GPS AND GPRS BASED SMART SCHOOL MANAGEMENT AND CHILD MONITORING SYSTEM USING MOBILE PHONES

Shivakumara M M[1], Dr. Venkateswarlu[2] , Dr. Shiva Yellampalli[3]

[1, 2, 3] *Department1 of VLSI Design and Embedded Systems, VTU Extension Centre,*

UTL Technologies, Bangalore, Karnataka (India)

ABSTRACT

This paper proposes cost effective method of monitoring of government schools which are functioning in rural area where no internet and other advanced technologies are available. The main objective of this paper is to monitor students / employee attendance and management of schools using biometric and mobile technology. Many rural schools may not have facilities such as computers, Laptops, or internet connection at the school. But most of the employees / teachers are well versed with usage of Mobile phone now a days and it is easy to carry and maintain. Many activities are happening at the school level such as construction of school building, construction of classrooms, providing drinking water facility, providing toilet facility and other incentives schemes such as mid-day meal, textbook distribution, uniform distribution etc. In this context, to manage rural school and to get accurate and correct data instantly from rural schools to the state level, mobile technology is proposed. The system allows the user's to monitor students/employees by capturing attendance details and civil works progress details along with its GPS location with the help of mobile phone which is equipped with an internal GPS receiver and a GPRS transmitter. A mobile phone application has been developed and deployed on an Android phone whose responsibility is to capture attendance with the help of fingerprint scanner and civil work's GPS location. Data captured through software will be sent to remote server by creating GPRS packet. Biometric technology involves the identification and verification of individuals by analyzing the human fingerprint. Commercially available android supported biometric device is used to capture students/employee attendance details. Smartphone with 5MP and above camera is used to capture image of civil works. Once the data is uploaded to the remote server, the data will be made available in the form of reports or dashboard through web portal. Instant data sharing across different levels in the organization is possible which leads to effective and efficient administration. This system ensures transparency, accuracy and accountability at all levels.

Keywords: Attendance System, Fingerprint Identification, GPS, GPRS, Smart Administration, Wireless Communication

I. INTRODUCTION

The most common method of recording student's attendance by calling students name and marking 'P' for Present and 'A' for absent in the attendance register. The same attendance status is used to provide all kinds of facilities such as mid-day meal, scholarships, textbooks, uniform distribution etc. Mismanagement of student's attendance or bogus attendance will incur huge loss for government and students may lose benefits given by the

government. Similarly teacher/staff presence is very important in schools to provide quality education for students.

Government is spending huge amount [17] on providing infrastructure facilities in schools such as school building, classrooms, providing drinking water facility, providing toilet facility etc. Poor technology based monitoring mechanism leads to low quality work, delay in completion of works, fake progress report etc.

To address the above issues, biometric and mobile technology is proposed at the client/school level for instant data transfer from the rural schools to remote/state level thereby involving higher authority to monitor and manage the schools.

A wide range of applications has been developed so far [1][4], but none of the applications has been developed and implemented in rural schools which could transmit data instantly. There is no mechanism available to fetch data directly from rural school level to the state level. The main focus of this paper is to reduce the overall cost by using GPS system which is a satellite based service and is available 24x7 everywhere in the world[11][12]. GPS system can be used to get location which includes details like latitude, longitude along with the timestamp details etc. It is a free service available to every individual. Mobile phone which fetches the GPS location communicates with the server using General Packet Radio Service (GPRS). This service is low cost service provided by the service providers which is a wireless data communication system [13]. Mobile phone equipped with GPS receiver is easily available in the market these days. The GSM/GPRS is one of the best and cheapest communication modes available in the present days.

Currently, different biometric methods are used to capture attendance details depending on the situation and cost involved. The magnetic attendance system widely used, but it has some disadvantages like card may be lost and gets damaged easily. Card may be misused with one another.

Fingerprint scanner can be directly connected to desktop computer through LAN or wireless communication thereby storing fingerprint data in the database which is created in the desktop computer. This system requires comparatively high investment and internet connection should be provided to transmit the data. Aiming at the disadvantages of traditional attendance system, a method of wireless fingerprint attendance system through mobile phone using GSM/GPRS technology is proposed. In this system fingerprint scanner is directly connected to smart phone. An android application is developed and deployed on a smart phone through which fingerprint data is captured and stored temporarily in mobile phone with SQLite database. An additional module is included to capture the image/photo of civil works along with GPS codes with the help of camera and GPS receiver available in the smart phone. Again civil works progress details along with image/photo and GPS codes are temporarily stored in mobile phone with SQLite database. Once the mobile gets internet connection, the data captured through android application would be sent automatically and stored in the remote server using web service technology. Data and Information could be shared through web portal which is designed using .Net technology.

A web service is a method of communication between two electronic devices over a network. Web services extend the World Wide Web infrastructure to provide the means for software to connect to others software applications. Applications access Web services Web protocols and data formats such as HTTP, XML, and SOAP. Web services combine the best aspects of component-based development and the Web, and it is the Microsoft .NET programming model. In this project Simple Object Access Protocol (SOAP) is used to exchange the information between mobile and remote server.
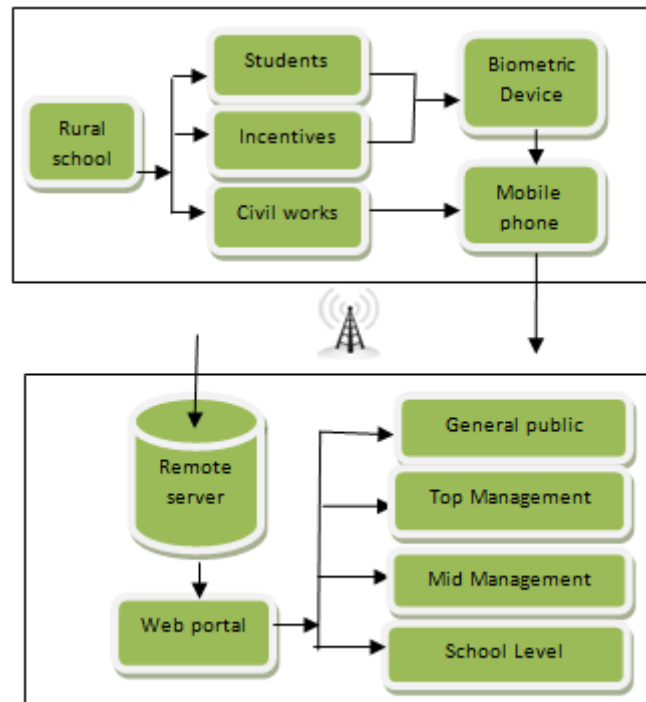
Figure 1: General Block Diagram

II. SYSTEM STRUCTURE

The system consists of FS80 fingerprint scanner, Smartphone with having minimum 5MP camera, 3G/GSM/GPRS and GPS enabled. FS80 USB 2.0 Fingerprint scanner is based on CMOS sensor technology and precise optical system that allow capturing high quality fingerprint images. Wireless phone technology is used for data transmission from school level to remote location and GSM (3G) technology is used for this purpose. 3G provides high communication speed, video calling, mobile internet access and live streaming etc. 3G provides higher data transfer rates, its downloading and uploading speeds are up to 1-2 Mbps and 4-7 Mbps respectively. Global Positioning System (GPS) enabled 3G mobile phone is used to identify the exact location of the schools, so that actual picture/image of the civil works could be captured and this avoids uploading of fake pictures/images. A web server with IIS 7.0 and the database server with 500GB are used to host the software and store the data respectively. The data which is uploaded from school level is stored in SQL Server 2005/2008 database.

III. SYSTEM HARDWARE DESIGN

The system hardware includes Futronic FS80 Fingerprint scanner, Samsung Galaxy S4 mobile phone/Tablet, 32GB External micro SD Card, Application server, Web Server and Database server with 2.4 GHz, 8 GB RAM, 500 GB HDD etc.

3.1 System Block Diagram

Figure 2 shows the block diagram of the fingerprint based attendance system. Students/Employee attendance is marked after identification. Initially all the students/employees have to be enrolled with their fingerprint which is uniquely identified by ID number. Students/Employee details are captured using android application which is deployed in Mobile phone. ID number is used as primary key and the same is used to map between student and employee details and fingerprints. FS80 fingerprint scanner is used here for enrollment and attendance

verification. The fingerprints captured during enrollment would be stored in the external 32GB micro memory chip which is installed in the mobile phone. Once the enrollment process is over then attendance could be recorded using FS80 Fingerprint scanner. During attendance process, fingerprint of each student/employee matches with fingerprint which is stored in the memory chip, If fingerprint is matched then that student/employee is treated as 'Present' otherwise he/she is treated as 'Absent'. Only those who present in the schools, their attendance status would be uploaded and stored in the remote server. Those who absent, their attendance will not be uploaded and stored in the remote server to avoid internet usage cost and memory space in the remote server.

3.2 Fingerprint Acquisition Module

FutronicFS80 fingerprint scanner is used in this system, it uses advanced CMOS server technology to deliver high quality fingerprint image. It has special electronic is built into FS80 to do Live Fingerprint Detection (LFD) with appropriate software in mobile phone. FS80 USB 2.0 compatible interface plug and play device. Raw fingerprint image file size is 150 KB and images will be stored in memory chip which is installed in the mobile phone. The storage of fingerprints is depends on the storage capacity of the memory chip. FS80 would support Android 3.1 and higher version with USB host port. It provides a functions such as fingerprint enrollment, fingerprint deletion, fingerprint verification etc. Basically a fingerprint scanner system has two jobs, it needs to get an image for enrollment and it needs to determine whether the pattern in this image matches with pre scanned images. The scanning process starts when the finger is placed on a glass plate. The FS80 fingerprint device used is shown in the figure 3.
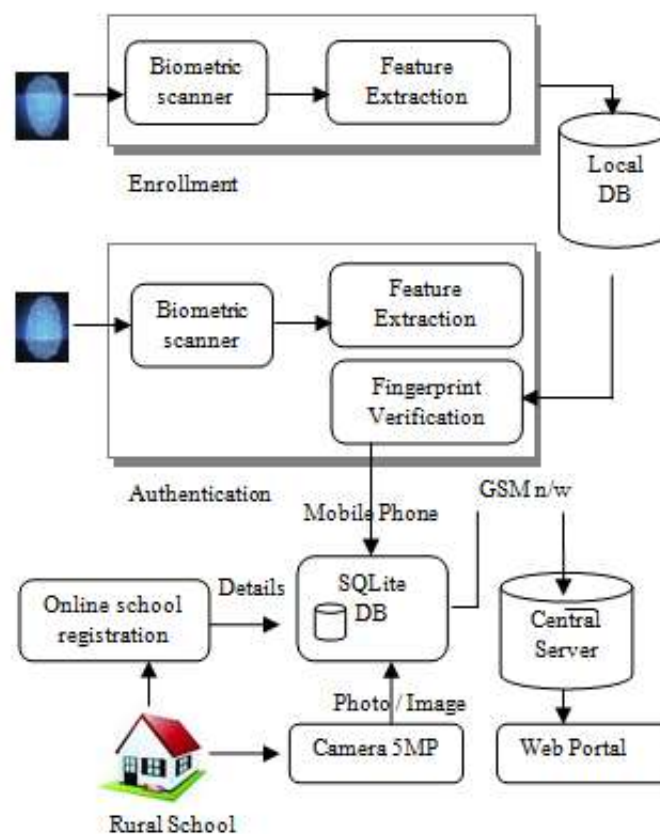

Figure2: Block Diagram of the System Proposed

Figure3: Futronic FS80 Fingerprint Device

3.3 Mobile Application Specification

The system needs GPS receiver enabled Android Mobile phone for receiving the GPS data from the satellite. There are a wide range of such mobiles are easily available in the market. This mobile will act as a both GPS receiver and GPRS transmitter which will use the GSM network to transmit the GPRS packets. Android application is deployed in this mobile phone which is supported to perform all the operation.

As soon as the application on the mobile phone is started, User registration is required for the first time, once registration is done, and then user can enter the software by using username and password as shown in fig 4. As the user enters username and password it is checked for its validity whether it's authentic or not. If it is not authenticated then the user is prompted with a message of wrong username and password. It allows the user to reenter again.

Once the mobile application successfully logins it goes into the background and starts fetching the GPS coordinates of the school.

The mobile application will work in three modes

1. Captures fingerprint of the students and employees through F80 fingerprint module.

2. Offline: It is not necessary that, mobile phone should be connected to internet while capturing data at the school level, since many rural area still does not have internet access. Mobile phone automatically uploads data to the remote server once it gets internet connection.

3. Online: In this mode, mobile phone is connected to internet, and then the data will be captured and uploaded to the remote server immediately.

3.4 Database Specification

The database is created in SQL Server 2005 at the remote server. School wise details are made available in the database. The details of attendance captured through fingerprint scanner and civil works progress with GPS codes uploaded by mobile phone will be stored. The database used in this system is 'Remote School' which has 20 tables, 10 views and 25 procedures.

3.5 Web Application Specification

Web portal is designed using .Net technology. Web forms are created to share the data across the different levels of the organization. Organization users are assigned username based on the hierarchy. Password can be given/modify by the respective users. There is no username or password protection for the general public. Dashboard and analytical reports are made available in the portal.

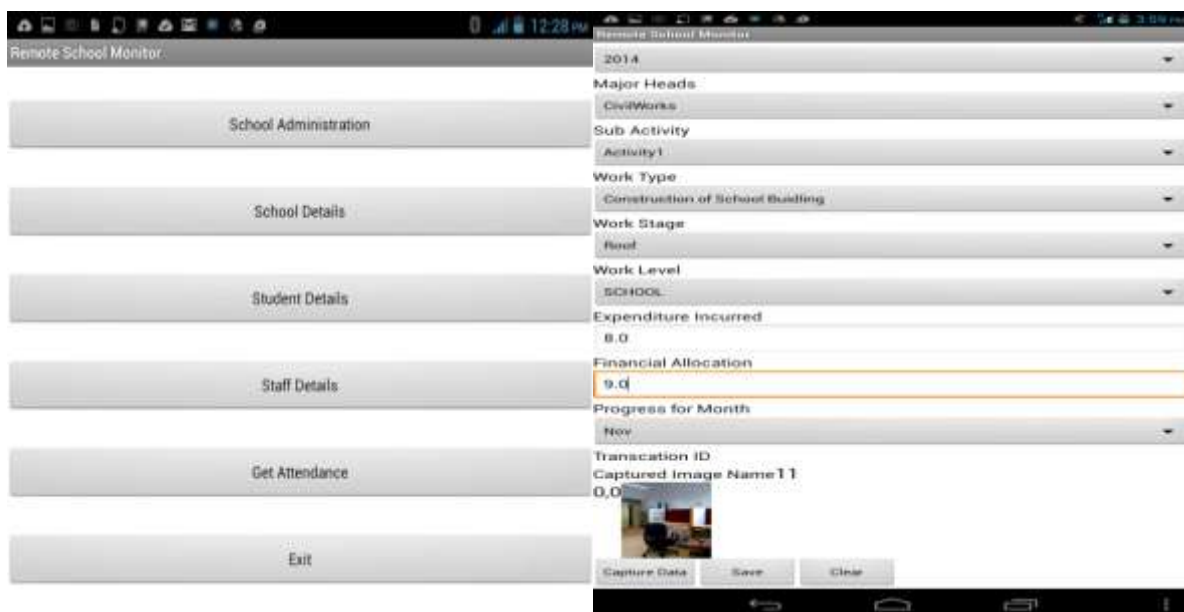**Figure4: Login ID and Password Entry Screen In Mobile Phone**

Figure5: Different Modules In Android Software   Figure6: Civil Works Progress Capturing Module

IV. RESULTS OF PROJECT

The proposed system used Futronic F80 fingerprint scanner to capture students and employees attendance. An additional module included to capture the Construction of civil works progress along with GPS codes. The captured data is sent through GPRS with the help of smart phone and the data is stored successfully in the remote server. The data is shared among the different administrative levels through a website. The details of attendance which is uploaded in the remote server and the same is displayed in dashboard is as shown in fig 7. Civil works progress with GPS codes captured and uploaded in the server, the decoded image is displayed in the dashboard is as shown in fig 8.
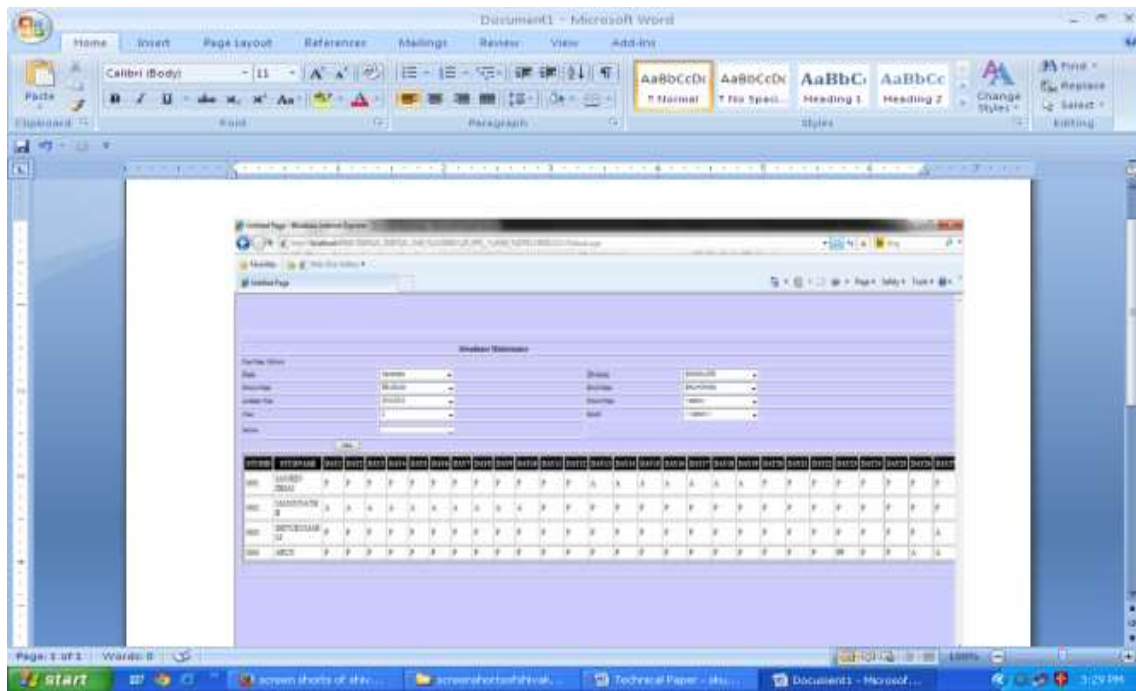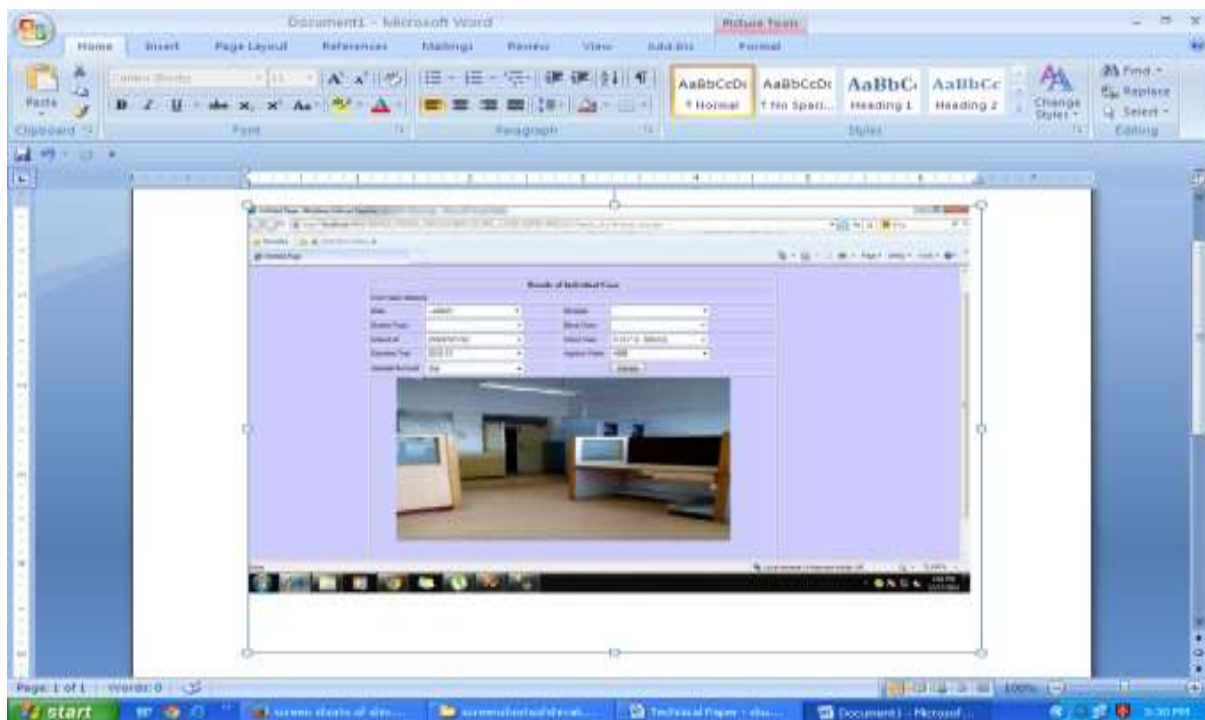
Fig 7: Day Wise Attendance Displayed In Dashboard

Fig 8: Decoded Image Displayed In the Dashboard

V. CONCLUSION

The main purpose of this project is to monitor students/employees by capturing attendance directly from rural schools where no internet and other advanced technology is available. It helps in monitoring and supervision of various developmental activities which are taken up by the government agencies at the school level. This system ensures transparency, accountability and helps in making effective decision at the different administrative levels. It is a technology based dynamic and smart administration.

VI. FUTURE SCOPE

The system could be extended to monitor other programmes such as mid day meal monitoring, distribution of text book, uniforms, scholarships etc. The system could be extended to other organization where top management requires monitoring various programmes. This system may used wherever civil constructions works are taken place and requires effective monitoring by the higher authority. This system or mechanism avoids reporting fake progress reports to the higher authority.

REFERENCES

[1]   SeemaRao, Prof.K.J.Satoa , "An Attendance Monitoring System Using Biometrics   Authentication", Volume 3, Issue 4, pp. 379-383, April 2013.

[2]   Peng Shi, JieTian, Qi Su, and Xin Yang, "A Novel Fingerprint Matching Algorithm Based on Minutiae and Global Statistical Features", IEEE Conference, 2007.

[3]   Neeta Nain, Deepak B M, Dinesh Kumar, ManishaBaswal, and BijuGautham "Optimized   Minutiae– Based Fingerprint Matching", Proceedings, 2008.

[4]   InfoTronics,Inc.2008.Biometrics: Advantages   for   employee   attendance   verification, Michigan:FarmingtonHillsRetrieved 11th November, 2011 from www.mwtime.com

[5]   VirginiaEspinosa-Dur6,"Fingerprints Thinning Algorithm," IEEE AES Systems Magazine,2003.

[6]   Anil K. Jain, Arun Ross and SalilPrabhakar, "An introduction to biometric recognition,"   Circuits and Systems for Video Technology, IEEE Transactions on Volume 14, Issue 1, pp 4-20, Jan-2004.

[7]   SDKhttp://developer.andriod.com/sdk

[8]   API http://developer.andriod.com/reference

[9]   Basics http://developer.andriod.com

[10]   Fulbert Leon Namwamba,(PhD) and Alaa Shams (MS), "Integration of GPS wireless Internet Technology to GIS database builder," Volume 3, Issue 4, pp. 278-289, April 2012

[11]   Yuan, G., Zhang, Z. and Wei Shang Guan, (2008), "Research and Design of GIS in Vehicle Moni tor ing System,"IEEE International on Internet Computing in Science and Engineering.

[12]   Michael, K., Mcnamee, A., Michael, M. G. and Tootell, H., (2006), "Location-Based Intelligence- Modeling Behavior in Humans Using GPS", Proceedings of IEEE.

[13]   Ruchika Gupta and BVR Reddy. "GPS and GPRS Based Cost Effective Human Tracking System Using Mobile Phones" Volume 2, No.1, pp. 39-45, Jun 2011.

[14]   Linux Standard Base Team, "Building Applications with the Linux Standard Base", IBM Press, 2004.

[15]   Brahim G. and Luigi L., (2000), "Understanding GPRS: The GSM Packet Radio Services", Computer Networks Journal, 34.5, pp. 763-779.

[16]   Al-Bayari and Sadoun, O.B., (2005), "New Centralized Automatic Vehicle Location Communications Software System under GIS Environment," International Journal of Communication systems, 18.9, pp.833-846.

[17]   www.schooleducation.kar.nic.in.