

College Net Wi-Fi Enabled Data Acquisition Network Using Openmoko

Mentored By:

Mr. Dhananjay V. Gadre

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By:

Saurabh Gupta (81/EC/05)

Vijay Majumdar (97/EC/05)

Overview

- Data Acquisition System (DAS)
- Data Acquiring Device
- Openmoko Framework
- Implementation
- Communication Engine and Protocols
- Graphical User Interface Development
- Central Database Storage Server
- Applications of DAS
- Future Scope
- References

Introduction

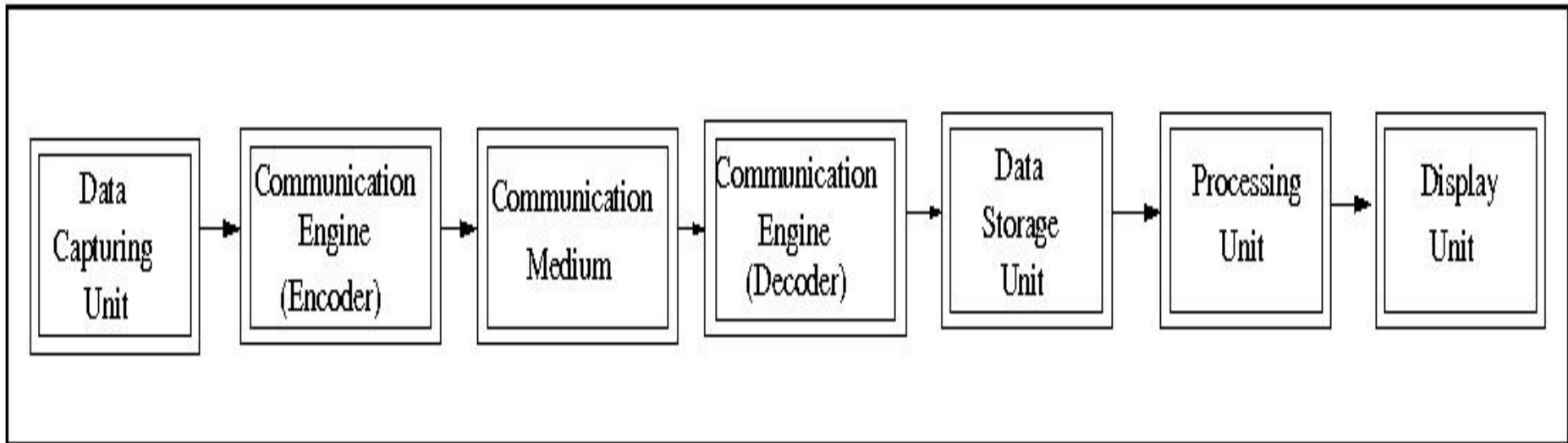
- Secured, automated and user friendly remote DAS
- This project develops a Data acquisition system which can be deployed in NSIT.
- The Data capturing unit is Openmoko, a touch sensitive embedded device.
- Data can be student's record, attendance, remarks or output of some sensors.
- Encryption is implemented for minimizing risk of data disclosure.

Data Acquisition System (DAS)

- Device to measure and log some data or parameters.
- Signals can be digital (called logical signals) or analog signals.
- Data is acquired by using sensors which works automatically or with some human involvement.
- DAS is normally electronic based and made up of hardware and software.
- Hardware part is sensors, cables and electronic components like memory etc.
- Software part is data acquisition logic and the analysis software.

Different Modules of DAS

- Main parts are data acquiring unit, communication engine and data processing unit



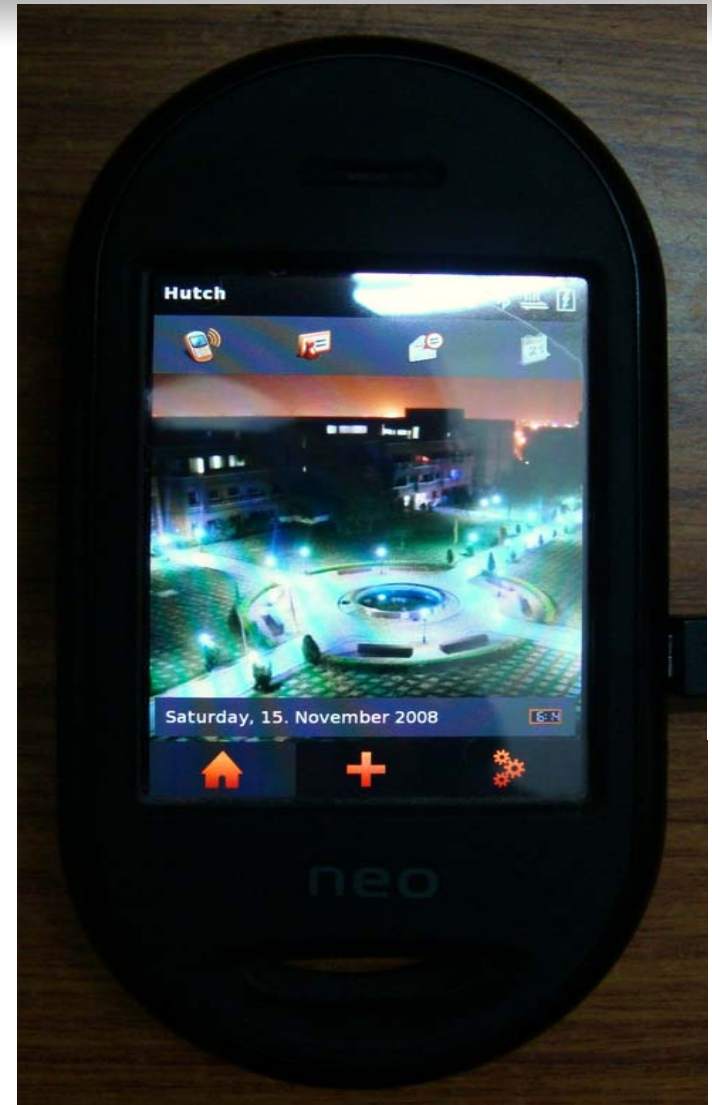
- Data Capturing Unit is Openmoko in this project.
- Communication engine is a program written in C++ and PHP which communicates through TCP/IP protocol.

Different Modules of DAS (cont.)

- Communication medium is wireless through Wi-Fi protocol.
- Data storage unit is a remote server with enough memory to store data digitally in form of database.
- Processing Unit is a computer with sufficient processing power.
- Display unit contains the output either on a computer monitor or in the form of printed results.

Data Acquisition Device

- Device used in this project is called Openmoko.
- Portable, hand held and touch sensitive.
- Runs Linux as operating system on it.
- Completely open source device.
- Can work as a mobile phone also.

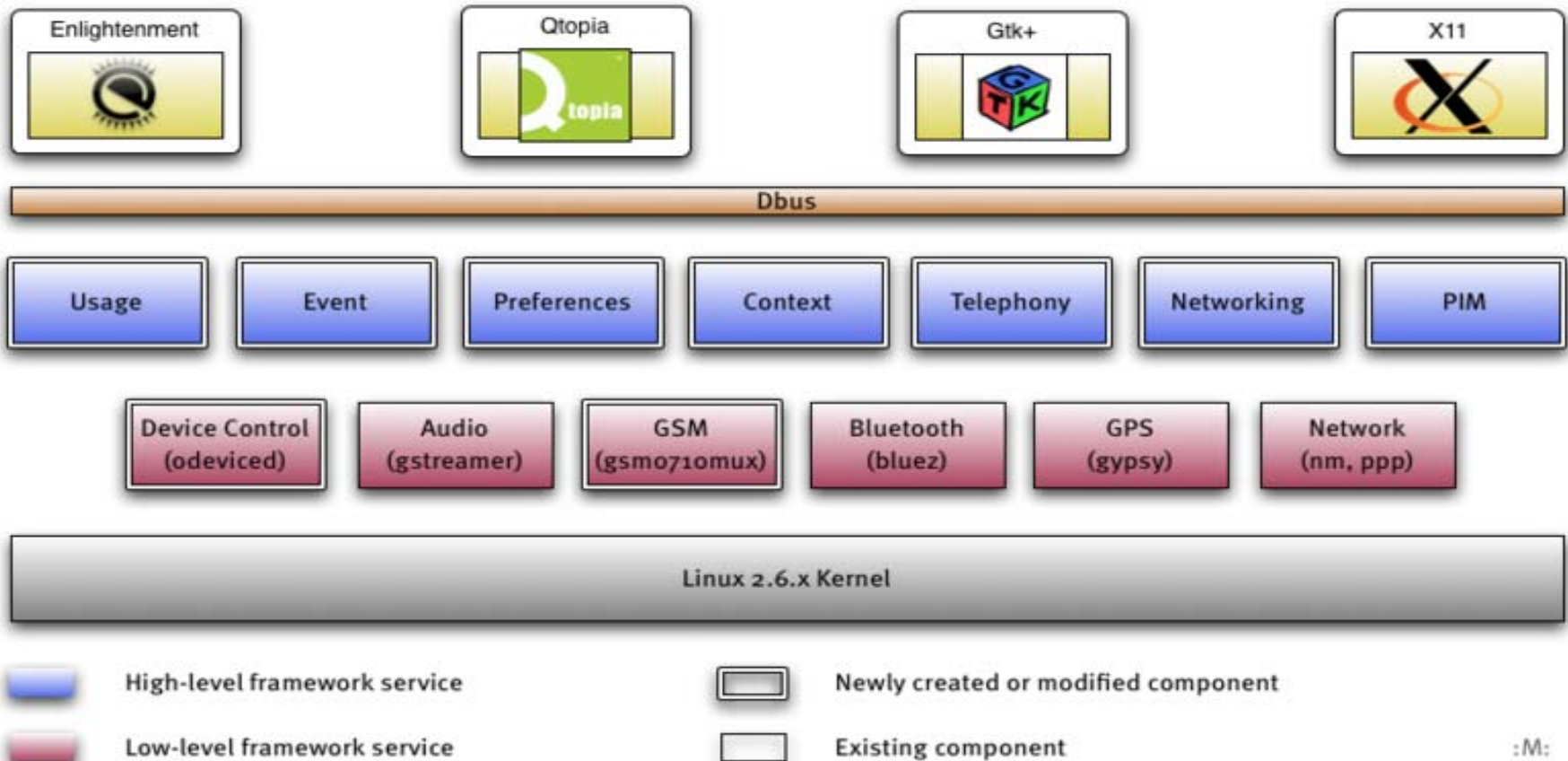


Openmoko Framework (Hardware)

- The hardware specifications are:
 - **Hardware Electrical**
 - 400/500 MHz Samsung 2442B Processor/SOC (400 minimum, ARM920T core, ARMv4T)
 - 128 MB SDRAM total, 64 MB CPU internal, 64 MB external
 - **Display (LCD screen)**
 - resolution: 480 x 640 pixels
 - size: 43mm x 58mm (1.7" x 2.27")
 - **Wi-fi transceiver.**
 - **Bluetooth Module**
 - **GPS/AGPS module support**
 - **GSM/GPRS modules and driver**

Openmoko Framework (Software)

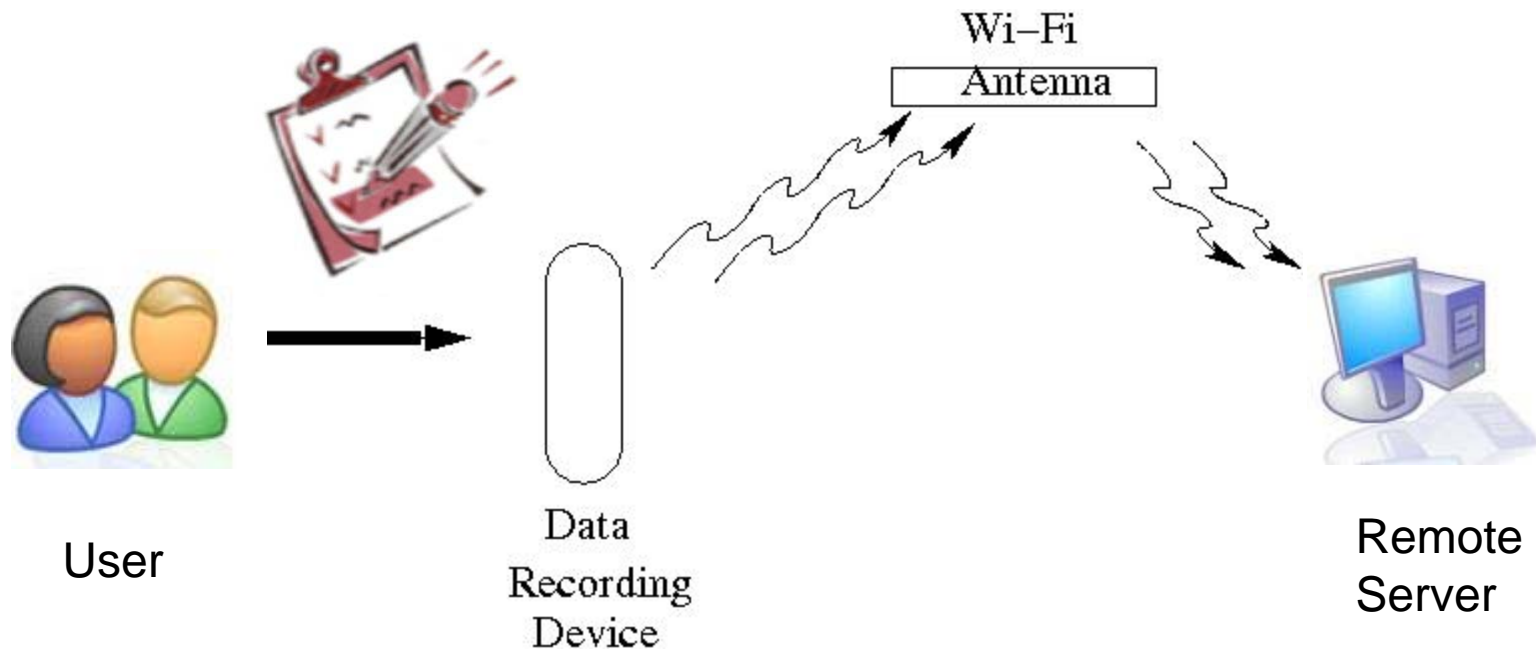
Openmoko 2008 Software Architecture



Implementation

- The design model of this project mainly uses three parts:
 1. Client Model
 2. Communication Model
 3. Server Model

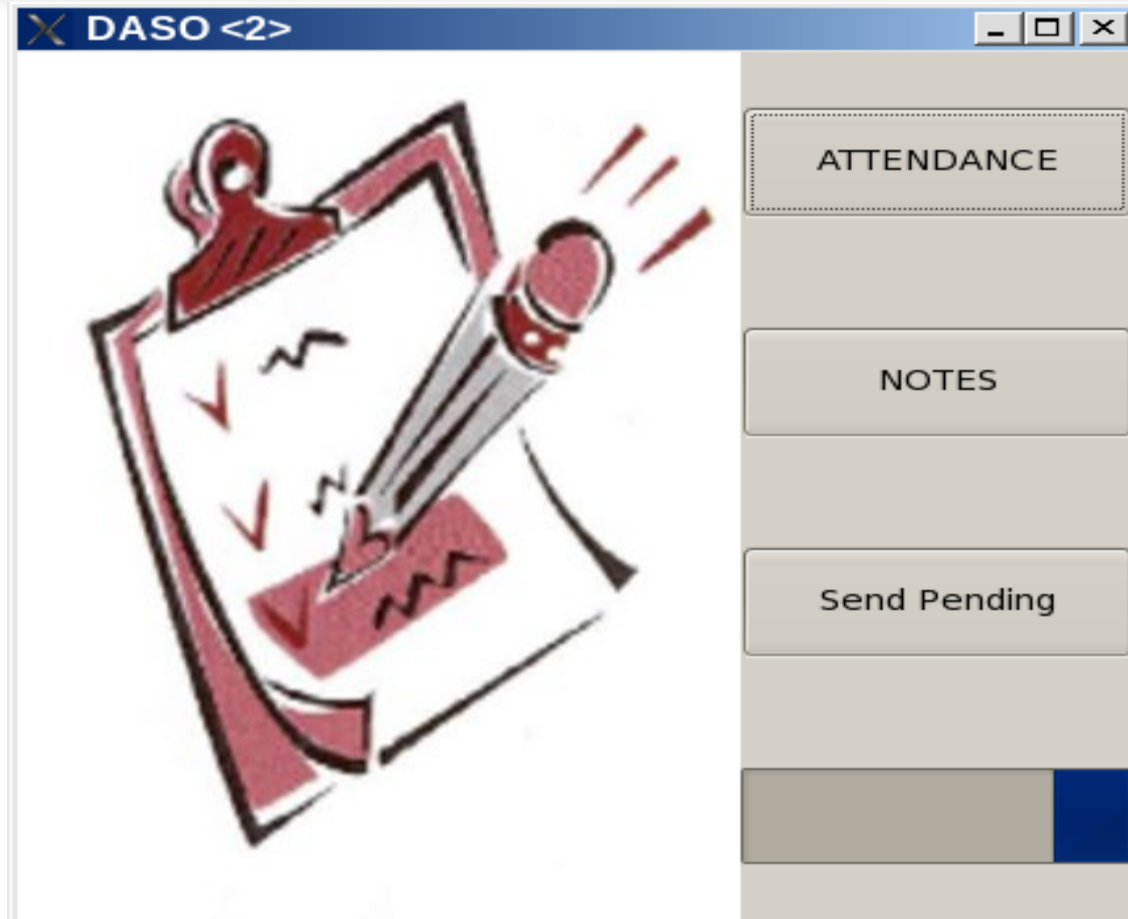
Project Overview



Client Model

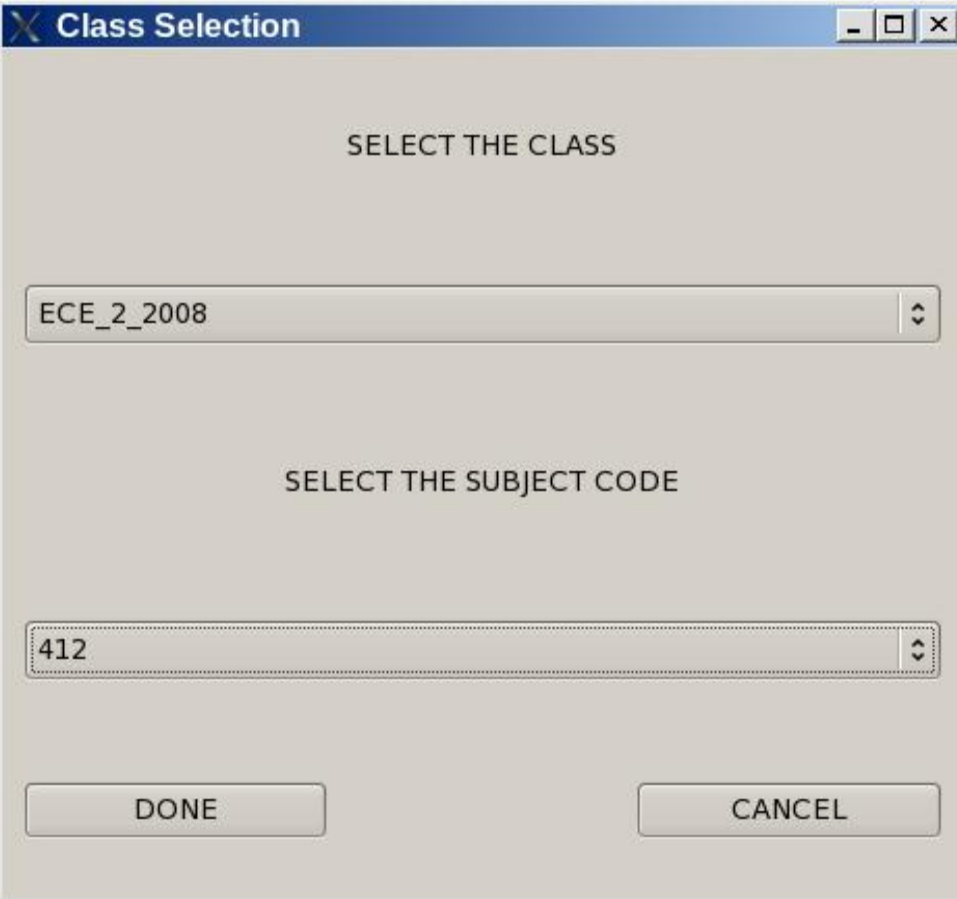
- Consists of GUIs for user
- Attendance can be marked
- Remarks can be added
- Can be directly interfaced with personal computer
- Pending data can be sent by wired and wireless mode any time

Graphical User Interface



Window for selection of action

Graphical User Interface



A screenshot of a graphical user interface window titled "Class Selection". The window has a standard Windows-style title bar with a close button (X), a maximize button, and a minimize button. The main content area is light gray and contains two sections. The first section is titled "SELECT THE CLASS" and features a text box with the value "ECE_2_2008" and a small downward arrow icon on the right. The second section is titled "SELECT THE SUBJECT CODE" and features a text box with the value "412" and a small downward arrow icon on the right. At the bottom of the window, there are two buttons: "DONE" on the left and "CANCEL" on the right.

Class Selection

SELECT THE CLASS

ECE_2_2008

SELECT THE SUBJECT CODE

412

DONE CANCEL

Selection of class

Graphical User Interface

ID	Name	Status
51	SAURABH gupta	PRESENT
52	vijay lamba	ABSENT
53	PRAVEEN yadav	PRESENT
54	nimit varshney	ABSENT
55	NAMAN goyal	PRESENT
56	pramod	ABSENT
57	NITIN singhal	PRESENT
58	vaibhav arora	ABSENT
59	varun sharma	ABSENT

Select All Cancel DONE

Marking the attendance

Graphical User Interface

The image shows a graphical user interface window titled "DASO <2>". The window has a standard Windows-style title bar with minimize, maximize, and close buttons. The main content area is divided into two sections. The top section is titled "Enter Notes" and contains a large text area with the text "Notes are to be taken hereHe is a GOOD PERFORMER." The bottom section is titled "Template" and contains a dropdown menu with the text "He is a GOOD PERFORMER." Below the dropdown menu are two buttons: "Submit" and "Cancel".

Writing the remarks

Communication Engine and Protocols

- Communication medium is wireless through Wi-Fi protocol.
- IPv4 TCP/IP protocol used. Packets of Data is sent by socket connection between remote server and Openmoko.
- Communication part is implemented using C++ and PHP programming languages at the network layer.
- Handles data in a robust way. Unsent data is stored locally and sent next time.
- Redundancy is used to prevent data loss.
- Encryption is used for data security.

Encryption

- PJW Hash function used

$h = 0x00$

$h = (h \ll 4) + k_i$

$g = h \& 0xf0000000$












if ($g \neq 0$)

$h = h \wedge (g \gg 24)$

$h = h \wedge g$

input.txt - WordPad

File Edit View Insert Format Help














Courier New10Western

12

NOTES
Device
Openmoko
id_code
#1234
Teacher
Mr Dhananjay V. Gadre
Year-of-Issue
2008
Fri Jun 5 14:14:24 2009
class
COE_1_2007
sub_code
0
Roll_no
0
Comment
The Class is Mass Bunked.

output.txt - WordPad

File Edit View Insert Format Help



Courier New10Western

12

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Central Database Storage Server

- Remote storage Device with enough memory to store the data.
- Communicates via Communication Engine with the data capturing unit.
- Operates all the time and remain in a listening mode
- Also Serves as a web server for which supports an intra college website.
- Server uses operating system Linux having a static IP.
- LAMP (Linux-Apache-MySQL-PHP) technology is used for running website.

Intra College Website

- Developed on the platform of glFusion.
- Uses LAMP technology
- User login feature available
- Work online Feature
- Full statistics and analysis results

Intra College Website

DASO

Data Acquisition System on Openmoko

[Home](#) [About Daso](#) [View Statistics](#) [Work Online](#) [Admin work](#) [Search](#) [Widgets](#) [Typography](#) [Site Stats](#) [Contact Us](#)

NAVIGATION

[Home](#)
[Topic Menu](#)

VISIT NSIT



TOPICS

[Home](#)
[General News](#) (0/0)
[glFusion](#) (0/1)

MY ACCOUNT

[Welcome to DASO](#)

Wednesday, June 03 2009 @ 09:27 AM CDT

View Statistics



READ IT
*browse our
documentation*

JOIN US
*be a part of
development*

- ➔ [View student's attendance data](#)
- ➔ [View Remarks for students](#)
- ➔ [View student's performance](#)
- ➔ [View Class performance](#)

Intra College Website

% of present students v/s date



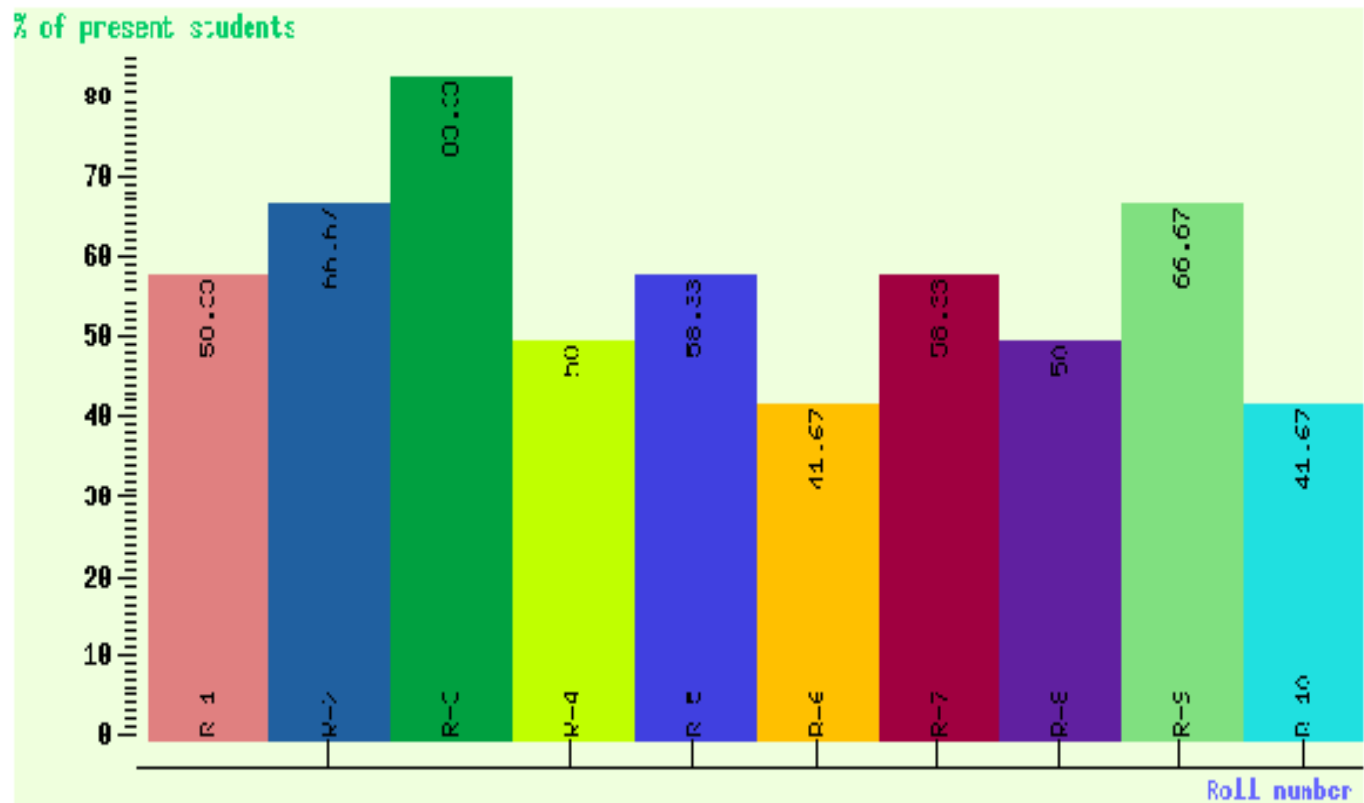
x-axis values



- 1 - Mon Jun 1 17:46:33
- 2 - Mon Jun 1 17:51:04
- 3 - Mon Jun 1 17:51:47
- 4 - Mon Jun 1 17:52:05
- 5 - Mon Jun 1 18:23:46
- 6 - Mon Jun 1 19:05:32
- 7 - Mon Jun 1 21:51:04
- 8 - Mon Jun 1 22:55:58
- 9 - Mon Jun 1 23:02:09
- 10 - Wed Jun 3 10:04:32
- 11 - Wed Jun 3 10:05:16
- 12 - Wed Jun 3 10:06:05

Intra College Website

➡ Percentage of attendance for each roll number of students



Features in DASO

- Robustness
- Data Redundancy
- Failure safety mode
- Work online Feature
- Directly communication with personal computer and website
- Full statistics and analysis results

Deployment of DAS in NSIT

- Currently, the project aims to support automatic attendance and notes writing feature.
- An intra college website will operate where all the statistics can be seen.
- Each teacher will have a data capturing device (Openmoko) and an account is provided so that they can access the data website.
- Compete provision for feeding the data to server through PC in case Wi-Fi medium fails.
- Attendance and remarks can be marked on website directly.

Advantages

- Extensible and support plug-ins.
- Independent Modules, can be used in other projects
- No dependencies.
- Standard C++ libraries used. Can be cross compiled on any platform.
- Can be integrated with other applications.
- Can be used with any data acquisition device.
- Openmoko can be interfaced with any sensors.
- Data stored will have proper back up in case of any data loss or failure.

Application of DAS

- Telemetry
- Surveillance
- Experimentation and Calibration
- Disaster Management System, Monitoring and Tracking
- Weather monitoring at Remote Locations

Future Scope

- It can be integrated with ***speech recognition module*** which will allow to record the data merely by speaking the words. e.g. attendance can be marked simple by speaking the roll number.
- It can be integrated with ***Face recognition application***. Attendance can be taken by capturing a picture of the class and faces of the present students are recognized.
- Can be interfaced with analog sensors and transducers and data can be stored and plotted on the display unit.

References

- http://en.wikipedia.org/wiki/Data_acquisition
- http://wiki.openmoko.org/wiki/Main_Page
- <http://en.wikipedia.org/wiki/WiFi>
- <http://code.google.com/p/attendance-on-openmoko/>
- <http://attendance-on-openmoko.googlecode.com/svn/trunk/>
- http://wiki.openmoko.org/wiki/Neo_FreeRunner_GTA02_Hardware



Thank you