment with which even a beginner can learn programming. For Instance...If you have to create an object of Rabbit Class you just have right click the specified IDE area where you will get an option for 'Add Object', clicking which you will an editor with some IDE generated codes and instruction or even you can just drag and drop some predefined objects already available. Later you can see how GUI component and the core codes working together and compare them for interactive learning.
Usability of project:

1. An Intuitive Java programming environment for students and teacher.
2. Different package and learning module for each level(Self Tutor).

8.2.14   Jaypee Institute of Information Technology

RC-1251
Place: Noida-128
by Dr. Devpriya Soni - Wednesday, 3 July 2013, 4:44 PM

8.2.14.1   UML Generator

Objective: UML is very powerful modeling language. Through UML diagrams we can provide users with ready-to-use, expressive modeling examples. UML can be applied in many areas like embedded systems, web applications, commercial applications etc. UML can be used for modeling the whole system independent of platform language. UML is a graphical language for visualizing, specifying, constructing and documenting information about software-intensive system.UML Generator is an android app that supports three types of diagrams which are Class Diagram, Activity Diagram and Use Case Diagram with theUnified Modeling Language (UML), which is the industry standard general purpose modeling language for software engineering. Students developing projects can use this application for the generation of UML diagrams.

8.2.15   Srinivas Institute of Technology

RC-1214
Place: Mangalore
by Ravishankara Kulamarva - Wednesday, 3 July 2013, 9:20 AM

8.2.15.1   ANDRO-EAR

Objective: To develop an android application for the hearing impaired by converting speech (of the person communicating with the hearing impaired) to text. It is mainly focused on aiding the hearing impaired. It covers a wide range of functions/applications that are indeed helpful for the hearing impaired in their day to day life. The most important of them being the applications ability to convert from speech to text and vice versa, thereby enabling the hearing impaired to listen to human speech as easily as others do. The application allows quick switch between both the conversion modes.
The application allow the person speaking to the hearing impaired to speak with any accent of English and of more than 75 other world languages including Spanish, Italian, French, Arabic and many more. The application is developed in such a way that the user is not required to learn any foreign accent.
Another innovative idea is to provide a hearing test using which the user gets an idea about his hearing capacity, which in turn enables him to customize the application in accordance with his personal requirements (his hearing capacity). The application contains a set of inspirational quotes which encourage the physically challenged.
The application provides links to blogs and community sites dedicated to the physically challenged and specifically the hearing impaired. Finally, the application comes preloaded with a few videos teaching the Hand Gesture communication method.
Note: The project won First Prize in the 27th CSI Karnataka student convention held at Reva Institute of Technology and Management, Bangalore on 20th April 2013.

Members of the Project Team:
Mr. Jaseem Abbas and Mr. Jose Baby, VII Semester Computer Science and Engineering.

8.2.16   St. Margaret Engineering College

RC-1031
Place: Neemrana, Alwar, Rajasthan
by RamNiwas Gurjar - Tuesday, 2 July 2013, 11:07 AM

8.2.16.1   Village Information and Knowledge Centre (VIKC)

There is need of a system that can provide needed information and knowledge to villager so that they can be benefited themselves to fast growing word of information. Village Information and Knowledge Centre (VIKC) will be a key enabler and a vital component of the new knowledge based information revolution. Village Information and Knowledge Centre (VIKC) is a place to render multiple services to villager through use of server having internet connection, WiFi access point and Aakash tablets. The purpose of setting up of a VIKC is to bring access to a range of services, content and information to people living in remote villages i.e. govt schemes, bus/train/air ticket reservation, nutritional information including primary processing of fruits and vegetables, rural sanitation, preventive and curative aspects of health and hygiene, skill development and linkage with market requirements and demands, capacity building among village based organisations and people or on any issue that the rural communities would desire.

Use of Aakash tablets in Village Information and Knowledge Centre:
Senior Citizens will be benefited with facilities i.e. Govt schemes, old age pension, bus/train reservations, banking, paying insurance premiums, medical help etc. Villagers/Farmers will be able to know about Govt schemes, agriculture loans, agriculture equipment, seeds, fertilizers/pesticides, grain/vegetable market rates, weather reports, cold storage, talk/chat to expert, seeing demonstration videos etc. Ladies/Girls will also able to know about Govt scheme for ladies/girls, vaccination, child-mother care, pre and post natal care, home care, cosmetics, various cooperative schemes. Students/villagers will be highly benefited by knowing information about Govt schemes, scholarships, education loan, access to e-books, e-newspaper, video lecture by experts, online form fill-up, examination and related information, learning by watching videos i.e. rhymes, stories, cartoons, interactive games, e-painting etc. Able to connect to e-governance portals i.e. online jamabandi, land record information, BPL, Aadhar, MNREGA information etc. Villagers can access govt portal for govt schemes and scholarships, audio-video information using internet and from server maintained at VIKC.

8.2.17   Maharaja Agrasen Institute Of Technology

RC-1238
Place: Delhi
by Namita Gupta - Monday, 1 July 2013, 10:40 PM

8.2.17.1   Guru

This app will make the classroom learning more interesting. Guru is an XML based application that will not require any external web server. Application would itself run on the tablet and multiple users can connect to the main application through Wi-Net software. This module Wi-Net is capable of converting ones own device as a hotspot, where several devices can connect to

it and communicate with each other. There is no need for an external router to communicate with other devices. In this app, the teacher will create quiz on his/her tablet or will import the quiz created by him/her on the desktop. The quiz files are in xml format. The teacher can analyze the performance of students on per-question basis using bargraphs, piecharts, stacked bargraphs, line graphs and textual summary. If large number of students fails to answer the same question correctly, the teacher would come to know that he/she needs to explain the same topic again in the next lecture. This would ensure that students do not leave their preparation for the last minute and discourage the practice of rote learning before exams.

Project Guide- Dr Namita Gupta, Mr Alok Sharma

Students - Mahima Kukreja, Vageesh Vyas, Ankit Popli, Abhinesh Kaushik, Arpit Goel

Guru has won FIRST prize in Project competition held in May 2013 by GuruGobind Singh IndraPrastha University (Dwarka, Delhi).

8.2.18   Knowledge Institute of Technology

RC-1146
Place: Kakkapalayam
by Karthikeyan Thangaraj - Monday, 1 July 2013, 3:02 PM

8.2.18.1   Knowledge Management System

The Knowledge Management System (KMS) is the project done with open source Learning Management System Moodle. This KMS is an effective tool to implement a fully computerized learning methodology. This project comprises to two exclusively dedicated servers privately intended for the Intranet Video conferencing and LMS to handle e-classes throughout the college Intranet. The Moodle server will provide a Virtual learning environment which encourages students to use computers effectively. It can be used as a Staff-Student portal to share the materials. Even it can be used as a forum for discussions. Provisions are given to use it as intranet social networking site. The Video conferencing server is used to conduct e-classes by video conferencing. It has options to record and playback the sessions so that students will never miss the classes. These two servers are effectively working in all terminals of our college network including android tablet devices connected to the WIFI router.

8.2.19   Govt.Engineering College

RC-1187
Place: Thrissur
by Dileesh E D - Monday, 1 July 2013, 11:34 AM

8.2.19.1   GEC Live An Event Notifier

The Gec Live event notification app is a small scale network developed on and for the Android environment. An event notification tool is a powerful tool which allows individuals to share information with each other on th go using their android devices. They help in bridging the geographical boundaries separating the users and creating a truly united campus. The features implemented are : Enable users to create and inform other users about events
Notify through calls and emails
Filter the contents of event description

Categorize notifications General events and blood donation requests

Future extensions:
Develop a system which enable users to form groups
Deploy an SMS based system for blood donation
Tracking the location of the users.

8.2.19.2 Project Dequeue- A Wi-Fi based mobile ticketing cum monetary system

The project was on providing a software alternative to the present physical queue system. An online web-portal, a local server application and a mobile application was developed to implement the system.

The mobile application was developed on and for the AAKASH tablet. The application acts as a window to the developed local server application and the device is connected to the local server through Wi-Fi. The mobile user logs in to the local server through the mobile application and communicates with the server to serve the ticket generation. The application also provides storage for the downloaded QR based ticket.

The Wi-Fi connectivity of the AAKASH tablet was found to be efficient and avoided the risk of disconnection in between communication which was critical for our application .The AAKASH tablet was found to be suitable and efficient for Android application development.

8.2.19.3 Project Tracker for Civil Engineers in Android using Aakash Tablet

Project Tracker for Civil Engineers in Android using Aakash tablet is an android application which can coordinate and administer the works of civil engineers at different construction sites. Aakash tablet enhance our application with all our required demands. This situation led us to implement the proposed system using Aakash. We utilized the tablet in almost every phase of our development, from design to testing and implementation. We used Android SDK with latest APIs for development and performed USB debugging on Aakash. The features that we proposed were:- Estimate Calculation
Cost Evaluation
Schedule Notification
Integrated Calculator

We implemented all the above features successfully and wish to extend its functionalities further more.

8.2.19.4 4Slide Presentation Controller for Aakash Tablets

The project was based on an application which was intended to provide a remote control over the slide presentation using the Aakash tablet. Since, Aakash is a future tool for lecturing and studying purposes, applications involving teaching enhancement will be in huge demand in future. This situation led us to implement the proposed system. We utilized the tablet in almost every phase of our development, from design to testing and implementation. We used Android SDK with latest APIs for development and performed USB debugging on Aakash. The features that we proposed were:- GUI for connection establishment with server.
Controls for slide-by-slide navigation
Highlighter for marking purposes

Among these, we successfully implemented every feature, except the highlighter. In the proposed time of 3 months, this was a fair achievement for us.

As future extension we are concentrating on:-
Implementing the proposed highlighter
Current system is suitable only for Linux systems, so another proposal is to extend it to windows systems

8.2.20   SASTRA University

RC- 1140,
Place: Tanjavur
by: Shankar Sriram - Sunday, 30 June 2013, 5:07 PM

8.2.20.1   AAKASH pustak (An E-Book Reader for AAKASH)

This application is developed in two phases. Phase 1 focuses on developing an ebook reader application (along with the application architecture) that would be well suited for the AAKASH tablets. The application allows the user to choose the required class and subject. The corresponding book is downloaded from the central server to the AAKASH tablet. The application also provides a search facility that searches for a term/phrase in all the books and lists the results. The second phase of the project focuses on converting the existing books to epub format that the ebook reader will read. The epub format is choosen for the reason that it is light weight and will be best suited for Tablets. To start up with, conversion of CBSE books to epub format is done for class 1 to 12. This Ebook reader helps the school students to have their books in the tablet, there by reducing the school bag size.

8.2.20.2   Career Counseling for High School Students on Aakash Tablet

This application has the following functional requirements
Advising students and parents on high school programs and academic curriculum, preparing them for college application and admission . Arranging dual/concurrent enrollment and Advanced Placement credits to prepare students for the rigour of postsecondary education. Planning and preparation for college admissions tests, SAT and ACT. Informing students about postsecondary financing that can be used to support advanced education and training. Developing career portfolios, which include test and grades results, examples of student work, and resumes and cover letters to prospective employers. Arranging job shadowing, work placements, and community-based learning programs to allow students to directly experience workplace situations.

8.2.21   Textile and Engg. Institute

RC-1008, 21781

8.2.21.1   Tutorial on Hormonic Analysis of one dimensional signals using SCILAB

by Jayashree Vaddin - Thursday, 4 July 2013, 9:09 PM
The application that we are developing is intended to be used as an e learning tool for hands on practice on the Digital Signal processing subjecs inside the classroom or in the lab to develop

interest of the slow learners and weak students. This report illustrates a basic scilab tutorial on analysis of noise affected audio signal.Tutorial is carried out in two parts i.e., priorily on the simulated complex signal and secondly on the real time audio signal. Fourier spectrum and power spectrums of these signals were studied, plotted and analyzed. Further the quality of these signals was computed using PSNRs. PSNR result are -56 dB and -109dB for simulated complex signal and noise added real audio signal respectively. In the last step of this tutorial an appropriate method was adopted to extract the original signal from noise embedded audio signal. This tutorial can be extended for analysis of other kind of noise embedded signals such as square, triangular etc. The steps involved for the analysis of the signal are stated along with the result images.

First Post:
by Jayashree Vaddin - Saturday, 29 June 2013, 5:53 PM
This report illustrates the basic scilab tutorial tutorial on analysis of noise affected signal. Tutorial is carried out in two parts i.e., priorily on generated complex signal and secondly on the real time audio signal. Fourier spectrum and power spectrum of these signals were computed, plotted,studied and analyzed. Random noise was added n audio signal. Further the quality of the signal was estimated using PSNRs. PSNR result obtained are - 56 dB and -109 dB respectively for simulated complex signal and the real time audio signal. In the last step of this tutorial, original signal embedded in noise was extracted by adopting a reverse procedure. This tutorial can be extended for the analysis of noise embedded signals such as square, triangular etc and real time vibration, medical signals. The steps involed for the analysis of the signals are stated along with result images.

8.2.22 Sarvajanik College of Engg. and Tech

RC-1043
Place: Surat
by Keyur Rana - Saturday, 29 June 2013, 4:08 PM

8.2.22.1 Tracking the object using multiple Access points

Project work, identifies location of object, which is equipped with embedded hardware, attached with it, using surrounded multiple access points, in indoor scenario. It scans signal strength of multiple access point in vicinity and compares, these values with earlier stored values, at virtual grid points on map of building/floor. It also sends such details to server, which is connected via Wifi network and one of the access points surrounded to it. So device runs matching algorithm which is based on calculating minimum Euclidian distance from various grid point measurements and hence identifies optimal grid point. This grid point is finally displayed as location of device/object. The positioning algorithm is based on the above deterministic Method which comes under the category of Location Fingerprinting Method. Server calculates location and displays on map. At server side php as programming language and My SQL data base is used to store data of object to be located.

Guide : Prof. Niteen B. Patel, Team members : Shah Rajvi, Patel Bhakti, Agarwal Simple, Parekh Shailja.

8.2.22.2 MyELib

Main objective of this project, MyELib, is to provide library members with ease of access to library formalities from anywhere at anytime. This project is all about the library. Only the

library members will be able to use its functionality, as members need to login to access the system. MyELib application will list members details along with books list issued by them. Library members will be able to view, search, demand/request for books. If the book is not available then they can request for the book and the books will be allotted on the bases of first come first serve. Book should be issued by next 24 hours of request or demand. Fine management will also be there. The book availability and the fine remainder will be given either through SMS or Email. Library members will also be able to give suggestions and complaints. Team Members : Ms. Hawagauri Mulla, Ms. Eva Kapopara

8.2.23 Rajalakshmi Engineering College

RC-1138
Place: Chennai
by Benedict Jayaprakash Nicholas - Saturday, 29 June 2013, 1:19 PM

8.2.23.1 An Enhanced Learning and Assessment Tool for Visually Impaired

Team Members :
Bhuvaneswaran B
Poonkuzhali S
Swaminathan B
Benedict Jayaprakash Nicholas

Project Summary:
This proposed project strengthens the visually impaired peoples learning and assessment capabilities using Aakash Tablet and addresses the problems that visually impaired people have on navigating and reading information from the web pages. In addition to that, reading contents from the web page, this project involves an exclusive text editor and a cost efficient smart Braille keyboard. This will be implemented by using a multi-modal approach of combining visual and audio technologies. The first prototype of these interfaces has been developed based on the results of the user requirements capture conducted with visually impaired people. This project uses interactive blind editor and an economic Braille keyboard with dual keyboard and Multi language support. It also comprises of an automatic alert system that increases usability and minimizes the occurrence of errors.

Hardware Requirements for Development
Processor : Intel Dual Core and above
RAM : 2 GB
HDD : 100 GB
Speaker : Normal Multimedia Speaker

Software Requirements for Development
Operating System : Linux
SDK : Android
IDE : Eclipse

Hardware Requirements for Deployment
Tablet : Aakash
RAM : 4 GB
Keypad : Numeric (Optional)

Cable : USB

8.2.23.2   SAVIOR:Speed, Accident Detection and Emergency Service System on Android Smartphones

Team Members:
Anand Raj A
Arthi R
Hariharan R.
Supervisor Name: Rajesh Kannan G.

Project Summary:
The Commission on National Road Safety reveals that at least 13 people die every hour in road accidents. Rash driving has claimed many a number of innocent lives. Thus, there is an acute need to look into this issue. Keeping this point in perception, our project proffers to reduce these accidents by exploiting the advent of the new technologies. This application named Savior is basically an android application that is GPS based which calculates the speed at which the vehicles are moving and intimates the drivers whenever they exceed the safe speed limit. It also produces an alarm that alerts the people walking on the road side. The main feature of Savior is that it detects the accidents and makes an automatic call along with the information about the approximate location of the accident to the ambulance service, police station and the person of concern (whose number is stored and preconfigured in the mobile). Accidents hurts but safety does not. The salient features of the application helps to reduce accidents and if it occurs (at adverse conditions) it at least facilitates an immediate medical assistance with a low latency.

8.2.23.3   Cafe Internet(Restaurant based Application)

Team Members:
Harish S.
Harivignesh S.
Kabilesh P.M.

Project Summary:
Customer satisfaction is the key to success for any business. In a restaurant, the traditional hand-waving method for calling services is inefficient often leading to many complaints. The Restaurant Management System increases operational efficiency through use of an intentional wireless communications system and a statistical data processing unit. The communications system increases customer satisfaction by leaving electronic devices at each table which the customer can use to request for a server. A data processing unit allows managers and owners to easily monitor restaurant functions and employee progress. To make this system a reality, Android devices such as tablets or mobile phones are placed at tables which are connected to WIFI Hotspot at the restaurant. The Wi-Fi enables local area communication with all devices in the restaurant with the system where admin work with. The Android application at phone enables the place orders and tracking them. The Web based admin part handles the request from android app. The System provides a new trend of changing technology and enables higher degree of satisfactions to restaurant.

8.2.23.4   QuizApp: An quiz application for board examination students

Team Members:
M. Anandraj
T.M. Sridhar
P. Ramadevi
Rajesh Murugesh

Project Summary:
This proposed project strengthens the students and increases the interest for their board examination and various competitive examination preparation using Aakash Tablet. The students can both attend the quiz off line and online, by online the student can participate competition with the other students for the self assessment and also to be monitored by the teacher. The quiz works with three time attack slow, medium, and Rapid fire, for the students not to get bored by attending the quiz the options and question will be selected randomly from the question bank stored in both online and offline database.

Note: Other projects for aakash tablet will be uploaded by 1st July 2013.

8.2.24   Sardar Patel Institue of Technology

RC-1229
Place: Mumbai
by Dayanand Ambawade - Friday, 28 June 2013, 4:36 PM

8.2.24.1   Indian Monuments and Achievements of India

Developed by: Vaibhav Kohli (ME-CMPN,SPIT)

Objective of the Project: To help teachers to teach students about various Historical Heritage Sites of India.

Brief Description of the Project:
We would like to make an Android application which will contain description about important monuments and achievements of India. It will also contain important ways to safeguard our endangered Cultural heritage sites as per UNESCO and the list of all the Indian heritage sites issued by UNESCO. It would be help to students to learn about various monuments of India and ways to safeguard them.
Project Category:Educational

Usability of project: In classroom teaching of History/General Knowledge Subject.

System Requirements: Hardware and software requirements of the project like:
Android 4.0.3
5 MB approx will be the application size.

8.2.24.2 Project Title: A Trip To Zoo

Project Member: Mangesh Shinde
Himanshu Gupta
Hetal Raut
(MCA-SPIT)

Project Descritpion:
A Trip To Zoo is a GAMIFICATION app! It is the best source of Educating Kids in a fun and animated way in users pocket. It's a mobile platform for teaching and educating small kids.

Objective:
A Trip to Zoo is developed to Provide Real Wildlife experence to kids, it Enable kid to Learn about animals in fun and animated way. Aim of this project is to provide all the necessary facts and trivia about animals, Give Challenges using games to keep the kids interest in learning, Track progress and performance of the kid which can be shared with parents. This application is developed for kids of the age group 2-6 years dont have the opportunity to visit a zoo and experience wildlife.

System Requirements :
Developer Perspective :
-Hardware Specification: RAM : 2 GB
Processor: 600 MHz and Above.
-Software Specification:
Android 2.3 (Ginger bread) and Above
JDK 1.5. and Above
SQLite.
Eclipse IDE.
User Perspective :
-Hardware Specification: RAM : 512 MB and Above
Processor: 600 MHz and Above.
-Software Specification:
Android 2.3 (Ginger bread) and above
-Permission:
Internet Connection

8.2.25 DCR University of Science and Technology

RC-1064
Place: Murthal
by Darshna Hooda - Friday, 28 June 2013, 3:23 PM

8.2.25.1 Aakash:Testing Environment for Video Ecncryption Techniques

Under this work we are trying to use Aakash as testing platform for Video Encryption techniques to measure performance of video encryption in constrained environment. Encryption is the proven technique to offer security but conventional encryption algorithms consume computing resources significantly and are not effective in current scenario of multimedia consumption through hand held devices. So our purpose is to offer convenient testing environment to measure

performance of video encryption on the parameters : power consumption, CPU utilization and time consumption.

Looking forward for valuable suggestions.

8.2.26   Maharaja Institute Of Technology Mysore

RC-1097
Belwadi
by Ashwin H.m. - Friday, 28 June 2013, 3:05 PM

8.2.26.1   Paper Less World (Go Green)

Paperleass world is an exclusive customized android based Write Book application to support hand writing feature in Aakash. This application has to be developed in the line of Write Pad for ios/android, Lecture Notes for windows, Samsung note etc. This application will support non English languages to support diverse cultural languages in India.

In todays Education context single digitized ebook for reading and writing is very demanding. The use of Tablet PCs application can fulfill the changing demand of the education system in this world. The Aakash tablet helps every human in serving his/her demands in a modern way. This article highlights the new idea of using AakashTablet for writing purpose within our education system. The Write book application for Android devices seems to be the perfect application to assist students with advanced note-taking. Every student to carry only one book for his/her entire KG to PG education. For whole of his life, he will carry only one book for reading and writing.

Uses :
Write book Application (Read and Write feature)
Digital Written Examination
Hand writing recognition for Non English Languages
Aakash adapting to new languages
e-Teaching

8.2.27   RK University School of Engineering

RC-1137
by Rajani kanth - Friday, 28 June 2013, 11:34 AM

8.2.27.1   K. S Patel Scholarship Exam Block Arrangement

This application is basically for 12th science students. This application is to make students seat Number and block Number allocation process easy and accurate. As it is an open scolarship exam so number of students are very high. This application provides the feature to allocate student's seat number, managing seating arrangement and provide supervisor duty chart. It is an android based application for Aakash Tablet. It is a centralized and serialized application for managing student's seat number and block number. Database is required to run the application and to manage all the details of the students.

8.2.27.2 Online Notice Board

ONLINE NOTICE BOARD is an application that is based on Aakash Tablet. It can provide all notices and events and important information to students and staff members uploaded by HOD or administrator. This will help everyone to get the updated information. It also provides the feature of control access to provide different access permission to different group people. Security measures are applied for providing proper authentication.

8.2.27.3 Survey On Various Issues

This is a research based concept to change the platform of Aakash Tablet which will enhance the security measures and improves its capacity to run more number of applications. Linux platform provide security to passwords, encryption of data and control access to specific files. It helps to run number of application on tablet with high security. It will provide multi-tasking without affecting the speed of processor. Using Linux will enhance the performance of tablet by inheriting its features.

8.2.27.4 E- Learning

E-Learning application is basically for Aakash tablet to make learning easier and comfortable for students and teachers. It can run through Bluetooth and GPRS. It will help them to share study materials and important information. It can easily transfer large the files by sending it into parts. E-Learning is suited to distance learning and flexible learning. It includes numerous types of media that delivers text, audio, images, animation and streaming videos.

8.2.27.5 Knowledge Hunt

KNOWLEDGE HUNT is an application that helps to groom up the knowledge of the student by getting all the related information of the subjects at one place. It provides the basic concepts of the subjects and helps students to get all the related study material at one place. It can also help to connect the application to internet to access more information from outer world. It also provides the feature to append more information for further use.

8.2.27.6 Notification Apps

NOTIFICATION APPS is an application for Aakash Tablet for maintaining and scheduling the assignments, their submission dates and reading time table etc. it keeps all the necessary documents and notify the deadline date for submission of the assignments. It will maintain grades of the students. It is very helpful for teachers as it maintains the record of the student and generates the cumulative grade for every student. As different account is required for students and faculties, control access privileges are provided for authorized access and security parameters are applied.

8.2.27.7 E- Tube

E- TUBE is an application that is based on educational criteria and it provides different types of tutorial in video format. It also provides e- books for all subjects that help students to get all important books at one place. It has the feature to convert the format of the video if not matched by connecting the application directly to internet. User can easily upload more videos to E- TUBE. Databese is provided to store the videos for further use. to resize the video file it uses convertor to change the file format and quality of the video.

8.2.27.8   Multipassword Locker

Multi password locker is an application for maintaining security of a particular application. It is named multi password since we not only use one password but we are going to add more password to provide high security. By this we can set two passwords for single application. So basically it is a multi password multiuser application. It increases security to rescue it from unauthorized access.

8.2.27.9   Oops Solution

OOPS SOLUTION is an application that is based on user queries and their solutions. This application is managed by administrator. Users can create their account and upload their queries and also provide the answers of others queries. This will provide notification if users receive their answers for their query. It provides number of solution of a single query. As it is maintained by administrator so security measures are provided for authenticated users.

8.2.27.10   Quiz Application

QUIZ APPLICATION is an application that helps to improves students knowledge by using quiz application. It can help them to solve more questions in less time. It also provides study material for students. This application is managed by the administrator. Access control privileges are provided for security purpose. It is a GUI application which is interactive and easy to use.

8.2.27.11   Standard Elements Data Generator

STANDARD ELEMENTS DATA GENERATOR is an application which is used to get the standard dimension of various mechanical components. It requires various mechanical name as an input according to which this application will provide standardized dimensions and 2D drawing of component depending on standard value. It is also very helpful for designing these components.

8.2.27.12   Design of Knuckle Joints (Mechanical Based)

Design Of Knuckle Joints is an application where aakash is used for designing of knuckle joint it also requires parameters which give final dimensions and 2D scale drawing of knuckle joint. It also has offline design where authorized person can only give the input parameter. Numerical based design check can be done with this application where design can be get at jpg image or pdf file. It can share with both connectivity either Wi-Fi or internet.

8.2.27.13   IT Quiz

IT Quiz is an application developed on Aakash Tablet based on Quiz competition, where not only quiz is conducted but also much competition has been added. In this application we only need to sign in so that we can be a part of the competition. The features that have been added in the particular application are all easy to use and understand. Through bluetooth conectivity more than two person can play this quiz simultaneously.

8.2.27.14 Spell Regulator

Spell Regulator is an application to check wrong spelling detection and correction. Here students can easily spell out the complex spelling, synonym and antonym. Spell regulator may be stand-alone, capable of operating on a block of text, or as part of a larger application. It scans the text and extracts the words contained in it. The main objective of this project is to detect wrong words, sentences and correct it.

8.2.27.15 Mobile Attendence

MOBILE ATTENDENCE is an application which is a mobile based application that helps to maintain attendance record in mobile. It is easy to keep attendance and maintain it in mobile. It helps to generate aggregate attendance and number of absentees per day, per week, per month. It can maintain monthly attendance record. Attendence can be shared among the faculties and can be transfered through e- mail or SMS if internet connection is not there.

8.2.27.16 CGPA and SGPA Calculator

CGPA AND SGPA CALCULATOR is an application which helps for calculating aggregate marks in different format like CGPA and SGPA. It helps to easily calculate CGPA and SGPA and it also helps to convert it from one format to other format. It provides graphical view of the results to show the performance of every student. It provides result of every semester and students can get the result through mail.

8.2.27.17 Security Camera Monitor

SECURITY CAMERA MONITOR is an application which is based on android. It connects to security camera server and gets the video streaming of security camera. It also works with multiple camera system like in university or in organization. It can also control the position of camera and different view of camera and can switch between multiple cameras.

8.2.27.18 Activity Log Tracker

ACTIVITY LOG TRACKER is an android based application. This application runs in the background. It can easily be installed on anyones mobile and extract all the logs of that mobile phone. The data can be easily sent through email or SMS. If there is no internet connection on phone to send the data through mail then user can use the other alternative by transferring log file through SMS.

8.2.27.19 RKU News

RKU NEWS is an application managed by administrator. All the information is updated on the application by the administrator. This will help student to get the updated information from the college about the events, cultural fests, exams dates, results and other important information. Access control privileges are provided for security purpose. Students and staff can make their own account, can participate and register themselves in different events. Newsgroups and forums can be added for healthy conversation among the members about an agenda.

8.2.27.20 ERP

This application stands for enterprise resource planning in which all the necessary details and additional features are added. In this case ERP of a college is taken in which registration;

details regarding the students, staff, college curriculums, and gallery are maintained. With this features all the students staff members can access their information any time. It is a centralized application, any changes made by any member is updated in all departments.

8.2.27.21   SNAPEDIA

This application created serves the purpose to make the search of any text or image by easy and fast means by capturing an image of it. Clicking a photo will give the information about the captured photo. Not only the text but also the related images are also provided simultaneously. It gives an easy use and quick information about any information and text.

8.2.27.22   College Notification

This project notifies information regarding college management, faculties, HODs, exam dates, exam result dates to the students. Also the submission dates, extra lectures and other important notices by HODs, along with notification for new books and reading vacation book issue date by college central library. The Placement office notifies about interview dates and college account notify about fees and payments. This application is for the faculties and HODs to post, the students cannot post any messages.

8.2.27.23   TODOPRI- an Android Application

This application is a robust task list maker for those who need reminders for the things to get accomplish. This application is helpful who makes list regularly by managing different type of lists and different fields. It also allows creating repetitive tasks to enter once even if it is to be done on multiple days. There is one touch access to schedule a task of calling, messaging, emailing a contact off your list or visiting website.

8.2.27.24   Draw- Ipad

This is the graphical application which enables to draw the diagram and design in an easy and efficient way. It also encourages students to draw in different pattern and style in an accurate way. All the difficult and complex drawings can easily be made on this tool which also provides some extensible features and options to enhance and modify the drawing.

8.2.27.25   Educational Video Sharing

This Application is for sharing the video lecture for educational tutorial. This application shares the videos for easy learning in an Interactive manner. This becomes easy for students to learn because learn because by videos they can grab more and sharing videos enable them to learn new and different things which is good as a point of education.

8.2.27.26   Bunk Snapper

This application is developed to save money, time and provide awareness to the students about his attendance. It involves filling of the leave report and inform students about their attendance. Accordingly they can check their attendance and apply for leave. It becomes easy for them to check and apply simultaneously.

8.2.27.27 Equation Solver

This application was created for the students to solve the problems in an efficient and a quick way. It provides better solution for mathematical problems. Also the suitable steps are accompanied to students for better understanding. It becomes fun for students and generates more interest in the subject.

8.2.27.28 Quiz Time

This application developed for those students to improve their general knowledge. This is an automated quiz generated for the students for their quick assessment. Also it increases the general knowledge for primary students only. Since it is a GUI application, its interactive and look and feel is also good.

8.2.27.29 Time Table with Notification

Application created to aware students for their regular study schedule. It alerts the students about their lectures, break timings and the subject slots and lot more. It is a useful tool for the students as it notifies them about their daily time table wherever they are present. It becomes easy for them to look into the time table and plan as soon they read up the notifications.

8.2.27.30 Mobile ERP

This is an application made as ERP module for mobile. This helps to check results, attendance for the students. Also it notifies the updates regarding the date of exams. Time schedule, extra classes, holidays by the university. Also the updates from the placement cell, central library, and accounts section are also notified on the mobile ERP.

8.2.27.31 Speak and Learn

SPEAK AND LEARN is an application which will help the user to learn how to speak a sentence and make them understand in local language. It uses translator APIs specifically to understand each word. In this dictionary also there this provides each word meaning and easy detail about entered word. Different dialects and scripts of various languages are added in the dictionary so that the translator APIs converts the source language to the target language.

8.2.27.32 Math Tables

This application is made to collect all the mathematical tables that a user needs for his calculations. It includes logarithmic tables, trigonometric tables and steam tables. The aim of the application is to provide a single destination for students who will require these tables for the calculations to solve related problems.

8.2.27.33 Periodic Table

This Application would contain all detail of each element in periodic table which could help a student while solving problems related to chemistry. It will contain the details like name, symbol, atomic number, atomic weight, color, classification. It is an offline application which gives detail about all the minute details of each element.

8.2.27.34   Roidsource

It is an application that will provide users to download and upload, request different source code of different languages like C, C++, JAVA. It serves as a medium to get to know the different programming styles and format and ways to execute a same thing. Also it connects developers to upload, share, learn new coding skills and provide virtual learning for coders.

8.2.27.35   QRXCHANGER

QRXCHANGER is an application that acts as a medium for the information exchange in an easy and convenient way. It helps users to gather information from different users through this exchanger. Also it allows different information of the same subject to be exchanged among users simultaneously.

8.2.27.36   Voice Applications

Different voice applications are developed which includes voice dictionary in which user can search particular words by voice. Also it includes voice mail and SMS which send messages through internet to any mobile device and mail system through voice respectively. Several other applications like voice translator, voice Google search, voice changer and voice calculator are also included.

8.2.27.37   I-TECH

I-TECH is an application which provides information about materials and used full website to the students. In this the total estimate of the materials is done and recorded for the students so that they get a clear idea about materials used.

8.2.27.38   Help Me

HELP ME is an application which is made with an aim to stop women abusing and harassment. This will help females to alert the person that she is getting abused or is in danger with just the start of an application via mobile carrier. This alert is in form of message which is sent to the person whose number is stored and the message describes where the person is located so that it becomes easy to reach to her.

8.2.27.39   IC HUB

IC-HUB is an application which provides complete description of the IC which the user enters as an input. The use of this application is for electronic and electrical engineers who get the complete information about the IC for their projects. This consists of library from where the information can be stored and retrieved at any time.

8.2.27.40   Picture, Gestures And Face Lock Password

It is an application develops for security purpose where user can use their face, gestures and pictures to lock and unlock. In this application, Face recognition is used as a default setting. Face lock lets user choose to protect individual application. It provides high security level and it uses 2.6 new face detection optimization.

8.2.27.41 Generic Calculator

Generic Calculator is an application which simplifies students difficulty in calculation. It has the property of calculating the gases, generation of waves, simple calculations, scientific calculations etc. The main advantage of this application is that, it can be used by those people who have no basic knowledge of equations or formulae. It is not only used by the students but can be used by any person with no much idea of calculation.

8.2.27.42 Binary Converter

Through this application we can learn binary conversion with less time. Special bit patterns are sometimes used for a sign or for other indications. Conversion of octal to binary, hexadecimal to binary, and octal, decimal can be performed. It helps in easy calculation even though the input is large.

8.2.27.43 Math Genius

It is an application developed on Aakash Tablet. In this application user will be able to perform any mathematic application in easy way. Where a sets of equations are provided in which the user have to select the equations according to their own needs, once the equation is selected you just have to enter the values thats it, instantly without any waiting time you will be getting your result.

8.2.27.44 Cam Profile Generator

CAM Profile Generator is an application that gives the output as acceleration and velocity in the format of jpg and pdf. Objective is to generate CAM profile where only radial cam is considered. CAM profile generator is very useful to the designers and engineers where students can also check answers of the numerical problems which they solve. It is developed using JAVA Programming.

8.2.27.45 Easy English Learning

The main objective of easy English learning application is to improve ones English. It can be used by everyone both professional and nonprofessional who helps in speaking English with correct grammars. The way of learning is level by level where tutorials will also be provided both audio and video.

8.2.27.46 Account Tracker

This application is based on Aakash Tablet. It is an Android application which allows user to track of current balance in different bank accounts held by the user and the transactions of those accounts. Some of the major operations include updating the account, search transactions by date and amount, deleting and adding transaction, showing all the details of single user etc.

8.2.27.47 Edu.Link

Edu.Link is an application that provides certain number of links to the user according to their needs based on what topic and which subject they are looking for, where the content may be in image for or video or txt form. The main objective is to abridge time wastage of user in searching their content of requirement and give them more flexibility towards their need.

8.2.27.48   English World

This application is basically based on Aakash Tablet.The main objective of easy English-World application is that it provides dictionary to improve ones English. It can be used by everyone both professional and nonprofessional who helps in speaking English with correct grammars. The way of learning is level by level where tutorials will also be provided both audio and video.

8.2.27.49   Dictionary

This application Developed serves like a dictionary in which all the information is gathered in the alphabetical manner. This acts like an e-dictionary where a person can search the meaning of the words electronically. This replaced the headache of maintaining the paged dictionary since it can be saved as an application of small size.

8.2.27.50   Audio Dictionary

This application is mainly designed for the education knowledge purpose. In this along with the meaning student can learn the pronunciation of the words in an easy and interactive way as a educational purpose it is an excellent tool in which students can learn how the word can be spelled and pronounced.

8.2.27.51   Message Blocker

This application is created to block or hide the message from other persons. It acts as a privacy application that provides security from the persons other than the user himself. To see the message a person has to know the password then only he is liable to look into the messages. It blocks the message to be displayed when proper password has not been used.

8.2.27.52   Auto Tune Swapper

AUTO TUNE SWAPPER is an application that automatically changes the user ringer profile as on the predefine day/time. This feature helps the user not to worry about the location of the user. It is an android application which knows when to change the mode of the profile. It is easily accessible due to its user friendly features.

8.2.27.53   Picture Password

This is the application created to make password sight very strong that one cannot easily unlock the password. In this user selects one picture from the pool of pictures, followed by selection of three coordinate points. The user with selected points in hand can unlock the phone by tracing the password. It maintains the authenticity and provides security with the help of image coordinate points.

8.2.27.54   Battery Saver

It is an application to save the battery and power of the device. It can constantly put the device to deep sleep mode while screen off. During deep sleep mode, wife, 3G are turned off, it stopped the background apps also. It can set a battery threshold which will automatically help to conserve battery as the device reaches that point.

8.2.27.55 RAR (ZIP) File

RAR (ZIP) FILE is an application which is used to compress the files and images to reduce its size. It uses a compression technique to split up the files into smaller chunks and allow them to be easily shared. To extract the original file, it needs to unzip it. It helps user to copy, delete, move, unzip/unpack, compress, encrypted ZIP supported, search, and organize your files, music, pictures, and folders.

8.2.27.56 Mp4 to Mp3 Converter, Mp4 to 3gp, Avi, flv,ogg etc. Format

The application is developed on Aakash Tablet used to convert in any format, where we can also convert any avi,flv,ogg etc to the format we wish too. The main advantage of this particular application is to convert the whole format to another format without any changes to the original file. An Mp4 can be converted in to Mp3 file and converted into some other audio format.

8.2.27.57 Kids Maths App

KIDS MATHS application is a simple application. Its a kids game for calculating simple mathematics problems and some more interesting games to increase the kids IQ level. It is a GUI based application providing interactive features that make it interesting for kids to use and learn it in an easy way. It provides alternative solution for playing game which helps kids to play.

8.2.27.58 Kids Corner

KIDS CORNER is an application useful for kids to increase their basic knowledge by providing alphabets, numbers, colors, animals etc. Iit will help to create their interest and to make them learn easily. It is a very attractive application to create the interest in kids. Its a GUI based application, very user friendly and easy to use.

8.2.27.59 Document Scanner

DOCUMENT SCANNER is an application which scans the document and image. It is easy and simple to use. It can take the photograph of book and graphs and images. It can also convert the file into pdf. It receives the document from the phone camera to scan it. It is a portable scanner. It can share, edit and manage all the contents on all devices. It is a very easy way to convert a document into a pdf file to share it with other devices.

8.2.27.60 Math's and Physics Unit Conversion with Math's Fun

It is an application developed on Aakash Tablet where it converts all the related math and physics unit in to all possible units with fun and innovative way to practice math. The content is highly interactive. Here the main aim is the conversion of Maths and Physics Unit with maths fun which helps in easy to understand and use.

8.2.27.61 Buddy Messenger

Buddy Messenger is an application that connects your buddy with the help of phone numbers where each of them has a unique number for connecting. Here we also make an account in which it also has a property of adding friends number by sending a request to the particular person. Apart from this it allows chatting and photo and video sharing.

8.2.27.62   Format Factory

Format Factory is a type of application in which we can change or convert to any type of format we required. This particular application helps in conversion to a supportable format which also helps in easy to use; here we can convert videos, images, audio file in any supportable format according to our need.

8.2.27.63   Widgets

This application named Widgets is a combination of applications within an application. The main purpose behind this application is to make access of any feature quickly, like current temperature, location, small music player, gallery etc. Apart from this features the application also adds small utilities like calculator, barcode reader, OR reader.

8.2.27.64   Money Manager

Money Manager is an application which helps to manage the expenditure per day, per week, per month and per year. It can alert user if there is any changes in the rate of expenditure or exceeding limits of expenditure by giving notification. Also it gives suggestions to manage money and to decrease the expenditure. It can also help to manage budget and in any case if it will go beyond budget, this application will notify the user and provide option to manage it.

8.2.27.65   Social Messenger

Social Messenger is an application that helps to connect the people who are in different social network like face book, twitter etc. This helps to create a user account and help them to include other networking account in it. Users can share the files, images, videos with other users from different social network. User can use different account simultaneously from social messenger and can easily use the features of those sites.

8.2.27.66   Translator

Translator is an application that is self explanatory by its name. It can help to translate one language to other. It includes some Indian languages like Guajarati, Marathi, Tamil, telgu and other languages like English, Chinese, Japanese, German, and Spanish etc. It will help user to convert any text into any other language. It can also help to learn other language very easily. It also includes idioms, phrases to convert into a target language.

8.2.28   MES's IMCC

RC-1034
Place: Pune
by Ravindra Padmakar Vaidya - Thursday, 27 June 2013, 6:29 PM

8.2.28.1   Educational Tool for displaying Science Project

The application that we are developing is intended to be used as an educational tool for explaining the principles of science through step-by-step demonstration of practical experiments for school students in the rural areas around Pune. This will help in Chhote Scientist programme jointly organized by KPIT, Pune and Jnanaprabodhiny, Pune
(Visit https://www.facebook.com/pages/Chhote-Scientists/268507279947989) Cchote scientist activity includes visiting various schools and explaining scientific experiments step by step

to the students. We are trying to make this process very easy and user friendly by presenting various experiments in text, video and interactive animation format. In the application teacher will add category wise experiments has valid username and password. Students can view the experiment and try them hands-on. Experiment can add along with their respective steps and detail, this part is controlled by teacher only. Export and import module has functionality to import or export experiments according to the needs. This application comprises of four distinct modules and each module is to be executed as a separate project.

1. Teacher Module (intended for administrators)
2. Student Module
3. Export / Import Module.

We are having 3 different teams assign for these 3 modules. Periodic Table on android with animated chemical reaction Learn the details about all the elements present in periodic table by using Android application. The app has following features

Tabular representation of periodic table
Search the elements by name
Custom Dialog to show the features of Elements
Details view will show more than 20 facts about elements.

User can drag one element on another and all possible combinations can be seen between those two elements. The application will help to the students and teachers to learn the properties of the periodic table very quickly and easily. The student can check the reactants and products of the compound by using this application.

8.2.28.2 Falling Number game to learn Basic Arithmatic

Falling numbers is an interactive application that will allow user to perform mathematical calculations in time bound manner to enhance their calculation skills. In todays world, you have to do every task within a certain time period so our application will help you to enable in performing calculations in quicker duration. It can be used by anyone but mainly developed for educational purpose. There are 4 levels,all the operations will be time bounded . In this, numbers will fall and at the same time ,timer will also start. By default textbox will generate random numbers and operator. You have to answer it.

8.2.28.3 Mathematical Formulae LIVE WALLPAPER

School students find it difficult to remember the mathematical formulae. At the same time, in todays world of Mobile devices, students spend considerable amount of time using smartphones. When you flash these mathematical formulas on home screen, it will automatically get registered in photo memory of human brain. Instead of taking special efforts to learn mathematical terms, it will slide unknowingly into your brain. When you start your application, it should allow setting the wallpaper. The application will allow user to create his own wallpaper. The formula based wallpaper will be shown on screen for stipulated time duration.

8.2.28.4 Teaching Data Structure for Higher Education Student

Now a days understanding DATA STRUCTURES / ALGORITHM is necessary task because it is an root of any software implementation. For example When creating O.S.software .This App helps teachers and students to know about how data structure implements / works. This app shows GRAPHICAL representation of STACK and QUEUE data structure operation so

students makes easier to understand concept of data structure. We also provided some helpful example about stack and queue with there effective operation like PUSH ,POP,PEEP so students also get little idea about data structure operations with less effort. This APP requires So much less memory and its a so much easier and user friendly APP so any one can handle or used easily. This project contains Graphical Representation of Data Structures like STACK and QUEUE that shows how STACK and QUEUE works or implement sequentially. After this scenario user will be able to enter in an interactive section in which he/she have to answers some questions based on last scenario and try to make varies structures such as stack of books, stack of plates etc.

8.2.28.5   Human Skelton Application

Human skelton application contains all the information about skelton its anterior view, posterior view, mascular anterior view, mascular posterior view and a jigsaw puzzle game related to skelton study.All the views are implemented using pinch zoom/zoom control to study detail about skelton body.Jigsaw puzzle is an interesting activity which help to study with fun.Human anatomy is also one of the striking feature of this application, it contains nervous system, male reproduction system,female reproduction system etc which are the important human activities which are held day to day.This application is helpful for all the categories of the people that from non-biological background,biological students,doctors etc because human skelton is realted to every human body in the world.

8.2.29   Thiagarajar College of Engineering

RC-1173
Place: Madurai
by Karthikeyan Periasamy - Thursday, 27 June 2013, 5:24 PM

8.2.29.1   Wordposer

We have developed this app for improving the vocabulary skills of learners. This app is designed to work in different modes. This app has arround 5 small different exciting modes in each round. the main intention for this type of design is to entertain the users and at the same time the users don't get bored of playing the same game for different levels. All the five modes have user interactions and sufficient hints to the users. This game continues until the lives given to each user interactions and sufficient hints to the users. This app tests the general knowledge of the players in the last level of each round to complete the round. This app mainly focus the English vocabulary skills.

8.2.29.2   Science Helper

This app is designed to simulate the science lab experiments. Through this, the school students (6th, 7th and 8th standard) are able to learn the experiments on their own with or without the help of teachers. some schools may not have sufficient lab apparatus and materials for doing the experiments. By this simulated way of teaching/learning the lab experiments, the laboratory operational cost is also comes down. Students can experiment and learn them as many time as he can without any chemicals handling fear. It enables the analogy based simulation in learning the lab experiments. It is also planned to enhance the app with automates the lab instructions for simulated science experiments and evaluate the performance of students based on different testing methodologies.

8.2.30 Saveetha Engineering College

RC 1045
Place: Chennai, Tamil Nadu
by Nagappan Govindarajan - Thursday, 27 June 2013, 3:37 PM
   15 Android Project Initiatives for IITB Aakash
Submitted by
G. Nagappan
SEC Aakash Co-ordinator
1045-Saveetha Engineering College
Chennai , Tamil Nadu

8.2.30.1 Bharathi- Hand Written Tamil Character Recognizer

This project 'BHARATHI' is aimed at developing software utility which will recognise handwritten characters of Tamil language script and can be accessed through an Input Method Editor. With rising touch enabled smart-phones and tablet market in India, there is strong need to develop software that provides native language support. This utility enables native users to overcome language barrier in access to technology, by recognizing Tamil characters and numerals. It is also helpful in recognizing special symbols. It engulfs the concept of neural network. One of the primary means by which computers are endowed with human-like abilities is through the use of a neural network. Neural networks are particularly useful for solving problems that cannot be expressed as a series of steps, such as recognizing patterns, classifying them into groups, series prediction and data mining. The neural network which is trained for classification is designed to take input samples of a hand written data pattern, which then attempts to classify them into groups to determine if the input data matches a pattern that it has memorized.

   This project is targeted on Android based Aakash tablets and concerns detecting free handwritten characters through touch gestures. It can be further developed to recognize the characters of different languages.

8.2.30.2 Biometric Web Security

Face recognition based security for accessing web services such as banking transactions on aakash / any android devices. This project focuses on the use of unique human characteristics to recognize the users and provide a secured access to web services that are restricted, using a mobile phone with Internet connection. The mobile phone is used as a biometric capturing device, which is later used for recognition too.

   In this growing era, mobile devices have both the network access and computing capacity to provide users with a diverse range of services. So, with increasing functionality and access to personal and sensitive information, there is an essential need for enhancing/advancing the authentication mechanisms. Hence, this project proposes to present mobile phone application architecture to capture and send the biometric to the web server based on the use of embedded web browsers.

8.2.30.3 Car Parking

An Android App to identify availability of vacant Car parking space in the car parking area of shopping malls / hospitals / apartments.

The available car parking space detection using Background Subtraction method is used to detect the engaged and free parking space in the parking lot using webcam. They always monitor events from recorded videos. Background subtraction is a computational vision process of extracting foreground objects in a particular scene. The input video is divided into slots and it checks whether the parking slot is occupied or not. If the slot is occupied then indicate the slot with red color else if the slot is vacant then indicate the slot with green color. The data about engaged and free slots in each parking lot are updated into the database automatically. Android application collects all information from server through database. This application shows graphical view of engaged and free slots and it validates information continuously to the web server. The main purpose of this project is to detect the vacancy of parking lot round the clock from anywhere and secondly to track the cars that comes in and out of the parking lot without any manual disturbances.

8.2.30.4   Anti Theft Privacy

If your Aakash tablet / android phone is stolen and tried to be accessed, this Anti theft privacy software will invoke itself and take a photograph of the user and happenings with the camera and send mails to the owner.

The Project THEFT SMS TRACKER AND LOCATION TRACKER is essentially software that allows person to track his stolen Aakash / mobile. Here the stolen mobile acts as a child mobile and substitute mobile acts a parent mobile.

All incoming and outgoing calls, texts and multimedia messages can be seen and interrupted when the parent mobile has been stolen or lost. And also the location of the parent mobile can be tracked when it is being stolen by the theft .

It happens only when the GPS (GLOBAL POSTIONING SYSTEM) is being enabled on the parent mobile.

Our aim is to develop an efficient and improved geographical asset tracking

Solution and conserve valuable mobile resources by dynamically adapting the tracking scheme by means of context-aware personalized route learning techniques. This system uses Android based mobile phones for the software to be run.

The alerts are also stored in the centralized server like the details of incoming call, text and multimedia messages and the timely location update of the stolen mobile. Owner may later login into the centralized server and view the details of his stolen mobile.

8.2.30.5   Treasure Hunt A Game of Knowledge

Android based Gaming application to enhance childrens knowledge about continents, countries, monuments and places on various locations all around the globe.

Web-app Gaming has been a revolution over the years, and attracted million of users all around the world. Online games are an emerging market with many opportunities and challenges for game developers. While developers have expertise in designing and developing game experiences, they require additional knowledge about the business and technology implications of online games in order to maximize their chances for success in a growing and evolving marketplace. Recent research proved that, knowledge oriented gaming helps students to gain knowledge by activity based learning.

Treasure hunt is an innovative application that contributes to enhance Geographical knowledge as well as puzzle cracking skills. Gaming mode also helps to switch between difficult levels of puzzle solving. The Game concentrates on enriching the Geographical knowledge of the Gamer through the generic Gaming concept. Scores will be awarded based on the ability to crack the Geo-location within the stipulated time.

The Gaming Environment also feeds knowledge about the factual information about various places, monuments and Man-made artifacts. It test puzzle solving, tracking location and time management skills of the gamer.

The complete gaming experience is visualized through the ease of Graphical user Interface. The updating feature enables the gamer to play without losing interest in playing.

8.2.30.6 Location Tracking

This Location Tracking App will help you to connect yourself with a group of friends / collegues / invitees coming to attend a meeting / party and track their locations until they reach the venue.

In current system, in order to find out the location of friends, user needs to call and ask friends about his/her location. The proposed system will help user to find out friends location. The proposed system will also allow user to see all friends on Google map as well. The application Friend Mapper on Mobiles solves all these problems. It offers below services

Allows user to select friend for location updates. Uploads users current location at specific frequency. Get friends current location. Shows friends location on Google map. This project presents a mobile application based on providing Location Based Services (LBS) using Global Positioning System (GPS) as location provider. The main objective of this work is to design and implement a client server system that help users to locate their family members and receive alerts went friends are nearby. The GPS is a most efficient positioning technique. It was developed mainly to be used in navigation systems. Because of the reduction in the size of the GPS receivers and because of the integration of GPS with some mobiles; GPS because one of the most important service providers in the LBS. They are not many projects that are carried out in the LBS field. This is because this type of application was somehow exclusive for mobile service providers because they use mobiles cells information to get the location of the mobile and then provider service to get it. But the information of GPS in this field will make designing and implementing LBS services open to researchers all over the world.

8.2.30.7 Speak India - a Voice Translator

An Android App to translate and convert your speech in any of the 10 languages into text and voice in any of the 8 languages such as (english, tamil, hindi, french, spanish etc..)

SPEAK INDIA - A VOICE TRANSLATOR is an Android application that can be installed in any Android devices to translate voice from one language to another. In this the user gives the voice input in his own language and gets the translated output in the form of both text and voice. Thus it helps the user to get familiarized with the languages that he does not know. This also helps the user to know the proper pronunciation of the words in the language that he doesnt know. This project also helps in conversation between two users who are from different natives. This also helps students who are curious in learning new languages. This also helps business men who have their establishments all over the world. There is an added advantage where the translated words will be stored in History and these words can be reviewed for later use. Hence the user can get more knowledge about the words that are being used for translation. The user can also obtain the output in Indian languages which is a new feature. There are not many languages that will give the output in Indian languages in the form of voice. But this application enhances this criteria. The use of Google app-engine has made this phenomenon possible. However, for foreign languages we use Bing translator which is a freeware.

8.2.30.8 Buzzone App

This App will help students to register in order to share their study materials, discuss on forums, download interesting contents and publish their articles / inventions / ideas.

Students have become Technology Lovers. Android Phones stand prior in the list. Apart from entertainment, they also help the students community for reaching out to educational purposes. This application is developed with a motive to provide an interactive interface which lets the students to effectively interact with an institution.

The system is an online application that can be accessed throughout the organization and outside as well with proper login provided. This system can be used as an application for the students to share and gain knowledge through forums, test their knowledge through aptitude tests, calculate their GPA using GPA calculator, and know about the events happening in the institution.

8.2.30.9 Anti Plagiarism Tool

The presence of textual materials in electronic format has made plagiarism easier than ever. Copying and pasting paragraphs or even entire text can now be accomplished with a few mouse clicks.

An Android App to effectively detect and thereby prevent plagiarism. It is a versatile tool to deal with World Wide Web copy-pasting information from the assignment of authorship.

The term plagiarism is defined as the practice of taking someone elses work or ideas and passing them off as ones own. This project aims at developing an android application to detect plagiarism that exists between documents.

This could help a lecturer to easily find the genuineness of the students in case of assignment submission where each student in the class is expected to come up with his own perspective on the topic put up.

The main goal of this project is to develop the PLAGIO app on Android Platform in AAKASH TABLET using Eclipse, android SDK and ADT Plug-in to view the text files present in the SD-Card comparing them and identifying the plagiarised documents while displaying the percentage of the plagiarised content. Android SQLite database is used for storing the registration and login details.

8.2.30.10 Saveetha Social Networking

Saveetha social networking App will be a platform to build social networks or social relations among all people working or studying in Saveetha group of institutions, for example, share interests, activities, backgrounds, or real-life connections among various departments and Alumni.

This app will consist of a representation of each user (often a profile), his/her social links, and a variety of additional services which allow users to share ideas, pictures, posts, chat, activities, news, placements, events, and interests with people in their network.

Using E-Learning feature students can download books for their studies and using forum students can discuss about certain topic. Using placement information students can get information about company requirements and interview process.

8.2.30.11 Principal Office Automation

This App will help students and staff to send online request to principal for getting letters / certificates / applications / forms of any kind to be approved and signed by him.

On approval of HOD, the corresponding document will be automatically generated after proper verification and validation and sent to principal for signing.

The requester will get intimation about the delivery status of the document once it is ready to be obtained.

The process goes like this. Student who needs certificate has to enter into our College Portal, where the certificate icon is presented. Once the person clicks that certificate icon, the type of certificates will be displayed and from that list one certificate type has to be selected, that selected content should be added with that predefined template which we created already. The letter should be mailed to the HOD where HOD can open and view the mail, and can approve and sent it to Principals mail. Once the Principal approved that request, it will be forwarded to the Admin. The Admin checks and send the confirmation to the student. The secret key is generated. Using the secret key fill the details in the form displayed and send it to the Admin. Now, the Admin has to generate the certificate and issue it to the students.

8.2.30.12 Gui Password for Android

Passwords and Pattern based authentications have failed due to attacks such as key logging or shoulder surfing.

This image based GUI Password system will secure your Android devices.

Object Drop-GUI Password for android system is an authentication application that can be used in the android operating systems. This security system provides a more secure way of handling the data. This application is mainly designed for the handheld device which is becoming more popular nowadays. This application provides a user interactive environment which makes it easier and user friendly. In this application the user can select their desired object as password; initially the user selects the required object and then set a particular location for each object selected which in turn get stored at the database linked to it. The selected object should have particular sequences such that the same sequences and position should be used to release the lock. This sequence is used because the object in the lock screen will get randomized. This randomization is used to increase the security of the device. The device can be more secured by adding more number of objects. As the user can forget the position of the object there is a way to unlock the device. A combination of numbers is used as code which is pre-set by the user itself. That code will be entered to unlock the device as alternative. This code can also been retrieved by using the Mail id.

8.2.30.13 Click to Contact

This Android App CTC will help you to create a new contact in your device just by taking a snap of a Visiting card or Address board or a banner display.

Object Drop-GUI Password for android system is an authentication application that can be used in the android operating systems. This security system provides a more secure way of handling the data. This application is mainly designed for the handheld device which is becoming more popular nowadays. This application provides a user interactive environment which makes it easier and user friendly. In this application the user can select their desired object as password; initially the user selects the required object and then set a particular location for each object selected which in turn get stored at the database linked to it. The selected object should have particular sequences such that the same sequences and position should be used to release the lock. This sequence is used because the object in the lock screen will get randomized. This randomization is used to increase the security of the device. The device can be more secured by adding more number of objects. As the user can forget the position of the object there is a way to unlock the device. A combination of numbers is used as code which is pre-set by the user itself. That code will be entered to unlock the device as alternative. This code can also been retrieved by using the Mail id.

8.2.30.14   Talk Free using Wifi

This android application will help you to communicate through phones without sim cards using the WiFi facility.

The use of Wi-Fi enabled cell phones to access internet away from the pc is increasing day-by-day. This proposed model is a form of telecommunication that allows data and voice transmissions to be sent across a wide range of interconnected networks. The models, which are Wi-Fi enabled and have ANDROID platform, can be used to communicate channel WITHOUT THE USE OF SIM CARD. Since this is a free channel, security is a priority. In order to engender security, the packets of data may be encrypted in the header and payload by different encryption techniques. However even the security is a concern only within the specific network, the communication is completely safe from external attacks external to this local network. Each mobile device connects to a WLAN router and identifies itself in the routing table. Calls can be placed by a user by sending the packets to the router, which then tries to find the destination. The destination must also be connected to WLAN. Since the communication is only capable of being affected by an inside influence, it is provided with complex cryptography techniques, which engenders high security. This model will be a prototype of different devices communicating through in the Wi-Fi bandwidth and will reduce the communication cost in large organizations.

8.2.30.15   Placement Portal

Placement portal aims at providing the facility to automate and simplify the process of registration and list generation of eligible students for placement.

This system provide facility to staff to do all their work regarding placement like collecting student records , registering the suitable students , to check the number and percentage of placed and unplaced students ,and important announcements regarding placement.

Faculties can easily communicate with the students, and can keep records of every student easily and efficiently. The proposed system could be accessed from any corner of the world.

The system consists of two modules. (a) Admin panel (b) User Panel.

In Admin Panel the faculties search for the eligible candidates for placement and send information regarding the upcoming placements. In User Panel the students have to enter their details to keep in track with the placement activities and recruitments.

Project has a big scope to do. Students can maintain their information and can update it. Notifications are sent to students about the companies. Students can access previous information about placement. This application can be modified from time to time as per the changing requirement of the user with lesser cost also the backend of the application can be changed as per the storage requirement of the application and to provide more security level features.

8.2.30.16   Learn Music

An Android App for helping even layman to learn music for example about Ragas, Thalas with help of karnatic / cine songs / album.

It will help user to convert his text into song in particular tune.

First 15 projects are initiated as Final year projects and were completed to a level and the 16th project Learn Music is under process by II year CSE students.

8.2.31 Loyola-ICAM College of Engineering and Technology (LICET)

RC-1228
Nungambakkam, Chennai
by Gopalakrishnan K - Wednesday, 26 June 2013, 9:47 PM

8.2.31.1 ARLabs Education with no boundaries

Project ARLabs is where the 3D model of the apparatus found in Physics and Chemistry laboratories are over layed on top of the observation books which contains the apparatus pictures, by means of Clic AR a software platform developed by Deepak John .J (CSE) which is available for the iOS App, Android App and the Web platform. These 3D models are created by the student community themselves which is headed by Abishek .R (CSE), utilizing the Google SketchUp software, which is an intuitive tool which helps in the creation of 3D models. The video tutorials created and the Professor in-charge is Dr. Caleb Chanti Raj. Project ARLabs was initiated as Physics and Chemistry labs where mandatory for a student during their 1st year of Engineering, where the student would learn for a year and then later on write his semesters. The problem here is unlike Computer Science labs where one can practice the program at a computer from his/her home, here the student is dependent on the apparatus. Hence Project ARLabs allows the students to view these models of the apparatus and also it comprises of the relevant experiment video which demonstrates how the experiment should be performed. Therefore the student can recollect these experiments and work with them. Due to the availability of the Aakash tablets the project impact is more than 1.5Lakh students per year just for the state of Tamil Nadu. Project ARLabs team believes that 20% of the population in the world comprises of Indians, hence a problem here affects the entire world and a solution found here is an impact to the entire world, as one would say "The future is Now".

8.2.32 Sir Padampat Singhania University (SPSU)

RC 1132
Place: Bhatewar
by Jinesh Singh - Wednesday, 26 June 2013, 10:06 AM

8.2.32.1 Student out-pass system

The purpose of this project is to develop an android application for managing student out-passes using the Wireless access device such Aakash which has Android OS. The out-pass management system is designed to work primarily on smart phones and tablets only and would allow users to make an outing request, check request status, update a request and maintain a record of last 10-15 outing requests using their smart phones and tablets.

The web interface is provided by the application to put the login detail for student. The login is then checked with the university/hostal database server for authentication and further processing. Once login is done the student can submit the details for the generating the outpass. The application will be connected to SPSU database and will work in coherence with the previously working out pass management system.

The web page will have four links: 1. Home
2. Request Outpass
3. Check status
4. logout

8.2.33   St. Xavier's Catholic College of Engineering

RC-1026
by Edwin Jose R. - Wednesday, 26 June 2013, 9:37 AM

8.2.33.1   Android Controlled Helicopter

In this project a model Helicopter is used which is controlled by the aakash tablet. The Interface in the tablet will have five buttons. Four button are used to move in the four different directions namely left, right, forward, backward. The fifth button is used for launching the helicopter. The helicopter chip is programmed using the Ardino software for movements based on the commands from the tablet. The signals are send to the helicopter through the wifi. In the helicopter there will be a wifi chip which will accept the signals and convert it to rf signals.

8.2.34   Vels University

RC-1177
by Gowri Shankar - Tuesday, 25 June 2013, 12:39 PM

8.2.34.1   Solar Powered Battery Backup for Aakash Tablet

We have developed a 9V/10W solar panel, which provides a constant 5 V charge for Aaksh tablet which lasts upto 4 to 5 hours. The system comprises of solar panel, a removable battery pack which can be connected to either solar panel for charging or to Aakash tablet for powering the device. If we have two such battery packs, one can be used for charging while the other for powering Aakash tablet, thus ensuring uninterrupted usage.

Interested Aakash enthusiasts can contact us for their ideas, suggestions and contributions for this project. If you are interested in this charger, do contact us for futher details.

In addition to the above project, we are also working on several other ideas through our students, which shall be updated in subsequent posts.

8.2.34.2   Customisable and Downloadable Moodle Courses for Android

We are in the process of completing an android version of moodle courses, which can be downloaded onto the tablets. This frees the students from having internet connectivity all the time. We are working on aggregating an Engineering Mathematics Moodle Course, and annouce its availability shortly. This project also looks at server side modifications, which enables courses to be connected and downloaded in tablets. Kindly send in your suggestions, ideas, interest in contributing to this project. This way we can collectively create a pool of resources capable of utilising Aakash tablet in creating and distribution of e-content.

8.2.34.3   Wireless Data Projector Interface for Aakash

This project aims to develop a wireless interafce for data projection connected to Aakash tablet. This makes an invaluable classroom lecture delivering tool, as it allows teachers to move freely and still be able to control the display and interaction of the Aaksh tablet used by the teacher.

We are trying to build a bluetooth device to achieve this connectivity with the tablet using a wireless display hardware. The device driver for this is in the development stage and we hope

to complete it by Septemeber 2013. We plan to launch this product through this forum, for the benefit of all who have Aakash tablet.

AS with our other posts, your ideas and suggestions are most welcome.

8.2.34.4   Interactive Book Authoring Tool on Aakash

(similar to Ibooks in iOS) This project aims to create an app which can create interactive content by teachers easily using Aakash tablet itself.

The ebook is modelled on Ibook authoring tool available in iOS. Users can annotate, meaning draw lines, highlight, create balloon text etc., on top of an exisitng pdf document or a blank page. The audio spoken by the teachers for explanation shall be inserted in the book through specific audio icons, which users can click and listen to. Provisions to include videos and animations in similar way is also envisaged, thus making this form of content development handy in the classroom scenario, while teaching sessions can be captured with ease.

We plan to build this tool by integrating many available open source nuggets, to speed up the development process. Any ideas, suggestions in this direction is most welcome.

8.2.34.5   Low cost stylus for Aakash tablet

We have experimented a low cost stylus as described in several DIY videos in youtube. We are planning to make a mould, and manufacture in volumes, and make it available to all users of Aakash tablet.

This natural writing interface, coupled with innovative applications like Abook Author, as described in our earlier post, is sure to revolutionise the use of Aakash in day to day classroom activity.

If you want to be a part of it, do strengthen our endeavour with your support in the form of ideas, suggestions and usage when we announce its delivery in this forum.

8.2.34.6   Content Annotating Tool

We have pages of pdf text and hours of video learning material available on the internet for creating higly effective moodle courses. This app allows us to annotate any required portions in contents (pdf text pages and video clips) with text strings. This way of marking our portions of interest with relevant text it will help us to search quickly rather than seek through viewing the entire content.

Mechanisms to create such annotations as URL links which can be added to a moodle course in a moodle server is attempted. We shall announce this tool shortly, which we are extensively using in our moodle course aggregation. Your participation by the way using this tool, and letting us have your feedback will make creation of moodle courses quick and effective.

8.2.35   Amrita School of Engineering

RC1070
BANGALORE
by Veeresh Kumar G B - Tuesday, 25 June 2013, 11:32 AM

Amrita School of Engineering, Bangalore is undergoing an exciting, and sometimes challenging, metamorphosis as technology has become an integral part of everyday teaching and learning and AAKASH Tablet has helped from problem solving and critical thinking to collaboration. The expanded capability makes AAKASH an important tool across the curriculum,

supporting science, math, and engineering coursework, in addition to providing the toolset for reading, writing, online research, and content creation [CAD] and viewing. Until April 2013 we had only 40 tablets and we have strived for the maximum exploitation of the available resources to carry out the following activities.

Students are taught to use AAKASH to draw and annotate diagrams, solve math equations. Development of an institution app, which provides information about our college facilitates, staff, co-curricular and extra-curricular activities, interaction with course mentors, academic activities and so on. The application has been named as Its my amrita and it is made available in playstore for free. The link is: https://play.google.com/store/apps/details?id=out.inandhl=en . The app supports ANDROID 2.2 and all above versions. More than 600 students and parents have installed this app on their smartphones and their personal tablets. Students are taught the use of tablet to solve problems in Engineering Mechanics using AUTODESK FORCE EFFECT. Students are taught the use of tablet for Developing mechanical systems with moving parts using Autodesk ForceEffect Motion Students who were interested in creating artistic pictures made utilized of the tablets for creation of sketches using AUTODESK Sketchbook express. Training for faculties on using the tablets for implementation in classroom. Training teaching assistants [Lab assistant] to create awareness about the usage of technology in labs. Students have started to use tablets for running MATLAB programs, after MATLAB have been made available on android from April 2013. Further we are trying to engage students to a) develop learning based games which might be helpful for kindergarten and primary school children. b) develop app similar to Its my amrita which will help other institutions/ schools to create or customize the available app to their needs c) to develop apps for the under privileged childrens d) to develop an app for teacher-student or student-student or teacher-teacher interaction regarding academics. Some of the faculties are learning to create quiz using the clicker app, based upon the tutorial available from the moodle. Finally we extend our gratitude towards the AAKASH project team for providing us with an additional 200 tablets, which really has boosted our intentions and morale to explore and exploit more options in creating technology enabled learning in the campus.

8.2.36   Sona College of Technology

RC-1157
by Thangaraj Kesavan - Tuesday, 25 June 2013, 9:42 AM

8.2.36.1   eAssignment

Managing and grading programming assignments always takes a lot of effort including accepting submissions, checking timestamps of files, grading and publishing grades. Our e Assignment idea that is designed for the purpose of automating the entire procedure of managing and grading programming assignments. With the help provided by our project, grading programming assignment becomes incredibly easy for instructors. The only thing that instructors need to do is setting up an assignment by providing information such as assignment name, due date, cutoff date and testing cases, and letting our project will take care of the rest. eAssignment Management System collects the submissions from students before cutoff date, compiles and executes the programs, and then verifies for the correctness of the results. Students could check their grades after the grading. Our project is a perfect tool for instructors who need students to submit programming assignments. Since there is no similar tool could provide similar functions which are managing student information and grading Java programming assignments, our

project actually fills in this gap.. Grading programming assignments written in more languages is the future work.

8.3   Feedback on Aakash Tablets from Remote Centres

All Remote Centres were requested to provide immediate feedback regarding the problems faced, if any with Aakash tablets

The table given on the next page gives the details of the faults reported by the Remote Centers. It is seen that **only a total of 319**, out of 1,00,000 tablets delivered, have manufacturing defects or transit damage. Different types of faults identified are given below.

1. Screen damaged

2. Tablet does not charge

3. Infinite Booting

4. Wi-Fi(Networks do not get detected or does not switch on), MAC Address

5. Touch(not responding or less responsive)

6. Buttons/Parts damaged

7. Pattern locking problem

8. Chinese Language Keyboard

9. Tablet becomes unresponsive

Tablets with defects have been returned to M/s. Datawind for replacements. Others are being collected from Remote Centers and will be dispatched to Datawind, well within the warranty period.

Although, the number of defective tablets found by RCs is very small, a detailed report has been compiled listing all the problems.This is more for the sake of completeness of the report.

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1001	Maulana Azad National Institute Of Technology, Bhopal	N	-	-	-
1002	Amal Jyoti College Of Engineering & Technology, Kanjirappally	Y	5	-	ANDROID Software
1003	Government College Of Engineering, Salem	N	-	-	-
1004	National Institute Of Technology, Calicut	Y	1	1004 1013	Screen damaged
1005	Anna University	N	-	-	-
1006	National Institute Of Technology, Tiruchirappalli	N	-	-	-
1007	Amrita School Of Engineering - Kollam			Workshop Centre	
1008	D.K.T.E Society`s Textile & Engineering Institute, Ichalkaranji	N	-	-	-
1009	Veermata Jijabai Technological Institute, Mumbai	N	-	-	-
1010	Sardar Vallabhbhai National Institute Of Technology, Surat	N	-	-	-
1011	Jaipur Engineering College, Kukas	N	-	-	-
1012				1012 1070	charging
1012				1012 1043	charging
1012	G H Raisoni College Of Engineering, Nagpur	Y	6	1012 1029	Not Starting
1012				1012 1012	Screen
1012				1012 1054	Not Starting
1012				1012 1033	Not Starting
1013	Mepco Schlenk Engineering College, Sivakasi	Y	2	1013 1004	-
1013				1013 1015	-
1014	P. V. P. Siddhartha Institute Of Technology, Kanuru	N	-	-	-
1015	Vidya Pratisthan College Of Engineering, Baramati	N	-	-	-
1016	K. J. Somaiya College Of Engineering, Vidyavihar	N	-	-	-
1017	Pvg`S College Of Engineering & Technology, Pune	N	-	-	-
1018	Samrat Ashok Technological Institute - Vidisha			Workshop Centre	
1019	Bengal Engineering & Science University, Shibpur - Howrah			Workshop Centre	
1020	Don Bosco College Of Engineering & Technology, Azara	N	-	-	-
1021	Nerist, Nirjuli	N	-	-	-
1022	Shri Sant Gajanan Maharaj College Of Engineering, Shegaon	N	-	-	-
1023	Pandit Deendayal Petroleum University, School Of Solar Energy, Raisan - Gandhinagar				
1024	Vivekanandha College Of Engineering For Women	N	-	-	-
1025	National Institute Of Technology, Warangal	N	-	-	-
1026				1026 1073	Charging
1026				1026 1215	Screen Touch .
1026				1026 1199	Screen Touch .
1026				1026 1208	Screen Touch .
1026				1026 1195	Screen Touch .
1026				1026 1083	Power/Volume Button Missing/Broken.
1026				1026 1051	Not Booting.
1026				1026 1120	Screen Broken.
1026	St. Xaviers Catholic College Of Engineering, Chunkankadai	Y	18	1026 1140	Screen Broken.
1026				1026 1016	Not Booting.
1026				1026 1021	Not Booting.
1026				1026 1127	Wi-fi not switching ON.

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1026				1026 1185	Display .
1026				1026 1187	Display .
1026				1026 1240	Screen Broken.
1026				1026 1238	Screen Broken.
1026				1026 1236	Screen Broken.
1026				1026 1201	Not Booting.
1027	Sudharsan Engineering College, Sathiyamangalam	N	-	-	-
1028	Tatyasaheb Kore Institute Of Engineering & Technology, Warananagar	N	-	-	-
1029	Terna Engineering College, Nerul Navi Mumbai	N	-	-	-
1030	Nielit - Formerly Doeacc, Srinagar	N	-	-	-
1031				1031 1102	not Booting
1031				1031 1107	not Booting
1031				1031 1022	Charger
1031				1031 1026	not Booting
1031	St. Margaret Engineering College, Neemrana	Y	9	1031 1030	not Booting
1031				1031 1021	Charger
1031				1031 1027	Empty Box
1031				1031 1040	not Booting
1031				1000 1917	not Booting
1032	Muffakham Jah College Of Engineering & Technology, Hyderabad	N	-	-	-
1033	Manipal Institute Of Technology, Manipal	N	-	-	-
1034	M. E. Society`S Imcc, Pune	N	-	-	-
1035	Srinivasa Institute of Engineering & Technology	N	-	-	-
1036	Kakinada Institute Of Engineering & Technology, Kakinada	N	-	-	-
1037	Jabalpur Engineering College, Jabalpur	N	-	-	-
1038	Vishwabharati Academy's College Of Engineering - Ahmednagar			Workshop Centre	
1039	Ips Academy, Indore	N	-	-	-
1040	College Of Engineering, Pune	N	-	-	-
1041	Shri Mata Vaishno Devi University, Katra	N	-	-	-
1042	Saintgits College Of Engineering, Kottayam	N	-	-	-
1043	Sarvajanik College Of Engineering & Technology, Surat	N	-	-	-
1044	Sasurie College Of Engineering, Vijayamangalam	N	-	-	-
1045	Saveetha Engineering College, Thandalam	Y	2	1045 1001	Wifi
1045				1045 1010	Wifi
1046	Sagar Institute Of Research & Technology - Excellence, Bhopal	N	-	-	-
1047	S.D.M. College Of Engineering & Technology, Dhavalagiri	N	-	-	-
1048	Royal College Of Engineering & Technology, Akkikavu	N	-	-	-
1049	PDE Association College Of Engineering	N	-	-	-
1050	Prasad Engineering College, Jangaon	N	-	-	-
1051	Pacific Institute Of Technology, Udaipur	Y	1	-	Display
1052	Noorul Islam Centre For Higher Education, Thuckalay	N	-	-	-
1053	NIELIT - Formerly DOEACC - Chennai			Workshop Centre	
1054	National College Of Engineering, Muruthakulam	Y	2	1054 1002	DC chargers port defective
1054				1054 1009	ANDROID Software

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1055	Mar Baselios College Of Engineering & Technology, Nalanchira	N	-	-	-
1056	Malla Reddy College Of Engineering & Technology, Maisammaguda	Y	1	-	Unfortunately, PokeTALK has stopped
1057	Madhuben & Bhanubhai Patel Women`S Institute Of Engineering, Anand	N	-	-	-
1058	Goa College Of Engineering, Farmagudi Ponda	N	-	-	-
1059	Gf Gharda Institute Of Technology, Lavel	N	-	-	-
1060	Ebet Group Of Institutions, Nathakadaiyur	N	-	-	-
1061	Er. Perumal Manimekalai College Of Engineering, Krishnagiri	N	-	-	-
1062	Dungarpur College Of Engineering & Technology, Dungarpur	N	-	-	-
1063	Dr. D.Y. Patil Institute Of Engineering & Technology, Pimpri	N	-	-	-
1064				1064 0028	Screen Broken & Locked
1064				1064 0029	Android
1064	Deenbandhu Chhotu Ram University Of Science & Technology, Murthal	Y	6	1064 0032	Screen Broken & Locked
1064				1064 0039	Screen Broken & Locked
1064				1001 0085	Android
1064				1064 1158	Not Charging
1065	Finolex Academy Of Management Technology, Ratnagiri	N	-	-	-
1066				1066 1019	ANDROID Software
1066				1066 1032	ON/OFF Switch is not working properly.
1066				1066 1222	Continuously Showing Android Screen
1066				1066 1124	Continuously Showing Android Screen
1066				1066 1051	Continuously Showing Android Screen
1066				1066 1123	Continuously Showing Android Screen
1066				1066 1009	Continuously Showing Android Screen
1066				1066 1095	Continuously Showing Android Screen
1066				1066 1236	Continuously Showing Android Screen
1066				1066 1227	Continuously Showing Android Screen
1066				1066 1198	Continuously Showing Android Screen
1066	Shrinathji Institute Of Technology & Engineering, Nathdwara	Y	25	1066 1210	Continuously Showing Android Screen
1066				1066 1049	Continuously Showing Android Screen
1066				1066 1026	Not Starting/Booting
1066				1066 1091	Not Starting/Booting
1066				1066 1145	Not Starting/Booting
1066				1066 1149	Not Starting/Booting
1066				1066 1083	Power ON/OFF S/w not working
1066				1066 1004	Charger not working, Too many Pattern Attempts
1066				1066 1024	Too many Pattern Attempts

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1066				1066 1090	Password Lock
1066				1066 1114	Pattern Lock
1066				1066 1156	Pattern Lock
1066				1066 1005	Screen Broken
1066				1066 1092	Screen Broken
1066				1066 1014	Screen Broken
1067				1000 1585	charging
1067				1067 1011	scilab
1067				1167 1181	Booting
1067				1167 1206	Booting
1067				1167 1210	Booting
1067				1167 1171	Booting
1067				1167 1110	Booting
1067				1167 1090	Booting
1067				1167 1037	Pattern Lock (OK)
1067				1167 1060	Battery
1067	St. Francis Institute Of Technology, Borivali West	Y	21	1167 1151	censor
1067				1167 1059	Booting
1067				1167 1199	Not Starting
1067				1167 1031	Cracked
1067				1167 1089	Cracked
1067				1167 1067	Cracked
1067				1167 1061	Booting
1067				1167 1133	Upper Porting of touch Screen not Working
1067				1167 1199	Not Booting
1067				1167 1083	Damage, Not Start
1067				1167 1167	Touch Screen
1068	Thakur College Of Engineering & Technology, Kandivali (E)	N	-	-	-
1069				1069 1020	booting
1069				1000 1704	booting
1069				1069 1167	booting
1069				1069 1169	booting
1069				1069 1055	power switch
1069				1000 1703	booting
1069				1069 1009	cracked screen
1069				1069 1037	booting
1069	Alluri Institute Of Management Sciences, Warangal	Y	16	1069 1159	booting
1069				1069 1001	cracked screen
1069				1069 1002	cracked screen
1069				1069 1007	cracked screen
1069				1069 1012	cracked screen
1069				1069 1017	cracked screen
1069				1069 1090	screen defective
1069				1069 1186	cracked screen
1070	Amrita School Of Engineering, Bangalore	N	-	-	-
1071	Amrita Vishwa Vidyapeetham, Amritanagar	N	-	-	-

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1072	Angadi Institute Of Technology & Management, Belgaum	N	-	-	-
1073	Bannari Amman Institute Of Technology, Sathyamangalam	N	-	-	-
1074	Caarmel Engineering College, Ranni-Perunad	N	-	-	-
1075	D. Y. Patil College Of Engineering & Technology, Kolhapur	N	-	-	-
1076	Devi Ahilya University, Iet, Indore	N	-	-	-
1077	Federal Institute Of Science And Technology, Mookkannoor	N	-	-	-
1078	Galaxy Global Group Of Institutions, Dinarpur	N	-	-	-
1079	Geeta Institute Of Management & Technology, Kurukshetra	N	-	-	-
1080	Griet, Kukatpally	N	-	-	-
1081	Gvit, Bhimavaram	Y	1	-	Screen Broken
1082	Hindustan Institute Of Technology And Management, Agra	Y	1	-	Wifi
1083	IIIT Hyderabad	N	-	-	-
1084	Institute Of Road And Transport Technology, Erode	N	-	-	-
1085	Nirma University, Institute Of Technology, Ahmedabad	Y	6	1085 1022	Screen Broken
1085				1085 1104	Doesn't move ahead after Android Logo
1085				1085 1056	Screen Broken
1085				1085 1002	Screen Broken
1085				1000 1806	Doesn't move ahead after Android Logo
1085				1000 1805	Screen Broken
1086	JNTU College Of Engineering Hyderabad	N	-	-	-
1087	Joginpally B. R. Engineering College, Yenkapally	N	-	-	-
1088	K K Wagh Instituite Of Engineering Education Research	N	-	-	-
1089	K.L.E. College Of Engineering & Technology, Chikodi	N	-	-	-
1090	K.C.E. Society, Coeit, Jalgaon	N	-	-	-
1091	KMM Institute Of Technology & Science, Tirupati - Chittoor			Workshop Centre	
1092	K.I.T. College Of Engineering, Gokul Shirgaon	N	-	-	-
1093	LDRP Institute Of Technology & Research - Gandhinagar			Workshop Centre	
1094	Lourdes Matha College Of Science & Technology, Trivandrum	Y	8	-	NO WIFI, RELOADING AGAIN AND AGAIN (NOT STABLE), DISCHARGING Battery very fast (only 18mins)
1095	M. S. Bidve Engineering College, Latur	N	-	-	-
1096	Mahakal Institute Of Technology, Ujjain	N	-	-	-
1097	Maharaja Institute Of Technology, Belavadi	N	-	-	-
1098	Marathwada Institute Of Technology, Aurangabad	N	-	-	-
1099	Medi-caps Institute Of Technology & Management, Pigdamber	N	-	-	-
1100	Mes Pillai`S Institute Of Information Technology, New Panvel	Y	-	-	-
1101	Mksss Cummins College Of Engineering, Karvenagar	Y	2	1101 1013	Android
1101				-	keeps on switching screens and applications all by itself
1102	Mother Teresa Institute Of Science & Technology, Sathupally	N	-	-	-
1103	NMIM MPSTME Shirpur	N	-	-	-
1104	NIE Institute Of Technology - Mysore			Workshop Centre	
1105	Nitte Meenakshi Institute Of Technology	N	-	-	-
1106	Nitttr, Chandigarh	N	-	-	-
1107	Poornima College Of Engineering, Sitapura	N	-	-	-

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1108	R. C. Patel Institute Of Technology, Shirpur	Y	2	1108 1012	Displaying Chinese language
1108				-	Android
1109	Rajiv Gandhi Proudyogiki Vishwavidyalay, Bhopal	N	-	-	-
1110	Regency Institute Of Technology, Adivipolam	Y	1	1110 1008	Procedure to Install APL.
1111	Rvs College Of Engineering And Technology, Coimbatore	N	-	-	-
1112	S. V. U. College Of Engineering, Tirupati	N	-	-	-
1113	S. B. Patil College Of Engineering, Indapur	N	-	-	-
1114	Sangam University, Itm, Bhilwara	N	-	-	-
1115	Shivaji University Kolhapur	N	-	-	-
1116	S. G. S. Institute Of Technology & Science, Indore	N	-	-	-
1117	Shri Vaishnav Institute Of Technology & Science, Indore	Y	1	-	Android
1118	Sri Jayachamarajendra College Of Engineering, Mysore	N	-	-	-
1119	Ssbt`S College Of Engineering And Technology, Bambhori	N	-	-	-
1120	St. Aloysius Institute Of Technology, Jabalpur	N	-	-	-
1121	Svp Engineering College, Visakhapatnam	N	-	-	-
1122	Techno India Njr Institute Of Technology, Udaipur	N	-	-	-
1123	Thakral College Of Technology, Bhopal	N	-	-	-
1124	Truba College Of Engineering & Technology, Indore	N	-	-	-
1125	Turbomachninary Institute Of Technology & Science, Patancheru	N	-	-	-
1126	Vignan Institute Of Technology And Science, Deshmukhi	N	-	-	-
1127	Vishwakarma Institute Of Technology, Pune	Y	1	1127 1031	Screen Broken
1128	Visvesvaraya National Institute Of Technology, Nagpur	N	-	-	-
1129	Vit University, Vellore	N	-	-	-
1130	Walchand College Of Engineering, Sangli	N	-	-	-
1131	Walchand Institute Of Technology, Solapur	Y	1	1131 1009	Screen touch
1132	Sir Padampat Singhania University, Bhatewar	N	-	-	-
1133	National Institute Of Technology, Agartala	N	-	-	-
1134	National Institute Of Technology, Kurukshetra	N	-	-	-
1135	Periyar Maniammai University, Vallam	Y	3	-	Touch
1136	Psg College Of Technology, Coimbatore	N	-	-	-
1137	Rk University, School Of Engineering, Kasturbadham	N	-	-	-
1138	Rajalakshmi Engineering College, Chennai	N	-	-	-
1139	Rajarambapu Institute Of Technology, Islampur	N	-	-	-
1140	Sastra University, Tirumalaisamudram	N	-	-	-
1141	Government Engineering College	N	-	-	-
1142	Government Engineering College, Sreekrishnapuram	N	-	-	-
1143	Indur Institute Of Engineering & Technology, Siddipet	N	-	-	-
1144	Sushila Devi Bansal College Of Engineering (Kcb Technical Academy), Indore	N	-	-	-
1145	Kmea Engineering College, Aluva	N	-	-	-
1146	Knowledge Institute Of Technology, Kakapalayam	Y	6	-	Wifi
1147	Kongu Engineering College, Perundurai	N	-	-	-
1148	Krishna Institute Of Engineering & Technology, Ghaziabad	N	-	-	-
1149	Lenora College Of Engineering, Rampachodavaram	N	-	-	-
1150	Sou Sushila Danchand Ghodawat Charitable Trust`S Sgi, Atigre	N		-	-
1151	Srm University, Kancheepuram	N	-	-	-

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1152	St. Joseph`S College Of Engineering & Technology, Palai	N	-	-	-
1153	Tezpur University, Tezpur	N	-	-	-
1154	Thanthai Periyar Government Institute Of Technology, Vellore	N	-	-	-
1155	Yeshwantaro Chavan College Of Engineering, Wanadongri	N	-	-	-
1156	NITK, Surathkal - Dakshina Kannada			Workshop Centre	
1157	Sona College Of Technology, Salem	N	-	-	-
1158	National Institute Of Technology, Durgapur - Barddhaman			Workshop Centre	
1159	Agni College Of Technology, Thalambur	Y	9	-	Wifi
1160	Anna University Of Technology, Madurai	N	-	-	-
1161	Anurag Group Of Institutions, Cvsr College Of Engineering, Ranga Reddy	N	-	-	-
1162	Asia Pacific Institute Of Information Technology Sd India, Panipat	N	-	-	-
1163	Avinashilingam University For Women, Coimbatore	N	-	-	-
1164	Bhagwan Parshuram Institute Of Technology, Rohini	N	-	-	-
1165	Bharati Vidyapeeth College Of Engineering, Navi Mumbai	N	-	-	-
1166				1166 1025	Wi-Fi Connectivity Issue
1166				1166 1032	Touch Screen
1166				1166 1036	Wi-Fi Connectivity Issue
1166				1166 1001	software, charger has to give
1166				1166 1008	software
1166				1166 1040	software, charger
1166				1166 1045	software, charger has to give
1166				1166 1003	charger
1166	Bhilai Institute Of Technology, Durg	Y	18	1166 1039	button missing
1166				1166 1025	wi-fi issue
1166				1166 1027	damage
1166				1166 1030	damage
1166				1166 1031	software
1166				1166 1032	damage
1166				1166 1063	power button
1166				1166 1091	software
1166				1166 1111	software
1166				1000 1505	usb port, charger
1167				1167 1181	Booting
1167				1167 1206	Booting
1167				1167 1210	Booting
1167				1167 1171	Booting
1167				1167 1110	Booting
1167				1167 1090	Booting
1167				1167 1037	Pattern Lock
1167				1167 1060	Battery
1167				1167 1151	censor
1167	Birla Vishwakarma Mahavidyalaya Engg. College, Vallabh Vidhyanagar	Y	19	1167 1059	Booting
1167				1167 1199	Not Starting
1167				1167 1031	Cracked

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1167				1167 1089	Cracked
1167				1167 1067	Cracked
1167				1167 1061	Booting
1167				1167 1133	Upper Porting of touch Screen not Working
1167				1167 1199	Not Booting
1167				1167 1083	Damage, Not Start
1167				1167 1167	Touch Screen
1168	Brcm College Of Engineering & Technology, Bahal	N	-	-	-
1169	Cape Institute of Technology, Levengipuram - Tirunelveli				
1170	Chitkara University, Chandigarh	N	-	-	-
1171	Dmietr, Sarod Hirapur	N	-	-	-
1172	Theem College Of Engineering, Boisar East	N	-	-	-
1173				1000 1720	Wifi
1173				1173 1052	On Button
1173				1173 1054	On Button
1173	Thiagarajar College Of Engineering, Madurai	Y	6	1173 1132	On Button
1173				1173 1061	On Button
1173				1173 1138	Power on
1174	Toc H Institute Of Science & Technology, Arakkunnam	N	-	-	-
1175	Truba College Of Science & Technology, Bhopal	N	-	-	-
1176	University B.D.T. College Of Engineering, Davangere	N	-	-	-
1177	Vels University, Pallavaram	N	-	-	-
1178	Vidyabharti Trust Institute Of Technology & Research Center, Umrakh	Y	-	-	-
1179				1179 1011	Display
1179	Viswajyothi College Of Engineering & Technology, Vazhkulam	Y	3	1179 1022	Touch Screen
1179				1179 1019	Screen Broken
1180	Yagyavalkya Institute Of Technology, Sitapura - Jaipur				
1181	Vivekananda Institute Of Technology, Jagatpura	N	-	-	-
1182	NK Orchid College Of Engineering Technology Hipparaga	N	-	-	-
1183	Vignan's Institute Of Information Technology, Duvvada - Visakhaptnam			Workshop Centre	
1184	National Institute Of Technology	N	-	-	-
1185	Amrutvahini College Of Engineering, Sangamner - Ahmednagar			Workshop Centre	
1186	Dhirubhai Ambani Institute Of Information & Communication Technology - Gandhinagar			Workshop Centre	
1187	Government Engineering College, Thrissur	N	-	-	-
1188	IIIT- Allahabad, Jhalwa - Allahabad			Workshop Centre	
1189	National Institute Of Technology - Jalandhar			Workshop Centre	
1190	Symbiosis Institute Of Computer Studies & Research, Pune	N	-	-	-
1191	Sinhagad Instiute Of Technology & Science, Narhe - Pune			Workshop Centre	
1192	MGM s College Of Engineering	N	-	-	-
1193				1193 1060	Charger, USB Cable, USB Extension
1193	Prof. Ram Meghe Institute Of Technology & Research, Badnera	Y	4	1193 1061	Charger, USB Cable, USB Extension
1193				1000 1942	Charger, USB Cable
1193				1193 1002	Charger, USB Cable

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1194	Gandhi Engineering College, Badaraghunathpur	N	-	-	-
1195	Bansal College Of Engineering, Mandideep, Bhopal	Y	1	1000 1885	android
1196	Balaji Institute Of Technology & Science, Narsampet	N	-	-	-
1197	G. H. Raisoni Institute Of Engineering & Technology, Wagholi Pune	N	-	-	-
1198	Mata Raj Kaur Institute Of Engineering & Technology, Rewari	N	-	-	-
1199	G. H. Raisoni Institute Of Engineering & Management, Jalgaon	Y	1	1199 1026	Wi-Fi Automatically Switch off after 2 Seconds
1200				1200 1013	Damaged Screen
1200	Ies College Of Technology, Bhopal	Y	5	1200 1158	restrating
1200				1200 1189	restrating
1200				1200 1055	restrating
1201	Islamic University Of Science And Technology, Awantipora	Y	1	1201 1011	android
1202	Ratnavel Subramaniam College Of Engineering And Technology, Dindigul	N	-	-	-
1203	Gnanamani College Of Engineering Namakkal	N	-	-	-
1204	Sai-Sudhir Institute Of & Technology For Women, Kundanpalli - Ranga Reddy	Workshop Centre			
1205	Mahatma Gandhi Missions College Of Engineering & Technology, Noida	N	-	-	-
1206	Bansal Institute Of Research & Technology, Bhopal	Y	1	-	android
1207	Jawaharlal Institute Of Technology, Borawan	N	-	-	-
1208	Anna University Of Technology, Tirunelveli	N	-	-	-
1209	Kiit College Of Engineering, Bhondsi	N	-	-	-
1210	Gogte Institute Of Technology, Udyambag	N	-	-	-
1211	Sri Shanmugha College Of Engineering Technology	N	-	-	-
1212	Kalyani Government Engineering College, Kalyani	N	-	-	-
1213	St. Peter`S Engineering College, Hyderabad	N	-	-	-
1214	Srinivas Institute Of Technology, Valachil, Mangalore	N	-	-	-
1215	G L Bajaj Group Of Institutions, Akbarpur	N	-	-	-
1216	Bsa College Of Engineering & Technology, Mathura	N	-	-	-
1217	Sies Graduate School Of Technology, Nerul, Navi Mumbai	Y	1	-	android
1218	Bansal Institute Of Engineering Technology	N	-	-	-
1219	Prestige Institute Of Engineering & Science, Indore	Y	1	1000 1988	Not Booting Hang
1220	Kurukshetra Institute Of Technology & Management, Kurukshetra	N	-	-	-
1221	N.P.R. College Of Engineering & Technology, Natham	N	-	-	-
1222	Chameli Devi Group Of Institutions	N	-	-	-
1223	Rbs Engineering Technical Campus, Bichpuri	N	-	-	-
1224	Reva Institute Of Technology & Management, Yelahanka	N	-	-	-
1225	Bms College Of Engineering, Bengaluru	N	-	-	-
1226	Skp Engineering College, Tiruvannamalai	N	-	-	-
1227	J.J. Magdum College Of Engineering	N	-	-	-
1228				1228 1003	Wifi
1228				1228 1008	Wifi
1228				1228 1015	Wifi
1228				1228 1002	starting
1228				1228 1106	booting

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1228		Y	14	1228 1171	top position of the touch was auto responsive
1228	Loyola-icam College Of Engineering & Technology, Chennai			1228 1214	touch screen and system unresponsive
1228				1000 1945	booting
1228				1228 1003	mac-id not able to detect
1228				1228 1008	mac-id not able to detect
1228				1228 1015	wi-fi not switching on
1228				1228 1101	wi-fi not switching on
1228				1228 1078	usb not working
1228				1228 1165	top position of the touch was un responsive
1229	Sardar Patel Institute Of Technology, Andheri	N	-	-	-
1230	Vidyaa Vikas College Of Engineering & Technology, Tiruchengode	Y	1	-	ANDROID Software
1231	Bhajarang Engineering College, Thiruvallur	N	-	-	-
1232	Jayalakshmi Institute Of Technology	N	-	-	-
1233	P E S College Of Engineering - Mandya	Workshop Centre			
1234	Meghnad Saha Institute Of Technology, Uchhepota	Y	2	-	Camera is not working 2nd one, WiFi is not working
1235	Dr. Mahalingam College Of Engineering & Technology, Pollachi	N	-	-	-
1236	Excel Engineering College, Komarapalayam	N	-	-	-
1237	Mewar University, Gangrar	N	-	-	-
1238	Maharaja Agrasen Institute Of Technology, Rohini	N	-	-	-
1239	Mohandas College Of Engineering Technology	N	-	-	-
1240	Shri Shankaracharya Institute Of Professional Management & Technology, Raipur	N	-	-	-
1241	Nri Institute Of Information Science & Technology, Bhopal	N	-	-	-
1242				1242 1002	ANDROID Software
1242				1242 1016	ANDROID Software
1242				1242 1241	1.Not Charging , 2. Charger Not Working
1242				1242 1169	Screen Blinking and switching On
1242				1242 1233	Rebooting Frequently
1242				1242 1078	Touch Screen
1242				1242 1156	Touch Screen
1242				1242 1093	Rebooting Frequently
1242				1242 1094	Touch Screen
1242				1242 1103	Touch Screen
1242				1242 1080	Not Booting
1242				1242 1210	Blured and unclear screen
1242				1242 1125	Touch Screen
1242				1242 1196	Blured and unclear screen
1242	K.L.E. Society`S College Of Engineering & Technology, Belgaum	Y	28	1242 1198	Rebooting Frequently
1242				1242 1200	Switching On
1242				1242 1226	Rebooting Frequently
1242				1242 1046	Switching On
1242				1242 1081	Rebooting Frequently
1242				1242 1085	1. Screen broken and touch screen , 2. Charger not working 354

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1242				1242 1124	Rebooting Frequently
1242				1242 1052	Switching On , Power Switch
1242				1242 1152	White screen with lines
1242				1242 1126	Touch Screen
1242				1242 1096	Switching On
1242				1242 1005	Booting
1242				1242 1016	Touch Screen also it is cracked
1242				1000 1951	Booting
1243	National Institute Of Science & Technology, Berhampur	N	-	-	-
1244				1000 1933	Pattern Lock
1244				1244 1002	ANDROID Software
1244	Archana College Of Engineering, Palamel	Y	5	1244 1004	ANDROID Software
1244				1244 1010	ANDROID Software
1244				1244 1017	ANDROID Software
1245	Stc School Of Engineering & Research Technology, Khamgaon	N	-	-	-
1246	C U Shah College Of Engineering Technology	N	-	-	-
1247	School Of Management Sciences, Technical Campus, Kasimpur Biruha	N	-	-	-
1248	Shri Sant Gadge Baba College Of Engineering & Technology, Bhusawal	N	-	-	-
1249				-	Unable to Connect to Wi-Fi.
1249				1000 1519	ANDROID Software
1249				1000 1520	ANDROID Software
1249				1249 1056	No MAC Address
1249	Sri Ramakrishna Institute Of Technology, Coimbatore	Y	8	1249 1214	Advance Option Not Available
1249				1249 1107	Display
1249				1249 1168	Not Working
1249				1249 1063	Not Working & Charger
1250	Sharad Institute Of Technology College Of Engineering, Yadrav	N	-	-	-
1251	Jaypee Institute Of Information Technology, Noida-128	N	-	-	-
1252	Narayana Engineering College, Nellore	N	-	-	-
1253	Ssm College Of Engineering, Komarapalayam	N	-	-	-
1254	Raj Kumar Goel Institute Of Technology For Women - Ghaziabad	Workshop Centre			
1255	Mount Zion College Of Engineering & Technology, Lena Vilakku	N	-	-	-
1256	Sree Dattha Institute Of Engineering & Science, Hyderabad	N	-	-	-
1257	Hctm Technical Campus, Kaithal	N	-	-	-
1258	Om Institute Of Technology & Management, Hisar	N	-	-	-
1259	N.D.M.V.P. Samaj's K.B.T. College Of Engineering, Nashik	N	-	-	-
1260	S.K.N. Sinhgad College Of Engineering, Pandharpur	N	-	-	-
1261	MET Institute Of Engineering Nashik	N	-	-	-
1262	Apex Institute Of Technology & Management, Pahala, Bhubaneswar	N	-	-	-
1263				1263 1208	Not Booting, No Display
1263				1263 1109	Tab Hanged

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1263				1263 1238	Charger
1263				1263 1065	OS
1263				1263 1156	Touch Screen & Charger
1263				1263 1071	Not Booting, No Display
1263	Techno India, Salt Lake Kolkata	Y	13	1263 1181	Touch Screen & Charger
1263				1263 1094	Battery
1263				1263 1128	Not Booting, No Display
1263				1263 1122	USB Not Working
1263				1263 1176	Not Booting, No Display
1263				1263 1106	Not Booting, No Display
1263				1263 1143	Screen Crack
1264	Shoolini University, Solan	N	-	-	-
1265	Madhav Institute Of Technology & Science, Gwalior	N	-	-	-
1266	Netaji Subhash Engineering College, Technocity, Garia	N	-	-	-
1267	Sri Shakthi Institute Of Engineering & Technology, Chinniyampalayam	N	-	-	-
1268				1268 1001	Wifi
1268	Techno India College Of Technology, Rajarhat Kolkata	Y	4	1268 1005	Wifi
1268				1268 1007	reboots
1268				1268 1010	Wifi
1269	Iercem Institute Of Information Technology, Banipur	N	-	-	-
1270	University Of Petroleum & Energy Studies, Bidholi - Dehradun	Workshop Centre			
1271	Jawaharlal Nehru National College Of Engineering, Shimoga	N	-	-	-
1272	Mangalayatan University, Beswan	Y	2	1072 1186	TFT damaged
1272				1072 1094	USB and USB adapter
1273				1273 1011	Damaged - screen broken
1273				1273 1040	Damaged - screen broken
1273	Gudlavalleru Engineering College, Gudlavalleru	Y	6	-	ANDROID Software
1273				-	Damaged - screen broken
1273				-	Glass Broken
1273				-	Not Charging
1274	Svs Group Of Institutions, Hanamkonda	N	-	-	-
1275	B H Gardi College Of Engineering & Technology, Rajkot	Y	2	1275 1024	Data Cable is not there
1275				1000 1830	Screen Broken
1276	Sankalchand Patel College Of Engineering, Visnagar	N	-	-	-
1277	Technology Education & Research Integrated Institutions, Kurukshetra	Y	1	1277 1064	USB Hub Missing
1278	S.D.M. Institute Of Technology, Ujire	N	-	-	-
1279	Mandsaur Institute Of Technology, Mandsaur	N	-	-	-
1280	Priyadarshini College Of Engineering Nagpur, Nagpur	N	-	-	-
1281				1281 1001	Cracked Screen
1281				1281 1002	Usb cable missing.
1281				1281 1178	Noise from Speaker
1281	Sveri`S College Of Engineering, Pandharpur	Y	7	1281 1110	Touch Screen
1281				1281 1011	Screen Damaged
1281				1281 1094	Booting
1281				1281 1140	Screen Damaged
1282	Sri Eshwar College Of Engineering, Coimbatore	N	-	-	-

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1283				1283 1005	Non accessibility of Wi-fi
1283				1283 1006	Non accessibility of Wi-fi
1283	Kanksa Academy Of Technology & Management, Panagarh	Y	5	1283 1008	Non accessibility of Wi-fi
1283				1283 1010	Non accessibility of Wi-fi
1283				1283 1015	Non accessibility of Wi-fi
1284	Saroj Mohan Institute Of Technology, Guptipara	N	-	-	-
1285	Siddaganga Institute Of Technolgy, Tumkur	N	-	-	-
1286	U V Patel College Of Engineering, Kherva	N	-	-	-
1287	Rayat-bahra Innovative Institute Of Technology & Management, Ganaur	N	-	-	-
1288	Vidyalankar Institute Of Technology, Wadala	N	-	-	-
1289	B K Birla Institute Of Engineering & Technology, Pilani	N	-	-	-
1290	Cdac, Noida	N	-	-	-
1291	Indian Institute Of Technology - Kharagpur			Workshop Centre	
1292	Sagar Institute Of Science Technology Engineering	N	-	-	-
1293	Seacom Engineering College	N	-	-	-
1294	Geethanjali Institute Of Science & Techonology, Gangavaram - Nellore			Workshop Centre	
1295	Gitam University Hyderabad Campus	N	-	-	-
1296	Nagole Institute Of Technology Science	N	-	-	-
1297	Sardar Patel Institute Of Technology, Piludra - Mehsana			Workshop Centre	
1298	Sardar Vallabhbhai Patel Institute Of Technology	N	-	-	-
1299	Dronacharya College Of Engineering	N	-	-	-
1300	Kurukshetra University Electronic Science Department	N	-	-	-
1301	K L E Institute Of Technology	N	-	-	-
1302	Sree Buddha College Of Engineering	N	-	-	-
1303	Sree Narayana Gurukulam College Of Engineering Kadayiruppu	N	-	-	-
1304	G.H. Raisoni College Of Engineering And Management - Ahmadnagar			Workshop Centre	
1305	Kavikulguru Institute Of Technology & Science, Ramtek - Nagpur			Workshop Centre	
1306	Shree L R Tiwari College Of Engineering	N	-	-	-
1307	Gandhi Institute For Technology, Bhubaneswar - Khurda			Workshop Centre	
1308	Roland Institute Of Technology, Berhampur - Ganjam			Workshop Centre	
1309	Silicon Institute Of Technology, Bhubaneswar - Khurda			Workshop Centre	
1310	Silicon Institute Of Technology - Sambalpur			Workshop Centre	
1311	Arunai College Of Engineering	N	-	-	-
1312	DMI College Of Engineering, Palanchur - Chennai			Workshop Centre	
1313	K.S. Rangasamy College Of Technology, Tiruchengode - Namakkal			Workshop Centre	
1314	Kathir College Of Engineering	N	-	-	-
1315	Selvam College Of Technology	N	-	-	-
1316	Dronacharya College Of Engineering	N	-	-	-
1317	Government Engineering College, Bikaner	N	-	-	-
1318	Amity University Haryana	N	-	-	-
1319	Mukesh Patel School Of Technology Management Engg	N	-	-	-
1320	Sri Balaji Technical Campus - Jaipur			Workshop Centre	
1321	Coimbatore Institute Of Engineering & Technology - Coimbatore			Workshop Centre	

RC	RC Name	Rpt	Qty	Tablet ID	Problem
1322	Charusat University Of Science Technology	N	-	-	-
8000	IIT Bombay DBP Account	N			
8001	IIT Kharagpur	N			
8002				8002 1034	Android
8002	Reliance IITM Telecom Centre of Excellence	Y	3	8002 1040	Android
8002				8002 1049	Android
8003	Indian Institute of Technology Guwahati	N	-	-	-
8004	IIT Mandi	N	-	-	-
8006	MHRD	N	-	-	-
8007	C-DAC, Trivandrum	N	-	-	-
8008	Indian Institute of Technology Hyderabad	N	-	-	-
8009	Indian Institute of Technology Gandhinagar	N	-	-	-
		Total	**319**		

Chapter 9

Aakash Application Development Labs

Prof. Ashok Jhunjhunwala started Aakash Application Development Labs at some of the selected IITs. Tablets were distributed to them. This distribution is reflected in the distribution report. All the reports of the work done at these labs has been compiled by Prof. Jhunjhunwala and is included in the following pages.

173

PROGRESS REPORT OF AAKASH APPLICATION DEVELOPMENT LABS (AADL)

JUNE 2013

IIT MADRAS

IIT KANPUR

IIT KHARAGPUR

IIT MANDI

&

IIT GUWAHATI

PROGRESS REPORT OF AAKASH APPLICATION DEVELOPMENT LAB, IIT MADRAS

I. AAKASH TABLET- USER FEEDBACK

1. Total number of tablets received so far: 270

2. Feedback on Aakash Tablets
Positives:

- Processor speed is reasonably good. Able to access applications developed in AADL as well as other applications without any issue
- Battery stands long time for lightweight applications
- GPU is good enough
- OS is good except for some application crashing
- Handy and supports many applications
- Screen resolution is good
- The performance is good when compared with other tablets in the price range
- Touch response is very smooth

Issues:

- Touch events are not performed well
- USB device is not connected programmatically. Shows "Permission denied" error
- No auto focus in camera, due to lack of this feature QR scanning is not possible
- Battery drains faster, does not have a powerful battery backup
- The tablet gets heated up within an hour of continuous usage.
- Doesn't have support for hardware encoder/decoder for web rtc videos
- Single core processor is very slow for big applications.
- Suddenly, some of the applications crash.

II. APPLICATION DEVELOPMENT AND STUDENT INVOLVEMENT

Application Development

As a part of the activities in the AADL, the following educational technologies are being developed that can supplement and complement existing educational content and teaching methods:

1) **Interactive digital Book:** An application that provides educational content in a graphically rich manner. Like any conventional textbook, it divides a lesson into chapters and topics and each section's core text material is augmented with short video clippings explaining the topic, images, animation, quiz modules, presentations, reference links, dictionary for reference, translation.

Plan for usage of eBook:

- **Working with Students:** To develop interactive eBook for 2 courses on Biochemistry and data structures. Over the next 2 months, 4 student interns (2 from Dept. of Biotechnology and 2 from Dept. of CSE) from IIT Madras will be working at the AADL to develop the eBook for the above mentioned courses.
- **Working with Faculty:** 2 professors who will be involved in converting their course material (text, recorded video lectures, lab assignments, quizzes, ppts etc) into eBook format to use from the next term onwards (July-Aug). The courses are: Digital Signal Processing (Dept. of Electrical Engineering) and Classical Mechanics (Dept. of Physics).

2) **eQuiz and eEvaluation Application:** A quiz application has been developed for both objective (exact answer) as well as subjective (essay) assessments. The quiz module has different types/formats of quizzes such as:

- **Objective Type:**

  - Fill-in-the Blanks
  - Match the following
  - Drag and drop
  - Multiple Choice Questions (MCQ)
  - True-False

- **Subjective Type:**

  - Worksheet were short answers can be written using stylus or can be typed in using the keypad on Aakash
  - Worksheet also has paint, draw, scribble features which enables drawing of figures, writing equations, etc. for answers

e Evaluation module:

- **For objective type quiz:** The evaluation is automatic system evaluation
- **For Subjective type quiz:** Where human intervention is required, a unique 'peer evaluation' system has been developed where the subjective questions are separated from the objective ones and are sent to assigned 'evaluators'. These evaluators based on the key/template evaluate the answers and send it back to the server. It is important to note that each/every question is sent to 3 assigned evaluators 'A,B,C' in order to compare their scores/evaluation of the same question. If the scores across evaluators varies too much then it needs to be sent for re evaluation to another 4th examiner.

3) **Exam Management Application:** This is a platform developed to conduct large scale exams such as IIT/JEE, UPSC, and other national level exams. These exams are conducted amongst large groups of people in distributed geographical locations. This platform will help in conducting the exams in a secure and efficient manner.

The platform consists of a central server (CS), exam room server (ERS) and the Aakash tablets in which the exam will be taken. The CS is where the question paper, answer keys, exam centre details, students taking the exams and other exam related details are uploaded and stored in an encrypted format. Each exam centre has ERS (laptops preferably) that communicate with the CS and can access the question paper. The students in these exam centres take their exams in tablets which run a unique 'exam application'. Only tablets with this application can access the ERS and the questions in turn. The questions are decrypted only on reaching the student tablet and they are given to the students one after the other and in a random order (varies from student to student). On answering the question, it is submitted back to the CS, where the evaluation takes place and the report can be generated at a later point.

4) **Live Lecture Application:** Web based platform that enables the delivery of live broadcast lectures using network connectivity. The platform can be used in a scenario where a lecturer located in one place using the tool can deliver live lectures to many students who are geographically distributed. The features of the platform include:
    – Live video streaming
    – White board application running on the tablet/device of the lecturer which reflects on every students screen
    – Document sharing—pdf, presentation, external links etc.
    – Quiz module
    – Quick notes
    – Synchronous View
    – PTT, Rise Hand for asking doubts
    – Group chat (lecturer and institute co ordinator)
    – Classroom chat

5) **Tutorial/ Collaborative learning Module:** Platform that enables small groups of 8-10 students to form virtual groups with/without the presence of a teacher/tutor to study together. The platform enables synchronous learning in real-time amongst students who want to study/work together but cannot come together at the same time. It enables interactivity among the students with features like document sharing, screen sharing, text/voice chat, live video streaming for video conferencing, and synchronous video viewing such that when a video is stopped, played, forwarded/rewound in one computer reflects on other users' screens as well.

Student Training

We have conducted 3 student Android training workshops so far, where students where trained on the basics of Android application development.

<u>Workshop I:</u> One day workshop consisting of 30 students

<u>Workshop II:</u> Two-day workshop for 15 students

<u>Workshop III:</u> Two-day workshop for 40 students

- Based on feedback from the first workshop, we have re-designed the course to stretch over two weekends. After part I of the workshop, the students are given quizzes and assignments to work over the week before they get back for part 2 of the workshop on the following weekend.
- A conscious focus is on imparting training to students from not just computer science background. We are encouraging students from Electrical Sciences, Chemical Engineering, Biotechnology and other streams (with basic programming knowledge) to participate in these trainings.
- At the end of the training, the students are given application ideas apart from the ones they come up with and in a couple weeks time we conduct sessions were the students present the applications developed by them to their peers.
- The long-term plan is to involve the trained students in the application development as a part of AADL
- More sessions have been planned for the following months

PROGRESS REPORT OF AAKASH APPLICATION DEVELOPMENT LAB, IIT KANPUR

I. AAKASH TABLET- USER FEEDBACK

1. **Tablets Received:** A total of 120 tablets have been received.

2. **Comments on Aakash tablets:**

   - All the tablets we used/tested so far work
   - Build quality is poor and inconsistent
   - Some of the tablets come incorrectly configured to Chinese keyboard
   - Battery life is poor
   - Response to gestures is OK
   - Audio is poor
   - Video playback and Internet connectivity is OK

II. APPLICATION DEVELOPMENT AND STUDENT TRAINING

Application Development

1) **PortMagic - Teaching electronics with Aakash Tablet**

Design and Implementation of a Mobile Platform for Embedded Programming

The modern day portable devices like smart phones and tablet PCs are powered by processors whose specifications and performance are much higher than those which were used in computers for complex programming in the late 90's. These powerful hand-held devices provide the user, a multi-dimensional platform catering his needs such as functions of personal digital assistant (PDA), gaming, web browsing, navigation, multi-media entertainment and to keep the user aware and updated with the current scenarios like weather, news and so forth.

At a tangible direction, enormous experiments, developments, applications and market growth can be witnessed in the embedded system field. To learn, understand and experiment in this field a lot of hardware knowledge as well as programming skills are required. In addition to these, a setup also needs to be installed either on a computer or on a laptop with the supporting hardware accessories, which may not be feasible/economical from user point of view. Furthermore, the smart phones or the tablets are as well specific outcome of a well-planned combination of hardware and software components, which is nothing but the embedded system.

This work explores how the computing power of the modern mobile devices can be utilized for developing a mobile application platform for the embedded world. The following are the major works undertaken during the course of this thesis:

1. In the initial stages of this thesis, the aim was towards optimizing capabilities of the smart phone with the help of a serial communication built over RS 232 protocol.

2. A prototype Application "ThunderPort" was built for Android OS, which provided a platform for understanding and establishing of serial communication protocols. It also offered a serial communication between the application and the external hardware, which is controlled with the help of a microcontroller. This also included programming of an AVR microcontroller for controlling the additional hardware.

3. An Android application "PortMagic Version 1.0" was built, which provided the user with limited set of commands to program ATmega 328 microcontroller through USB port, with a master program running on the microcontroller.

4. The final prototype software development platform "PortMagic" was built for Android, which provides a simple but rich language and could support all Arduino (an Open Source Electronic development platform) projects (sketch is the term used by Arduino community) available across the web. The application is a standalone platform for creating, editing and compiling projects, and programming Arduino boards through USB port.

PortMagic allows it to be used as an educational toolkit for teaching the functioning of electronic components, sensors and other devices through the microcontrollers. It provides a simple learning tool for understanding embedded programming concepts. It can be used an independent mobile platform for advanced embedded programmers.

2) Apps for the differently abled

The main objective of this project is to create new apps for the children with special needs or mentally challenged children. Modern touch pads and smart phones have the potential to transform children's education, because almost all children are attracted to them, and their interface is inherently more usable than that of a traditional desktop computer. However, apps to teach children only succeed if they are designed with an understanding of how children learn. This is especially true for children with special needs.

 Here are some advantages of using Tablets for children with special needs:

- The touch screens are easier for the children to use when compared to the mouse and keyboard.
- Touch screens also make learning more direct, something that is vital for these children.
- Children who are non- verbal often find it easier to communicate through a tablet.

Purpose of the Apps:

- The apps will be created to improve the functional development of the children in the following areas: Communication, social skills, life skills, functional literacy and Numeracy.
- Most of the apps will be created in Hindi with Hindi audio support.
- The contents, symbols or picture images will be created according to the local regional culture and their daily practices.
- Some basic level educational curriculum (specially designed for special education) will also be included in the program.

Here is a sample list of apps we have in mind:

- Functional literacy- Hindi and English functional Vocabulary (with Phonological awareness)
- Words with picture cards
- Functional Numeracy: Number concept, functional money concept, basic counting, identifying different shapes and sizes.
- Communication aid- Facilitate the children for making their own choices to communicate about the things that they require for their daily living. For this create different blocks of picture card data-base for all the common needs and the things that the child will need to use at home and at school.

Our initial experiments with the 7" tablets show that a larger tablet will have greater utility for this kind of applications.

Student Training

We have conducted 6 workshops so far – 5 at IIT Kanpur and one at Institute of Technology, Kanpur University. About 300 students were trained in these one-day workshops on writing apps for Android. These were very well received and there are many requests to do more of these training workshops.

Date	Location	Number of attendees
01-Sep	IITK	54(CS724 students + RAs)
08-Sep	IITK	65(CSE Dept. students)
15-Sep	UIET	49 (3rd year cse students of UIET – Kanpur University)
29-Sep	IITK	50 (Students of IITK)
30-Sep	IITK	45 (Students/RA's of IITK)
6-Oct	IITK	45 (Students of IITK)
15- May	IITK	8 (Summer interns – students of IITK)

A project work on "Teaching Embedded Electronics with Aakash Tablet", as a Master Thesis, is also completed successfully by Lt Cdr Ashwin M Rao, CSE Dept., IIT Kanpur, under the guidance of Prof. T.V. Prabhakar. The abstract is reproduced below:

The modern day portable devices like smart phones and tablet PCs are powered by processors whose specications and performance are much higher than those which were used in computers for complex programming in the late 90s. These powerful hand-held devices provide the user, a multi-dimensional platform catering his needs such as functions of personal digital assistant (PDA), gaming, web browsing, navigation, multi-media entertainment and to keep the user aware and updated with the current scenarios like weather, news and so forth.

At a tangible direction, enormous experiments, developments, applications and market growth can be witnessed in the embedded system eld. To learn, understand and experiment in this eld a lot of hardware knowledge as well as programming skills are required. In addition to these, a setup also needs to be installed either on a computer or on a laptop with the supporting hardware accessories which may not be feasible/economical from user point of view. Furthermore, the smart phones or the tablets are also specic outcome of a well planned combination of hardware and software components, which is nothing but the embedded system.

This thesis explores how the computing power of the modern mobile devices can be utilized for developing a mobile application platform for the embedded world. During the evolution of the thesis, the complex coding of the microcontrollers is abstracted from the user thereby making it easy for someone interested in venturing the embedded eld. The thesis also provides a physical medium through which the powerful sensors and actuators of the mobile device can be utilized for external interface. As the part of the thesis, a prototype software toolkit was developed on the Android Open Source Mobile Operating System for Arduino, an Open Source Electronic development platform. This application can be used as educational toolkit for teaching and testing of functioning of various electronic components, sensors and other devices through the microcontrollers. The application also provides a strong platform for developing and implementing microcontroller based projects on Arduino platform for the advanced developer and hobbyists.

PROGRESS REPORT OF AAKASH APPLICATION DEVELOPMENT LAB, IIT KHARAGPUR

I. AAKASH TABLET- USER FEEDBACK

1. **Total Number of Aakash Tablets received**: 40
2. **Comments on the Aakash Tablets:**

The tablets are very effective and useful. However, some of the important issues that need to be addressed are:

- Very weak Wi-Fi reception
- Non standard battery life
- The chargers are not reliable and are turning non-functional soon
- The speaker gain should be enhanced
- The touch screens are not all equally sensitive
- Many of the tablets received had a broken or severely scratched touch screens
- For the developers, it will be very useful to have the drivers (such as touch-screen drivers etc.) accessible.

II. APPLICATION DEVELOPMENT AND STUDENT TRAINING

Application Development

The following applications have been developed:

1) **Development of an Online Repository of Picture Library:**

   This Picture Library project is an online repository of a set of more than 1200 standard icons that are used by people with Severe Speech and Motor Impairment (SSMI) to communicate their daily needs. These Icons have been developed by Indian Institute of Cerebral Palsy, Kolkata and are available in both colored as well as grey scale. The icons dictionary is freely available from http://aadl-iitkgp.nltr.org/

2) **Development of Aakash Bani:**

   A Voice Output Communication Aid (VOCA) is an electrical device that assists people who are unable to use natural speech to express their needs and exchange information with other people during a conversation. The VOCAs store pre-recorded messages, which are produced in the form of digitized speech when the user presses an image. The most elaborate VOCAs include software that allows users to create and combine words to produce novel utterances in the form of computerized synthetic speech. IIT Kharagpur in association with Society for Natural Language Technology Research,

Kolkata has recently developed a VOCA system for people with autism. This would definitely enable autistic persons to use tablets running on Android platform seamlessly.

Key Features:

- Can be customized as per the needs of the user.
- No. of grids may be increased or decreased.
- Grids can be modified, changed, edited.
- Provision for sound recording in .mp3 format.

3) Development of Talking Keyboard

A talking keyboard is a specially designed tool that allows people with motor disorder to seamlessly type texts in android based tablets. The keyboard is integrated with automatic scanning mechanisms and pre recorded audio files of individual alphabets that help the target population to type as well as listen to the typed letter.

4) Development of an Online Portal for Student Developers from the IITs for Aakash Project

A web portal http://www.aadl-forum.nltr.org/ is developed where students volunteers from different IITs, who are developing applications based on Android platform, can register their names. The registration will allow them to access the web forum where the developers can share their development ideas, experiences, any sort of technical queries and possible solutions. The forum along with the web portal is maintained by an administrator from IIT Kharagpur.

Applications under Development:

1. **Web-Browsers for the Disabled:** Aakash based browsers for the differently abled (sightless as well as those with neuro-motor disorders) are being developed

2. **Text to Speech for Bangla:** Text to Speech for Bangla is being developed for Aakash

3. **Note Maker in Android:** This application will allow students to prepare class notes using different applications. The tool is capable of capturing different text or image documents from different sources and places them together in a single document with proper reference.

4. **Video Lecture Organizer:** Video Lecture Organizer allows a student to go through well-organized category of videos and find the course videos he/she wants to see. There are video links from a variety of sources NPTEL, MIT OCW,

and other open course ware of other leading universities). Most of the Video Lectures are indexed; hence a student can either watch the whole lecture video or go directly to the part he/she wants to refer to. There would be online streaming of videos, with an option to mark down a part of the video for future referencing. It also has a parallel Google/wiki search so that students can directly search any term or concept which they haven't understood in the lecture.

The courses will be easy to search through as they will be categorized based on subject and topic. No external applications or players such as the YouTube player will be required to play the video. The GUI will be clear, simple and easy to use, facilitating quick searching and organizing. A student can benefit from this app vastly. It will help improve student productivity as students will no longer have to spend time searching for video lectures on the internet. The quick parallel search feature will allow students to quickly look for reference on the topics discussed in the lectures. The search will also be useful in quick translation of any terms used in the lectures to local languages, thus promoting a larger outreach of video lectures.

5. Application to help users in qualitative analysis of salts in Chemistry lab based on predefined tests.

6. **Science Timeline:** An application which will display history of science as a timeline of various events.

7. **C4You:** This app will help you to understand the Programming Language C. It will contain-

    a. History of C

    b. Basics of C

    c. Importance of C

    d. Important Algorithms

    e. C –compiler

8. **Math4Droid:** This app is basically for students of class 9th to 12th. It will contain:

    a. Important Formulas along with derivations

    b. Various trigonometrically and Geometric Theorems

    c. Everyday's problem

9. **Chemistry Experiment tool:** This tool will assist students to know about compounds, physical properties, structure and other stuff.

10. An interactive game to increase vocabulary in a particular language.

11. **Virtual Lab** for Physics Experiment Related to Kinematics, Laws of Motion, Systems of particles.

12. **SciMaze:** Application will enable user to test his knowledge of science. User will have to find two connected things in a maze and answer a question about the connection between them to gain points and advance to next level. After answering the question user will be displayed with brief information about the topic.

13. Interactive application which helps students to perform simple science experiments related to their respective curriculum. The application will provide steps to do the experiment using materials easily available at home. It will explain various concepts and provide brain teasing questions on the concepts taught by the experiment. The student will learn to interact with their surroundings and observe scientific events happening around them in day to day life.

Student Training

Two android training workshops have been conducted in Indian Institute of Technology Kharagpur and Jadavpur University, Kolkata. The workshops were targeted towards students from engineering and technical disciplines such as, B. Tech, M. Tech, M.Sc., and MCA. The instructors were chosen from students and research scholars of IIT Kharagpur and professionals from SNLTR, Kolkata, who had a good knowledge in android development. They were screened through a personal interview. Each workshop was of 16 hours duration spanning over two days. Total 112 students have been trained in the two sessions; the distribution is as follows:

Workshop -I	
Place	IIT Kharagpur
Total Students	60
Students from IIT Kharagpur	40

Students from other Institutes	20
Workshop-II	
Place	Jadavpur University, Kolkata
Total Students	52
Students from IIT Kharagpur	16
Students from other Institutes (Jadavpur University, Bengal Engineering and Science University, Shibpur and West Bengal University of Technology).	36

PROGRESS REPORT OF AAKASH APPLICATION DEVELOPMENT LAB, IIT MANDI

I. AAKASH TABLET- USER FEEDBACK

1. No. of Tablets received:

Number of Tablets Received	Date	Comments
10	Oct 2012	Pre-installed software, no major problem with the tablets
40	April 2013	Default language was Chinese, many chargers did not work and few tablets just did not start
200	May 2013	Few tablets did not start up at all and few became dead after sometime.

2. Comments on Aakash Tablets:

IIT Mandi' AADL team is quite happy with the tablets. Following are our observations:

Hardware:

- The processor speed is quite good.
- All applications run smoothly without slowing down.
- The battery is fine, works for around 2-2.5 hrs with WiFi on and tablet in constant use.
- The touch screen is excellent and at par with other tablets / phones in market.
- The only problem encountered while using Aakash tablet is that sometimes it hangs. It appears to be an operating system problem.

Software (Pre-supplied Applications):

- The applications currently on Aakash are all quite nice.
- The C, C++ and Python programming environment is easy to use and has sufficient features for students to practice programming.
- Other applications like proximity (Video Lecture Player) are very useful too.
- In addition to applications currently available, it was easy to install any new application on the tablet.

Few issues which came up with the tablet appears to be more with the second lot than with the first one. Some chargers just stopped working and the tablet started with the interface in Chinese rather than English.

II. STUDENT TRAINING AND APPLICATION DEVELOPMENT

Application Development

1. **Data Structure Simulation**- This app will ease the understanding of the data structure and various algorithms.

2. **Interactive e-Book**- Developing interactive eBook for various engineering subjects to help students in their studies because larger numbers of graduate students are more favorably leaning to e-books.

3. **Doubt Buster**- It's a teacher student interaction application to solve doubts regarding any stream anytime.

4. **E-Blackboard**- This application provides interface for free hand writing to take notes. It also contains toolbar of different elements such as: pencil, color, shapes etc.

5. **Easy Engineering**- This application is to perform a role of a handy pocket reference guide for students stepping into engineering colleges who need guidance on different aspects of engineering courses.

6. **Note Mania**- This app is intended especially for the students to make study easier i.e. taking notes, remembering the important things, setting up the reminders to get alerts about projects/assignments etc.

7. **Aakash Ayurveda**- It is simple but useful Educational App that makes students aware about various Ayurvedic plants of Himachal region. The information that app contains mainly include plant name, plant common name and medicinal properties. It also provide offline as well as online quiz mode.

Student Training

As a first step, the self-motivated group of few students gave "Beginners workshop" to around 40 students for getting started with Android application development. After that competition about the ideas for developing applications for Aakash was floated. Good ideas were selected and students started working on the applications.

After receiving more tablets we organized workshop for the Government Engineering College in the neighborhood, called Jawahar Lal Nehru Govt Engineering College. Lots of hands on practice were given to the students to give them a good feel of the android application development as well as use of Aakash tablet.

To reach out to students in nearby private engineering colleges, few interns from Shoolini University, Solan (HP) were taken. Just to mention, Shoolini University at Solan had received Aakash tablets from IIT Bombay and students had undergone the training about how to use the tablet. We trained these interns and workshop on application

development on Aakash has been planned at Shoolini University in the month of August where their own student trained with us will help us in parting the training.

Recently, few students from NITs who had interest in android application development also have got involved with AADL, IIT Mandi and working for applications on Aakash.

Workshop at Location	Date	Comments
"Android Development Workshop for Beginners" at IIT Mandi	August 06, 2012	Workshop covered various aspects of app development such as java programming, XML designing and basic designing of an app.
"Competent use of Aakash Tablet and Android Development" at IIT Mandi	May 05, 2013	It was a very successful workshop. It motivated many participants for android development for Aakash tablet.
Interactive session at NIT Jaipur	June 01, 2013	It encouraged Students to develop apps for Aakash tablet.
"Interactive Android App Development" at Shoolini University, Solan	Proposed date August 08, 2012	It will be a basic level workshop, so the prerequisite required will be zero.

Progress Report of Aakash Application Development Lab, IIT Guwahati

I. Aakash Tablet- User Feedback

1. **Number of Aakash Tablets Received so far**: 249
2. **Comments on Aakash Tablet:**

   - Battery Life: The battery life of the tablets in general is low when compared with two other low-cost tablets (in range of Rs.4000-6000). Battery life when the device is on Wi-Fi is particularly low.

   - Operating System: All tablets are not loaded with same version of operating system. Even though the version is same, all tablets do not have same set of Android tools. Some tablets for example do not have Wi-Fi Direct feature, some tablets do not have support for WEP security, cannot acquire IP address with DHCP, etc.

   - Wi-Fi interface: All tablets do not seem to have same hardware capabilities. While some tablets detect an access point, the same could not be located with other tablets. In general, the Wi-Fi signal must be very strong for the tablets to detect. While other low cost tablets detect an access point, Aakash tablets cannot detect. Many tablets do not support WiFi Direct.

   - LCD Display: Few tablets have bad display just as they are opened. Till now, we have 4 tablets with LCD display gone bad. Scratch guards must be provided for the screens.

   - Accessories issues: Some connector cables are not working and some chargers are not working even for new lot. Cable length of the charger is very short.

   - Tablet Casing: The quality of the casing is not of high quality. Chances of getting the LCD display damage are high even with slight falls or bend. LCD of at least 4 tablets have gone bad during transit.

Some software and usage related feedbacks from users:

1. Date and Time need to be set whenever the device is restarted. Problem can be with CMOS battery or OS.

2. Device often hangs. Three devices crashed and are not usable any more.

3. There is no option to close default applications such as browser. They can be only minimized. For closing, you need to explicitly open the list of active applications and kill. Users tend to minimize or press back button resulting in many live applications in the queue. It may cause the device to get hung.

II. APPLICATION DEVELOPMENT AND STUDENT TRAINING

Applications Development

1) **Speak2Learn:** This application teaches alphabets to kindergarten students through interactive pictures and audio. It recognizes the word spelt by the user to verify against the picture and help the user to learn alphabets in an interactive fashion.

2) **Formula App:** This application has support to evaluate mathematical formulae and teach students to learn periodic tables, calculus, algebraic equations and few other scientific tools for engineering students.

3) **Library Book Reminder:** This application helps a student in campus to automatically keep track of his library account details and set reminders for due dates of books issued. It can work on campus wireless network and can also work in offline mode with inputs provided by the user.

4) **Mess Calorie Calculator:** This application acts as a calorie counter for Indian food items served in hostel mess and can suggest a health diet plan for the students eating in hostel.

5) **Note Taking App:** This application integrates the academic calendar of a student with an application to write lecture notes. The application takes the academic calendar of the student and automatically identifies the lecture a student is supposed to attend at a time. Any notes taken during the time is written into the notes corresponding to the subject. The application gathers lecture notes for different subjects at the end of the week and helps in the revision of the class proceedings.

Applications under development:

6) **DocRevise:** This application takes a document and generates a set of fill-in-the-blank type questions from the content automatically using machine learning algorithms. The number of questions to be generated can be selected by the user and it determines the relevance of the questions. This application can be used by a student for self-assessment after reading a document.

7) **Examination Conducting System:** To develop a system that can enable a teacher to conduct an examination either in class or offline on the tablets. The system would help the teacher to create an examination paper using the application from a database of questions, start and finish the examination, and evaluate the answers. The examination can be conducted in both the online and offline modes would work for multiple choice, exact answers and short answers questions.

8) **Note Taking and Sharing Application:** The idea here is to create an application that can allow the students to highlight parts of electronic material (files either in text or pdf format) and save them for reading later. The application would allow the students or teachers to create notes from e-books. These notes can be indexed for searching by other users who are also interested to read similar content. This application would help students to learn important concepts directly from notes prepared by other students or

teacher. Such notes preparation would not require any additional effort on the part of the reader except the need to highlight and share the content.

9) **Discussion Forum for Collaborative Learning:** The idea here is to create a discussion forum portal that can be used by students attending any course to post questions and answers related to each topic or section of the course. The main challenge is to categorize the discussion based on topics or tags automatically and enable browsing through the forums in an easy manner. The discussion forum can be used by students to interact and learn from each other and can optionally have participation by the teacher as well. A chat application can also be integrated in this system to enable live interaction among the members of the forum. This discussion forum can be used by the students present across a campus network.

Student Training

- First Brain Storming Session and Talk on Android Application Development conducted on 20 September 2012. (No. of participants: about 150)

- Second Brain Storming Session on possible pedagogical applications conducted on 15 February, 2013. (No. of Participants: About 60)

- Two-day workshop cum contest on Android Application Development on 6th-7th April 2013.

Chapter 10

Enhancing Participation through Contests

10.1   Contest for Teachers

A novel contest was launched to encourage teachers to use Aakash as an effective educational tool. This was made open to all teachers of Aakash Project Centres (APCs), who attended the orientation workshop in November 2012. As a part of the workshop, participating teachers were required to submit a team assignment.

This assignment required each team to first think, imagine, and envision different ways of using Aakash, which can enhance quality of education, using Aakash. After summarizing these thoughts, the team was then required to consider one or more of these ideas, and formulate specific projects/activities, giving some details about how such projects could be implemented.

These reflections and ideas, as well as the detailed project proposals, were not to be limited only to engineering education. Teams were free to think about deploying Aakash in any level of the full spectrum of education, ranging from primary school, high school, colleges, to professional studies. This could include vocational education and adult literacy as well. The only expectation was that, one should be able to carry out the main components of the suggested project in our engineering colleges, with the collaboration and assistance of others outside the engineering education system, if required. For example, to implement a project idea for primary schools, one may need assistance from primary school teachers, local school board, NCERT, etc..

The contest for teachers is that the team submissions made are eligible for 'Aakash Research Fellowship' awards. These Fellowships will be given to the members of faculty teams, whose team assignments are adjudged as the best, amongst submissions made by participating teams. These submissions will be ranked on the basis of innovative ideas, detailing of the proposed projects, and the quality of the report.

The value for each fellowship, is Rs. 15,000 for each member of the winning team. Thus, if a team has 3, 4, or 5 members, the corresponding fellowship amount for the winning teams, will be Rs. 45,000, Rs. 60,000, or Rs. 75,000 respectively. The fellowship amount awarded to teams, is to be spent by each individual member of that team, only for any professional activity as desired by him or her. This could, for example, include attending a professional conference, buying consumables for research projects of students, etc.. Over 2,000 submissions have been received. Evaluation of the submitted entries, is being done through a peer-review process. Details of the announcement are given on the following pages.

ISTE Workshop on 'Aakash for Education'
Team Assignment

Date posted: Thursday, 6th December 2012
Submission due on or before::   Wednesday, 9th January 2013

The file, 2012_12_06_Aakash_team_assignment_and_fellowship.pdf, has been uploaded on the workshop Moodle.

Assignment:

In the workshop we introduced the Aakash tablet, and briefly saw the demonstration of some useful applications and content developed at IIT Bombay, for Aakash -2. We now have a preliminary idea on how Aakash can be deployed for our educational activities. In coming months and years, a lot more work will be done by all of us together, to make Aakash more effective in education.

This assignment requires each team to first think, imagine, and envision different aspects of such work which can enhance quality of education using Aakash. These thoughts should be documented and summarized in a section by the team. The team should then take one or more of these ideas, and formulate specific projects/activities, giving some details about how such projects could be implemented. These details should be reported in a separate section.

Your reflections and ideas, as well as your detailed project proposal, need not be limited to engineering education. You are free to – and in fact, encouraged to -think about deploying Aakash in any part of the full spectrum of education, ranging from primary school, high school, colleges, to professional studies. You may wish to include vocational education and adult literacy as well. The only expectation is that, one should be able to carry out the main components of the suggested project in our engineering colleges, with the collaboration and assistance of others outside the engineering education system, if required. For example, to implement a project idea for primary schools, one may need assistance from primary school teachers, local school board, NCERT, etc..

The team assignment submitted by you will be released in open source. It will also be eligible for 'Aakash Research Fellowship' awards, described in the annexure attached to this document.

Report Submission:

Your assignment report should consist of four sections.

Section 1 will be limited to one page (the first page). It should contain the RC code, name of your Institution, city, and state. You should then give a title to your report. It may be indicative of the specific proposal(s) you have elaborated in the report.

Enrollment number and names of all team members should then be listed. The first name should be that of the team leader. Against each name, provide an approximate number of person-hours spent in the assignment activity, with total effort spent by the team given at the end of the list. Finally, a set of keywords or key-phrases should be listed which best describe the nature of your proposal. An illustrative list of such key-phrases is given below, only as possible examples:

(1) Primary education, Tamil script rendering, teaching history.
(2) High School education, science tutorial, Hindi.
(3) Civil engineering education, finite-element analysis, Scilab.
(4) Linux port, memory optimization.
(5) Wi-Fi access, concurrent users.
(6) Solar charging, battery optimization.
(7) Pedagogy, learning enhancement.

Names of the team members must not occur anywhere else in the report.

Section 2 should contain your general reflections on the possible use of Aakash in education. This reflection section is expected to present an argument -with rationale and justification - for an approach or perspective on deploying affordable Aakash tablets in our educational system.

Section 3 should contain a detailed plan of possible work on any one task, chosen from the set of activities on which you have reflected in the first section. If you wish, you may choose to detail more than one task. You may expand on the use of Aakash in a class room; you may describe a specific R&D project to be done by students or even by senior researchers on a specific topic, or for improving Aakash and/or its usage; you may dwell upon the issues of educational pedagogy; you may wish to work out details of the infrastructure needed to deploy Aakash tablets in a school or college; or you may elaborate on any novel idea(s) you have, which have probably not yet been thought out by anybody else.

You should also try to work out an estimate of effort, time, and expenditure needed to implement the proposed project idea. These estimates should be included in a separate paragraph.

Section 4 (optional) It should mention brief observations about possible future work, beyond the suggested project work.

Appendices
If there are any references cited in the text of your report, full details about them should be given in one appendix. Further appendices may be added, if necessary.

Format of the Submission file

The assignement is to be prepared in a file which in an editable format (such as .odt, .doc, or .txt), and should be uploaded on the workshop Moodle by the team leader, on or before the due date. There should be only one submission per team. If your team uses Microsoft Office, please do not save the your file in the .docx format. Please use the older .doc format. This is because at IIT Bombay, we have very limited licenses of the newer Microsoft Office.

Important Notes:

1. As mentioned in the workshop announcement, ISTE certificates will be given only to those participants who have attended the workshop, submitted on-line feedback, and complete this team assignment.
2. Since substantial funding is proposed for selected entries,

(a) All participants must agree to participate and contribute to the peer review process, which will be detailed after the submissions are received. This will entail an additional work of about 4 to 6 hours in the weeks following the submission date.
(b) Participants who qualify to get the Aakash fellowship award, must also agree to spend the amount only for professional activities, and to account for the expenditure as per the standard accounting/auditing procedure.

Participating teams not willing to agree to the above, are required to explicitly state their inability to comply, on the first page of their report. Such submissions will, of course, qualify for the ISTE certification; but will not be considered for the Aakash fellowship awards.

3. Like all academic institutes in the world, IIT Bombay considers plagiarism of any kind to be a very unethical activity. Since all your submissions will be released in public domain, it is absolutely important that the report should contain your own expression of thoughts. If you feel the need to refer to someone else's work, appropriate citation must be included in the text, and the corresponding reference must be provided at the end of section 4, in a separate list of references.

Noncompliance with the above, will immediately disqualify the submission, and the matter will be reported to concerned authorities.

(Dr Deepak B Phatak) 6th December 2012 In-Charge, Aakash project

ANNEXURE

Aakash Research Fellowships to be awarded by IIT Bombay to selected participants of the   workshop on 'Aakash for Education'

General:

1   We, from Aakash project at IIT Bombay, are glad to announce the 'Aakash Workshop Fellowships'. These Fellowships will be given to the members of faculty teams, whose workshops assignments are adjudged as the best, amongst submissions made by participating teams. These submissions will be ranked on the basis of innovative ideas, detailing of the proposed projects, and the quality of the report. Evaluation of the submitted entries will be done through a peer-review process which will be described in detail, after assignments are submitted. Members of all the participating teams will be required to contribute to this peer-evaluation process, as directed by IIT Bombay.

2   The evaluation will be done in two stages. In the first stage, the top two teams will be identified at each Aakash Project Centre. These two winning entries from each centre, will then be assessed to determine the best 50 entries across the country, amongst all participating Aakash Centres.

3   The team which is declared as the best entry in each center, will be awarded the Aakash fellowship. In case there are more than 15 teams from a centre, then each of the top two entries will be awarded the fellowships.

4   The value for each fellowship, is Rs. 15,000 for each member of the winning team.   Thus, if a team has 3, 4, or 5 members, the corresponding fellowship amount for the winning teams, will be Rs. 45,000, Rs. 60,000, or Rs. 75,000 respectively.

5   The Institutions to which the top 50 teams belong, will get a special 'Institutional Aakash Research Grant' of Rs 1,00,000. This is in addition to the research funding of similar amount being provided to each Aakash Center, for setting up the basic infrastructure for use with Aakash tablets.

6   The fellowship amount for winning team(s) at each Center, will be given to the Institute, and Head of the Institution, or a person designated by the head, will be in charge of disbursement to the individual faculty members of the winning team(s).

7   Norms for using the fellowship are given in the next section.

Use of fellowship grant:

1.   The fellowship amount awarded to teams, is to be spent by each individual member of that team for any professional activity as desired by him or her. Some suggestions are given below:

(i) Many faculty members wish to attend national conferences on subjects in their fields. Getting financial support for conference fees, travel, and stay, is often difficult for a faculty member to arrange, even if a paper written by him or her is accepted in the conference. Without a submitted paper, it is nearly impossible to get financial support, even though attending a specific conference may significantly add to one's professional knowledge. It is suggested that the fellowships be used for such funding support, for attending a conference of the choice of the faculty member. In case a faculty member chooses this option, it is expected that the faculty members discusses the Aakash project with other attendees of the conference, briefly describing our activities.

(ii) The fellowship can be used for purchasing professional books, or for subscribing to research journals.

(iii) The fellowship amount can be used for supporting other academic and research activities of the faculty member, or the activities of any student(s) being guided by him/her. Thus, purchase of equipment, consumables, accessories, etc., can be supported from the fellowship grant.

1   The above are only suggestions. The decision of the faculty member will be final in the choice of these or any other professional activities chosen by the faculty member. The only expectation of the project is that, through the professional activities chosen to be undertaken, the faculty member will try to promote the cause of using affordable tablets for effective education.
2   It is reiterated that the fellowship amount can only be spent for professional activities, and will be required to be accounted for, strictly through the accounting procedure applicable within the Institute, as per Government of India norms. Request for releasing an advance when required, such as for paying registration fees for a conference, or for booking travel tickets, etc., can be made to the Institutes; but such advances must be settled within prescribed time limits.

(Dr Deepak B Phatak)   6th   December 2012 In-charge,
Aakash project, IIT Bombay

10.2   Software Development Competition on Aakash Tablet

The competition was announced in December 2012. We received 192 project proposals by 25 April 2013, out of which, 149 projects were selected. 36 final projects were submitted by participants on 15 July 2013. The results will be announced on or before 15 August 2013, where the first prize winner will be awarded Rs. 50,000/-, second Rs. 25,000/- and third Rs. 10,000/-. Some of the feedback sent by the participants are given below:

Soniya Singhal and Pooja Bhatnagar
16 July 2013
"Dear Aakash Team,
It has been a great experience participating in this competition. Not only did it improve my coding but I also got to learn new stuff especially GIT.
Regarding Aakash Tablet,i would say its a nice tablet to work on.
Thanking you again for organizing this competition and also hoping you would do so in near future."

Sunil Bhoi
16 July 2013
"Respected Aakash Team members,
Its awesome experience to work with your team. Due to this Competition, my software development skill extends to ton. I feel proud to being part of this competition. Its my request to Aakash team please keep giving this type of opportunity in future. I look forward to being part of any event organize by Aakash Team in future. Thanks a lot to Aakash Team.
Especially thanks to srikant sir, sachin sir for keep in touch with us and resolving every doubt occur during this app development. Again thanks from my bottom of heart to every person directly or indirectly involve in this competition.
with Regards,"

Vishalika Choraria
NIT Agartala
16 July 2013
"Respected Aakash Team,
It has been a nice experience throughout because this competition helped me to develop my technical skills. At every point when there is doubt or any clarity required the Google group of Aakash team really tried their best to help each of the participants. This competition should be kept going twice or thrice in a year because it motivates and also helps to improve their skills.
I have used the Aaksh tablet and I really find it useful for the students.
Thanks to everyone involved in this competiton.
Thanks and Regards,
Vishalika Choraria,
Student Representative
Training and Placement Cell
Master of Computer Application
National Institute of Technology, Agartala"

Godly T.Alias
NIT Calicut

16 July 2013
"Hi Aakash Team,
It was a great experience to participate in the competition. This competition helped
to develop my coding skills as well as my knowledge in android developing a lot.
I had a learned a lot of things in the last three months through this application
development project. Thanks a lot to the Aakash team who took the initiative for
such a contest.
The Aakash tablet is also a nice device. It wondered me how a device of this much
less cost can perform in a same level as the branded tablets do.
Thanks and Regards,
Godly T.Alias,
National Institute of Technology, Calicut"

Rahul Kalkani
16 July 2013
"Thank you Aakash Team for spotty Help during competition on group.
I wish there will be more events like this. And Tab is so good. its value for money.
I hope there will custom aakash rom for Tab.
Best Regards with you guys for more success in Aakash project"

Visit `http://aakashlabs.org/compete` for more details

10.3   Android Application Development Contest for Aakash Tablet

10.3.1   Introduction

In the Android workshop, we introduced the Aakash tablet, studied how an application is
developed in Android environment, and briefly saw the demonstration of some useful applications and content developed at IIT Bombay, for Aakash-2. We wish to develop a collaborative
community of Open Source developers who will create Android applications and educational
content for the Aakash Tablet, in order to maximize effective learning using Aakash tablets.
This competition is targeted only for participants of the workshop conducted on 22, 23 February
and 2, 3 March 2013. These participants must have

1. Attended the full workshop

2. Given the online evaluation quiz

3. Must have submitted the feedback form

10.3.2   Prizes

Depending upon the number and quality of entries, there will be up to 3 awards as follows:
First prize: Rs. 5000/-
Second prize: Rs. 3000/-
Third prize: Rs. 2000/-

Top entries from each Aakash Centre, will be further evaluated, and the top 50 among them,
will get a prize money of 10,000/- each. All Android applications submitted in the contest, will
be released in Open Source, with the names of the team members showcased to the world.

10.3.3   Rules of the Contest

1. You have to make a team of preferably 2 or 3 members.

2. A participant cannot be registered as a member in more than one team.

3. You are free to develop any Android application of your choice, that empowers students and teachers for effective learning.

4. As a part of submission, teams will need to submit the .apk file of your application, the entire source code, user manual and technical documentation.

5. Your application will be evaluated by using 'peer to peer evaluation'. All participants must agree to participate and contribute to the peer review process which will be detailed after the submissions are received. This will require an additional work of about 10 to 12 hours in the weeks following the submission date.

To begin with, you have to register your team on
`http://www.it.iitb.ac.in/aakashcompetition`
The deadline for completing the team registration, is 5 p.m. 25 March 2013.
For instruction manual, visit
`http://www.it.iitb.ac.in/aakashcontest/teamregistration.pdf`
For Frequently Asked Questions, visit
`http://www.it.iitb.ac.in/aakashcontest/faq.php`
For further queries, visit
`http://www.it.iitb.ac.in/aakashcontest/contact.html`

10.4   IITB-IEEE Aakash Challenge

Institution of Electrical and Electronics Engineers(IEEE) is a globally reputed professional organization, with activities in all mahor countries of the world. Its past president Prof. Michael Lightner is currently the VP in-charge of educational activities. During his visit to India last year, Shri. Ashok Thakur, Secretary(HE), suggested him for a meeting with NME-ICT project leaders at IIT Bombay, with a possibility of engagement with Indian efforst in using technology for higher education.

At Prof. Lightners invitation, IIT Bombay participated in the IEEE students' congress of Region 10, held recently on July 11 to 14 in Hyderabad. Student leaders from over 26 countries in the Asia Pacific region participated in the event. An 'Aakash Challenge' was jointly announced by IIT Bombay and IEEE. About 160 tablets were distributed to students leaders from all countries, including India. The contest registration form and details are enclosed. Apart from the prize money, IEEE has also offered the winning students fully paid participation in one of the global IEEE student events.

10.4.1   Registration

Do You Have a Winning Idea for an Educational App?

The AAKASH Tablet App Challenge is a joint effort between IIT Bombay and IEEE, to identify, develop, and incubate ideas for mobile apps focused on all levels of education, including school education, through the university.

This is an opportunity for you to exercise your knowledge, skills and creativity in order to enhance the education of other students.

By Participating in the AAKASH Tablet App Challenge, you will:

- Learn how to apply engineering and business knowledge and expertise in order to develop a useful app and potentially see it employed on the AAKASH Tablet

- Gain critical teamwork and multi-disciplinary skill sets that are transferrable to the engineering workplace, and provide you with a competitive advantage

- Contribute to the educational process, by developing an app that benefits current and future students

- Receive an IEEE Certificate, and earn a chance to win various prizes and awards

- Please visit `http://www.it.iitb.ac.in/nmeict/AakashChallengeParticipant.do`, to see the list of Participants Registered.

10.4.2 Timeline

Entry Period:	12 Aug 31 Oct 2013
Judging Period:	1 Nov 6 Dec 2013
Winners Announced:	13 Dec 2013

10.4.3 Eligibility

Open to all students in IEEE Region 10. Student teams of 2 to 5 members (At least one team member must be an IEEE Student Member)

10.4.4 Form for Enrollment to IITB-IEEE Aakash Challenge Registration

1. Email

2. Retype Email

3. First Name

4. Last Name

5. Mobile Number

10.5 Ron Mehta Aakash contest

Mr. Ruyintan (Ron) Mehta, is an alumnus of IITB (B Tech Chemical 1970). He was very impressed with the work done by IIT Bombay on Aakash and other national mission projects. He wanted to encourage more direct contribution from our students in these efforts. Towards this goal he donated an amount of US$2500, to be used as prize money for a contest, exclusively for current IIT Bombay students at all levels. The contest is to develop innovative applications on Aakash.

The awards will be graded by a committee for 1st, 2nd and 3rd prize, for the three (3) best applications for the Aakash-2 tablet. The prize money is the equivalent rupee amounts of $1,250 for 1st prize, $750 for 2nd prize, and $500 for 3rd prize. The prizes are named Ruyintan and Monica Mehta Aakash tablet Application Development Prizes. The Aakash project will give a certificate of participation to each student, and special certificates to winners.

It is a team contest. A team can consist of minimum 2, and maximum 4 students. Although not mandatory, it is strongly suggested that the composition of teams should have an interdisciplinary flavour. One of the team members will be the team leader who will be responsible for timely submissions as per the contest schedule. Aakash project will arrange for special training sessions on Android programming, for all participants. In consonance with the spirit of the national mission, all applications submitted for the contest, will be released in open source, under a creative commons license.

On-line registrations have been opened on the link: `www.it.iitb.ac.in/nmeict/iitbaakashcontest`. Registration will close on the midnight of Monday, 5 August 2013. A training workshop will be conducted on Saturday 17 August 2013. Detailed proposals will have to be uploaded on or before 23 August 2013. Last date of submission of the developed applications, is currently planned as Monday 6 January 2013. It is believed that this contest will provide a unique opportunity for students of IIT Bombay, to display their creative talent, besides contributing to open source knowledge pool.

Chapter 11

Conclusion

11.1 Achievements

We are happy to announce that the objectives originally envisaged in the project have been realized. We have managed to get significant upgrades to the hardware specifications than what we began with. The tablets procured under the project are comparable in specifications, to those available presently in the market, for prices ranging between Rs. 5,000 and Rs. 7,000. The prices of comparable tablets were in the range of Rs. 10,000 to Rs. 12,000 in May-June 2012. By pegging the procurement price for Aakash tablet at Rs. 2,263, Government of India can certainly take credit for anchoring the prices of the tablet in the market at a lower level. All the big players who shunned the invitation to participate initially, are now queuing up for collaboration.

It is instructive to note that the global sale of PCs has been constantly declining, and that of tablets is exponentially increasing. In the year 2011, 76 Million tablets were sold as against 155 Million PCs. In 2012, each of these sold about 145 Million units. Thus, the corssover from PCs to tablets, has already occured. As per IDC, the forecast for 2013 and 2014 for tablet sales, is 229 Million and 287 million respectively, as against the PC sale forecast of 135 Million and 131 Million only. In 2017, PC sales are expected to be around 123 Million, as against 410 Million projected for tablets.

It seems that we have joined the rising tide at the right time.

The applications and content developed by IIT Bombay, and by hundreds of partner institutions, have made these tablets into a useful educational tool. This is acknowledged by everyone, students, teachers, and even global professional bodies such as IEEE. Our pilot efforts to use these tablets in schools have been very well received by school teachers and students.

The lab tests and field trials have thus proven beyond doubt that the Aakash tablets are contributing significantly to enhancement of quality of education. Reports from all the colleges about extensive use of tablets, clearly indicate that these objectives have been achieved.

11.2 Future work

The project has moved to the second year of its operations. It is essential to build on the present achievements, and further expand on the gains from the project. The main activity will

clearly be to develop more applications and content, and to experiment more with the actual use of Aakash in various educational activities ranging from classrooms to assignments and self-study by students. The other equally important activity is to further optimize the tablet itself, and move towards greater indigenisation, including Indian manufacturing.

Android tablet devices are clearly becoming very popular, and an ecosystem will soon evolve across the nation, much like the mobile phone ecosystem. This project must continue to contribute to this movement

11.2.1   Educational activities

We will now focus on appropriate pedagogy and best practices, to make the use of Aakash tablets more effective in education. Participating colleges will be encouraged to offer actual classroom teaching using Aakash. A large community of students and teachers, involved in development of applications and content, has been created. This community will be further expanded and empowered during the remainder of the project. The Aakash-Bazaar, which has been developed at IIT Bombay, will be further optimized and deployed. This permits automatic synchronization of updated applications from local servers, as also from national servers. Concrete feedback will be obtained on the educational effectiveness, through independent surveys by ISTE. IIT Bombay will continue to conduct and supervise these activities in the remainder of the project duration. Detailed plans will be presented to PRSG.

11.2.2   Optimization of Aakash tablet

As regards the future versions of Aakash tablets, another committee has already framed specifications. These were notified for public comments, and have been frozen to define a new base model. DGS&D is expected to run a global tender soon, to obtain competitive prices and quantity discount for this model. It is expected that other ministries, notably DEITY, should lead the efforts on greater indigenisation of these tablets. CDAC and IIT Bombay have gained significant insights into design of hardware and software of these tablets. The best way forward is for these two institutes to to embark on building reference designs for the tablet. It will not be out of place to cite the example of NIST, which developed the refence implementation for fingerprint systems and releases it in open source. This has led to a very large number of countries to develop their own adapted versions, including the Indian Aadhar system.

A project of this kind, run by CDAC and IIT Bombay for development and implementation of reference designs, will go a long way in building Indian design and manufacturing processes. Experience gained at other IIT, notably IIT Madras, can be effectively factored in such efforts. The nano-electronics group at IIT Bombay is keen to work on the design of an Aakash System on Chip, and to work towards an Indian Fab to manufacture these chips.

Due to the wise and timely initiative of the Government, India has achieved an early start in her efforts to use these devices in education. One hopes that we will continue to speedily and substantially build on these efforts, to make a significant difference to our education system.

Acknowledgements

It has been a matter of privilege for IIT Bombay, to have been given the responsibility of this important national project. We have successfully executed the first phase comprising upgrade of specifications, procurement of 1,00,000 tablets, distribution of these to hundreds of engineering colleges in the country, and completion of testing in the labs and in the field. A very large number of individuals and organizations have helped in this successful execution of this project. We recognize the important contributions made by them, and gratefully acknowledge that without these, the project could not have accomplished its goals. It is impossible to individually list and thank all the people who supported the project. A few of these are acknowledged below:

Shri. N. K. Sinha, the then mission director of NMEICT, for conceiving the affordable tablet as a device to influence quality of education for masses in India. His commitment and support to the project has been primarily responsible for giving it the shape it is in today.

All the senior leadership of MHRD, including the Hon'ble HRMs Shri Kapil Sibal, and Dr. Pallam Raju, for providing unstinted support.

Prof. Prem Kalra, the then director of IIT Rajasthan, for taking up the project, when not many in the country believed that the tablet price could be kept below US$50. IIT Rajasthan conducted the global tender successfully, discovering the price of US$49.5.

Prof. Devang Khakhar, Director IIT Bombay, for supporting the initiative of IIT Bombay to carry the project further, when it faced some problems at the sister institution.

Senior colleagues at IIT Bombay, and heads of different administrative units, for always providing timely support when needed.

Prof. Rajat Moona, D.G. CDAC, for agreeing to partner with IIT Bombay for conducting all the lab tests.

Shri Ravindra Kumar, Dr Murthy, and other colleagues at CDAC, for providing excellent support in the project activities.

Prof. Ashok Jhunjhunwala, for setting up Aakash Application development labs at 5 other IITs.

Prof. Somnath Sengupta and his colleagues at IIT Kharagpur, for help in setting up APCs in their region, and for helping with logistics.

Thousands of teachers and students across the country, for validating Aakash as a useful educational tool, and for developing a large number of applications and educational content.

The dedicated team at IIT Bombay, which worked tirelessly with commitment and passion.

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