International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-2 Issue-5, April 2013

Design and Development of Anti-detaining Student Monitoring System

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Abstract*— The Idea of Designing an Innovative Anti-detaining student monitoring system is born with the observation of student's behavior in real life. Most of the students will be bunking the classes, most of the time and due to attendance shortage finally gets detained. And he will be losing his career most of the times. The parents will not be aware until the student crosses the attendance dead line. The purpose of this project is to develop a student monitoring and guardian alert system maintain the attendance of students who are mostly irregular to classes. After observing the attendance of the students in the first month, students whose attendance is below the margin level, (approx. below 40 to 50%) are filtered out and those students should be registered in the system with their identity particulars, finger prints, mobile numbers of their guardians etc…every day the enrolled students has to put their attendance at periodical intervals of the day. If the student fails to put attendance, immediately a SMS message using GSM modem will be sent to the guardian and student mobiles. The main objective of the system is to reduce the students who are getting detained every year.

***Keywords*— RFID, NFC, Biometric, GSM Modem, Attendance.**

I. INTRODUCTION

This paper focuses on implementing the Automation of Attendance System using RFID, Bio – metric, GSM Modem with .Net framework. An RFID system comprises three components that is an antenna, a transceiver and a transponder. The antenna uses radio frequency waves to transmit a signal that activates the transponder. When activated, the tag transmits data back to the antenna. Using the RF the RFID tag can be read, the RFID reader can read from a distance, it can read through your wallet, clothes, purse or backpack. Every RFID tag has a unique ID. Biometric is a method for uniquely identifying human being based on some physical characteristic and in this system we will be using the fingerprint. In this system we will recording a template of the student fingerprint in the database with a specific RFID tag ID and when this fingerprint is verified 4 to 5 times in the whole day his attendance will be finalized and stored in the database this is required because otherwise a student can fool the system by giving his ID card to his friend and showing that he is present whereas actually he is absent and if the student's fingerprint is not identified he will be sent an warning sms thirty minutes before closing time of the fixed thresholds and if not verified the student and the guardian will be informed that the student was not present and was trying to cheat the system. The software managing all these will be designed using VB.net or visual basic and the website using ASP.net which will share a common database of MySQL.

The complete process will be automated and no one needs to be monitoring the system. If a failure occurs for example a RFID transponder is not functioning properly then the system using the GSM modem will send a SMS to the person in-charge of the system to go and handle the problem with that RFID transponder. The complete overview of the process is also explained in Figure 1.

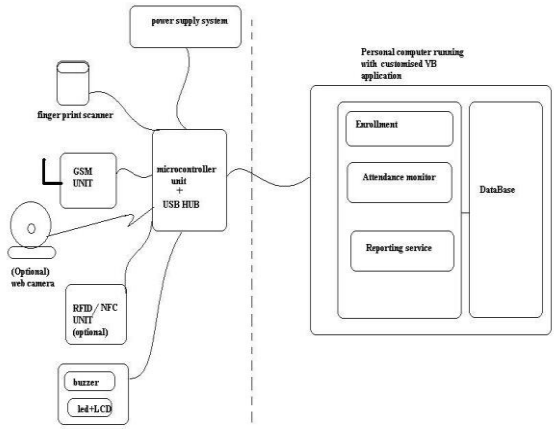

Figure.1 Block diagram of the system

II. THE BASICS OF RFID

RFID is commonly used to transmit and receive information without wires. RFID readers and tags communicate through a distance using radio waves. There are a lot of advantages in RFID system, included their price, size, memory capacity and their capability. The pure memory-based RFID chip without a co-processor is cheap, and its footprint is small and usually use in car immobilizer applications where the IC has to fit in a tiny glass tube buried in the key. RFID fast processing speed is also essential. There are many different types of RFID systems, and it's important to choose the right type of RFID system for a particular application. The vast majority of RFID tags or transponders use a silicon microchip to store a unique serial number and usually some additional information. There are two broad categories of RFID systems – passive (figure 2) and active (figure 3) systems [2].

Manuscript published on 30 April 2013.
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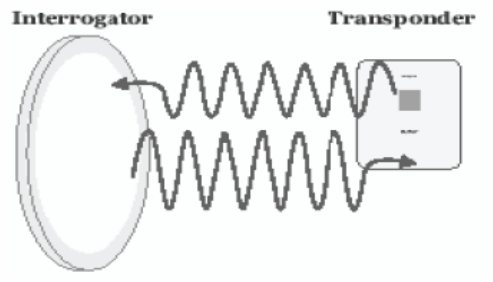

Figure 2: Passive RFID System

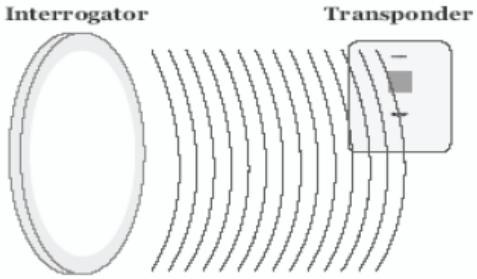

Figure 3: Active RFID System

Radio frequencies of these systems range from very low frequency (VLF), which has a range of 10 to 30 kHz, to extremely high frequency (EHF), which has a range of 30 to 300 GHz.

III. THE BASICS OF BIOMETRIC

Biometric is a method for uniquely identifying human being based on some physical characteristic and in this system we will be using the fingerprint. The fingerprint is an impression left by friction ridges of a human finger. Fingerprint image capturing is considered to be one the most critical step in an automated authentication system. It needs to be of high a high quality image and the basic idea is to measure the distance between ridges and valleys. There are two major categories of fingerprint scanner that are solid-state fingerprint and optical fingerprint readers for this system we will be using a optical fingerprint system which connected to the system using an universal serial bus (USB 2.0) The top layer of the sensor, where the finger is placed, is known as the touch surface. Beneath this layer is a light-emitting phosphor layer which illuminates the surface of the finger. The light reflected from the finger passes through the phosphor layer to an array of solid state pixels (a charge-coupled device) which captures a visual image of the fingerprint. A scratched or dirty touch surface can cause a bad image of the fingerprint. A disadvantage of this type of sensor is the fact that the imaging capabilities are affected by the quality of skin on the finger.

IV. THE BASICS OF GSM MODEM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

V. USING RFID IN THE ATTENDANCE SYSTEM

In the attendance system we will be using passive tags in the ID cards of the students and there will be a RFID transponder at the university gate when the student enters the university gate then the transponder will detect the RFID passive tag in the students ID card and will forward it to the server which will detect that this information has been received first time for the day and has been received from the transponder which is at the gate, it will then look for the students mobile number and the guardians mobile number and sms them that they have been detected and that they have reached respectively. RFID transponders will also be present in each classroom, laboratory, libraries, staffrooms etc. and when the student enters the server will be informed and will be stored in the database same will occur on exiting. The server will also ping all the RFID transponders regularly to check if they are properly working or not. If the RFID transponder does not respond then the person incharge will be informed by a sms to check the particular RFID transponder.

A. Why RFID Technology?

RFID is a very promising technology with significant impact. Following are the reasons for us to use this technology for students' administration application.

- No line of sight required.
- Tags can be read from significant distances.
- Multiple tags can be read at the same time.
- Because tags must be enclosed, they are much more difficult to tamper.
- Many tags are read / write capable, rather than read only.

VI. USING BIOMETRIC IN THE ATTENDANCE SYSTEM

In this system we will be using a fingerprint scanner as the biometric device. Fingerprint is an unique human characteristic and hence this will be used in the attendance system to make it fool proof. This will be installed at a secure location where the student needs to get the finger swiped once in the day to make sure that the student himself is present. When the student will swipe the finger which would be same as the one which was swiped while registering than the swiped finger will be matched with the finger database, once matched the attendance of the student for the day will be finalized and stored completely. The student will be notified by a sms for the confirmation of the same. For this we will be using an optical finger print scanner.

B. A. Advantages:

i. Physical resistance: they are physically more resistant than systems based on semi-conductors, in terms of resistance to impacts, scratches, corrosion and durability. This resistance is very useful for outdoor systems

ii. Maintenance low costs: fingerprint recognition systems based on semi-conductors chips have greatest maintenance costs due to its fragility.

iii. Non-electrostatic problems: semi-conductor systems are susceptible to electrostatic energy damages. Moreover, electrostatic energy can start a fire

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C. Disadvantage:

A disadvantage of this type of sensor is that the image capturing capabilities are affected by the skin quality of the finger. For example, a maker or dirty finger is difficult to be captured properly. It is also possible for an individual to erode the outer layer of skin on the fingertips till a point where the fingerprint is no longer visible. It can be fooled by an image of the fingerprint if it is not connected with a live finger detector.

VII. USING GSM MODEM IN THE ATTENDANCE SYSTEM

In the system we will be using a GSM Modem to send and receive sms. When the student enters the campus of the university then the student will be notified a welcome message for the confirmation that the student was detected and a sms to the guardian notifying the arrival of the ward. The same will occur when the student leaves the gate. This will only occur once a day and not as many times the student enters or leaves the gate. The welcome message and the exit message will only occur after the server matches it with the student's time table of the university. The GSM modem will also be used in the locating service of a student when a sms is sent in a particular format for example search space roll number then the GSM Modem will transfer it to the server and the server as programmed will look up the database for the roll number last recorded position and message back the location of the student on the same number.

VIII. USING .NET FRAMEWORK IN THE ATTENDANCE SYSTEM

The server application will be built using Vb.net and the website will be built using Asp.net as integrity between them is very strong.

A. Advantages of .Net Framework

i. Consistent Programming Model For doing a task different approaches are there for different programming languages. For example, accessing data with a VB 6.0 application and a VC++ application is totally different. When using different programming languages to do a task, a disparity exists among the approach developers use to perform the task. The difference in techniques comes from how different languages interact with the underlying system that applications rely on With .NET, for example, accessing data with a VB .NET and a C# .NET looks very similar apart from slight syntactical differences. Both the programs need to import the System. Data namespace, both the programs establish a connection with the database and both the programs run a query and display the data on a data grid. The VB 6.0 and VC++ example mentioned in the first paragraph explains that there is more than one way to do a particular task within the same language. The .NET example explains that there's a unified means of accomplishing the same task by using the .NET Class Library, a key component of the .NET Framework.

B. Direct Support for Security

Developing an application that resides on a local machine and uses local resources is easy. In this scenario, security isn't an issue as all the resources are available and accessed locally. Consider an application that accesses data on a remote machine or has to perform a privileged task on behalf of a non-privileged user. In this scenario security is much more important as the application is accessing data from a remote machine. With .NET, the Framework enables the developer and the system administrator to specify method level security. It uses industry-standard protocols such as TCP/IP, XML, SOAP and HTTP to facilitate distributed application communications. This makes distributed computing more secure because .NET developers cooperate with network security devices instead of working around their security limitations.

C. Simplified Development Efforts

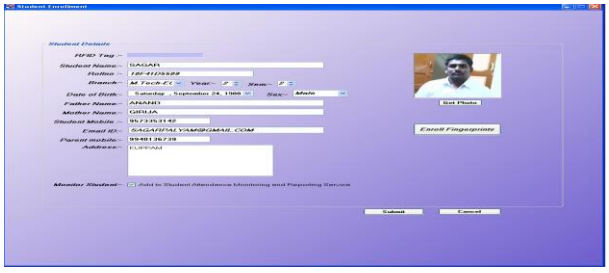
Let's take a look at this with Web applications. With classic ASP, when a developer needs to present data from a database in a Web page, he is required to write the application logic (code) and presentation logic (design) in the same file. He was required to mix the ASP code with the HTML code to get the desired result. ASP.NET and the .NET Framework simplify development by separating the application logic and presentation logic making it easier to maintain the code. You write the design code (presentation logic) and the actual code (application logic) separately eliminating the need to mix HTML code with ASP code. ASP.NET can also handle the details of maintaining the state of the controls, such as contents in a textbox, between calls to the same ASP.NET page. Another advantage of creating applications is debugging. Visual Studio .NET and other third party providers provide several debugging tools that simplify application development. The .NET Framework simplifies debugging with support for Runtime diagnostics. Runtime diagnostics helps you to track down bugs and also helps you to determine how well an application performs. The .NET Framework provides three types of Runtime diagnostics: Event Logging, Performance Counters and Tracing.

D. Easy Application Deployment and Maintenance

The .NET Framework makes it easy to deploy applications. In the most common form, to install an application, all you need to do is copy the application along with the components it requires into a directory on the target computer. The .NET Framework handles the details of locating and loading the components an application needs, even if several versions of the same application exist on the target computer. The .NET Framework ensures that all the components the application depends on are available on the computer before the application begins to execute.

IX. RESULTS

The present system mainly concentrates on enrolling, monitoring and reporting the student details. and finger prints. The student details and finger prints are taken in order to identify the students and to store the relevant information of the students in the database.



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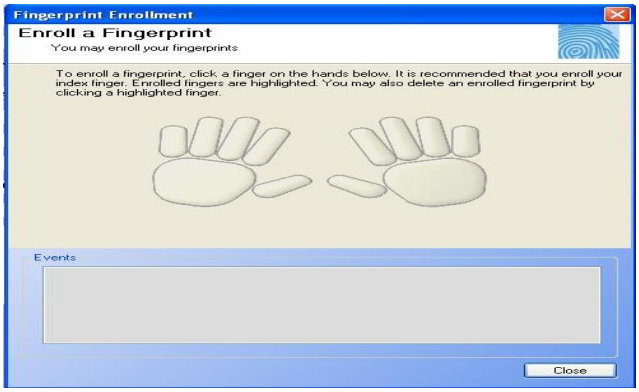
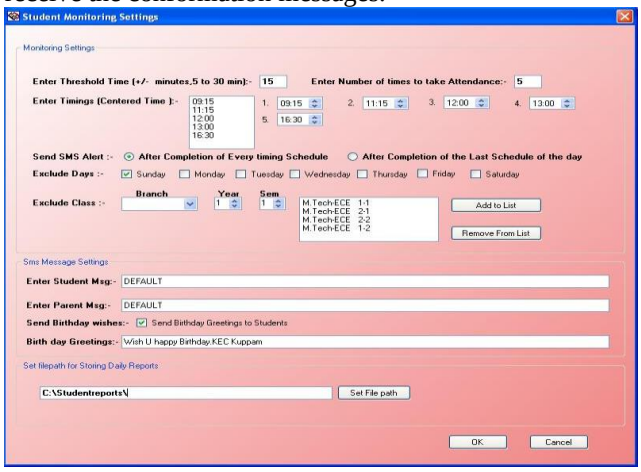
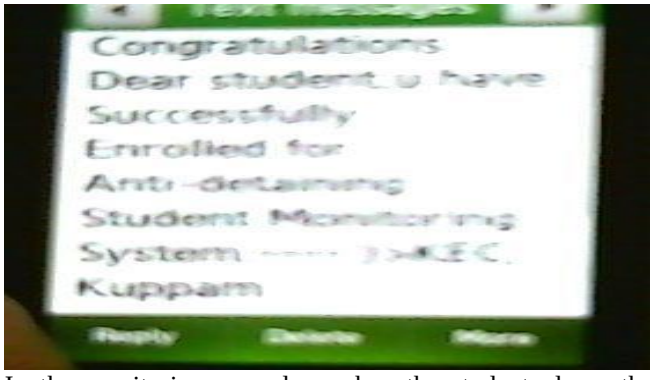
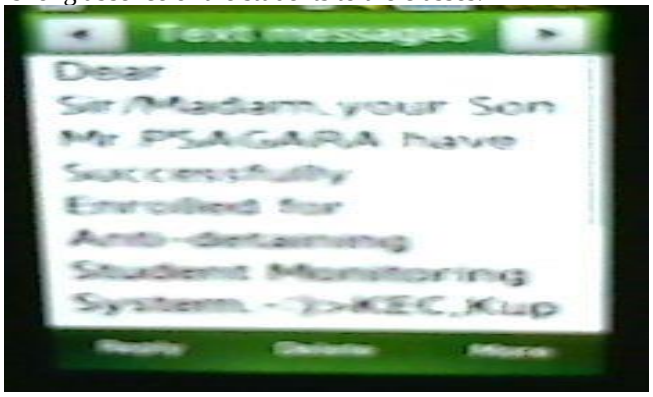


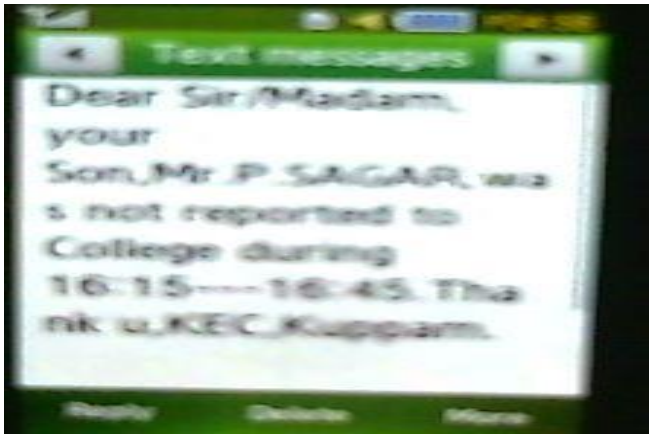
The enrolling procedure is, when the student waves his RFID tag in front of reader it displays the information window where the student enters the details in respective fields. After successfully taking the photo and finger prints all the data will be placed in the database. Both the parents and students receive the conformation messages.





In the monitoring procedure when the student places the finger prints it updates the attendance record. The controlling section sends the message to the parent and students if there is long absence of the students to the classes.





X. CONCLUSION AND FUTURE WORK

This paper demonstrates how an automation of attendance system can be implemented using RFID, Biometric, and GSM Modem with .Net Framework can be implemented in a university or an educational institution. There are although a few limitations that are as follows:

- The system would fail if it is not kept on always.
- If a student gets hurt on the finger he has put in the system he will have to get it changed otherwise he will not be marked present.
- The security of biometric device is a must.

The future enhancements in the system can be that the doors of the classrooms, laboratories etc. are managed by the system itself and are unlocked and locked accordingly. Software can be made for the mobile phones and then using the mobile phones GPS (Global Positioning System) the location of the student can be known all over the place and not only the campus. The same ID card can also be used for other functionality of the university like the library card for issuing of books and for example the exam identification

XI. ACKNOWLEDGMENT

This work is supported by Kuppam Engineering College and thanks for valuable references provided by the authors. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect their views

I would also like to express my gratitude to all other members of the faculty of Electronics and Communication Engineering department for their cooperation.

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