A WIRELESS FINGERPRINT ATTENDANCE SYSTEM

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ABSTRACT

In this paper we design a system which takes student attendance and the attendance records are maintained automatically in an academic institute. Taking the attendance manually and maintaining its record till end of year (or even beyond) is very difficult job as well as wastage of time and paper. This necessitates an efficient system that would be fully automatic. Top level design of the system includes marking attendance with the help of a finger-print sensor module and saving the records to a computer or server. Fingerprint sensor module and LCD screen are portable although they can also be fixed to a location for e.g. entry/ exit points. To begin with, a student needs to be registered in the finger-print sensor module. Thereafter every time the student attends a lecture he/ she will place his/her finger on the fingerprint sensor module. The finger-print sensor module will update the attendance record in database. The student can see the notification on LCD screen.

KEYWORDS

Fingerprint module, Fingerprint scanner, Zigbee, LCD etc.

1.INTRODUCTION

Even though we are living in 21st century with so many innovations making human life much better than ever; there is one thing that is still going on since years. It is "student attendance monitoring" in an educational institute. Even today most advanced colleges use attendance sheet printed on paper having names of students on left hand side and day-wise columns to make short signature. As soon as professor enter classroom he circulates attendance sheet. Students pass it on until it is signed by all and then returned to the professor. Obviously there are many lacunae in it like some students missing to sign or somebody wrongly or on purpose signing for another student. And if anyone loses the attendance sheet a whole month's attendance data will be lost since there is no back up.

Apart from educational institutes many other organisations like hospitals, small-scale companies need to mark "in" and "out" time of their staff. Labour oriented organisations for e.g. manufacturing company may carry out time-study to effect time saving leading to cost saving. These companies use magnetic/ RFID card. Though this is much better than manual attendance on hard copy there are disadvantages of it. The card can be lost or damaged [2]. Replacement of card may take some time. Unlike these systems, fingerprint scanner comes with lots of advantages like uniqueness, anti-impersonation and ease of use. Thus it is getting more & more recognition and acceptance from people [1] & [3].

Biometrics systems essentially consist of recording and comparing biometric characteristics. When a person first uses a biometrics system, his or her identifying features are enrolled as a reference for future comparison. This reference can be stored in laptop/ server for future use. In this project ZigBee technology is used for wireless communication. Which is an emerging

technology developed in recent years. There are many wireless communication technologies in the market; but ZigBee scores over them due to its low-power and low-cost. This makes it very apt for use in wireless sensor networks [4].

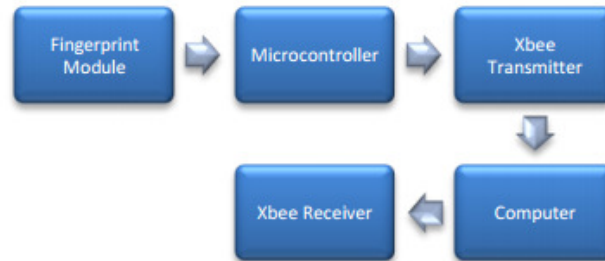The block diagram of fingerprint attendance system is shown in the figure 1

Figure 1: Block Diagram of Fingerprint Attendance System

A design method of wireless fingerprint attendance system based on ZigBee technology is proposed with the main objective of negating the disadvantages of traditional wire attendance system. It achieves attendance management by fingerprint identification. It combines ZigBee wireless technology and attendance management. It has achieved low-cost, low-power and high-performance fingerprint information acquisition, transmission and recognition function, which provides a new attendance way for all types of organizations whether educational or otherwise.

2. RELATED WORK

The work in [5] elucidates specifications and performance comparison of various available fingerprint sensors. It also explores the future direction and system development that states using similar techniques for Chance or latent fingerprint enrolment. The work in [6] briefs on an experiment that combines hand geometry, palm print, finger texture and vein pattern of hand to increase the performance of the hand based biometric scheme by adding new hand based traits. [7] Depicts a system of recording student attendance using fingerprint identification allowing students to monitor their attendance in any class electronically. This attendance system has pleasant-to-the eye graphics and stores complete details of students' using Microsoft Visual Basic Studio and integrated fingerprint reader. In [8], the author shows a survey of various developments in fingerprint sensor technologies with respect to their relative strengths and weaknesses. Related issues on technology, performance assessment, limitations and standardization are discussed.

Paper [9] presents research carried out by means of social survey using pre-set questionnaire to evaluate the theory and practice of introducing biometric recognition technology, hand geometry capturing into the attendance management system. Paper [4] talks about the biometrics technology by using a portable device for capturing attendance. The device can communicate with a host computer thru USB interface. This device operates from a rechargeable battery.

3. PROPOSED SYSTEM

The proposed system combines fingerprint authentication with the process of attendance management and thus forming a novel "automatic attendance management technique". It comprises of three processes namely; enrollment, attendance and reporting. Enrollment process covers capturing the biometrics of a person and storing it in a flash memory against the person's id. The simple aim of the enrollment module is to register the user using his/her id and

fingerprints into a flash memory after feature extraction. During "attendance" the biometrics of the person is captured and compared with all records in the flash memory to determine a match. If a match is found then attendance is marked against the person's id. The flash memory includes fingerprint template and other details of the person. The general block diagram of fingerprint attendance system is as shown in Fig.2
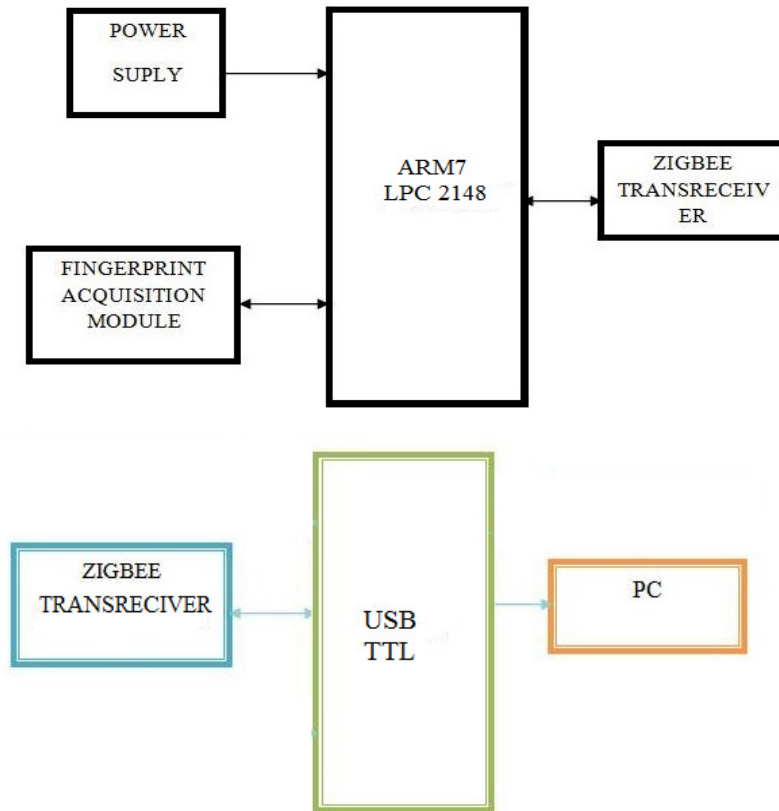
Figure 2 General Block Diagram of Biometric System

The system consists of fingerprint acquisition module, zigbee transmission and receiving module and attendance management workstation comprises of ARM7 processor. As its name suggests, fingerprint acquisition module is used to realize fingerprint collecting and pre-treatment. Zigbee transmission and receiving module is used to send the fingerprint image to main computer. Attendance management workstation, the ARM7 family is a 32- bit RISC microprocessor cores enhanced for low power and low cost applications is used to extract fingerprint data and matching it in order to realize attendance report [1].
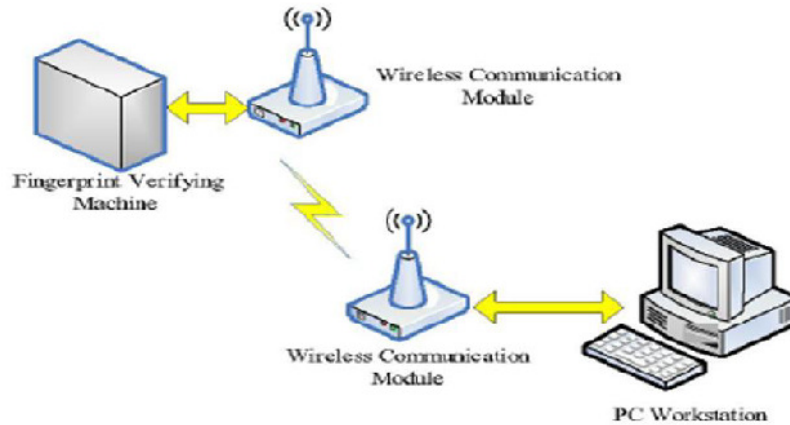
Figure 3 Scenario of Wireless Attendance Systems

4. IMPLEMENTATION DETAILS

The most important hardware requirements and software requirements for the implementation of the wireless fingerprint system are listed below:

4.1 HARDWARE COMPONENTS

1) ARM 7 Processor [LPC2148]
2) Fingerprint Module [R303]
3) Fingerprint scanner
4) Zigbee transmitter & receiver
5) LCD

4.2 SOFTWARE REQUIREMENTS

1) Operating system: Windows XP,10
2) Programming Language : Embedded C
3) PC Software: VB. Net 2008
         SQL 2005

4.3 WORKING

The proposed system is basically consist of three modes;

Enrollment
Attendance
Reporting

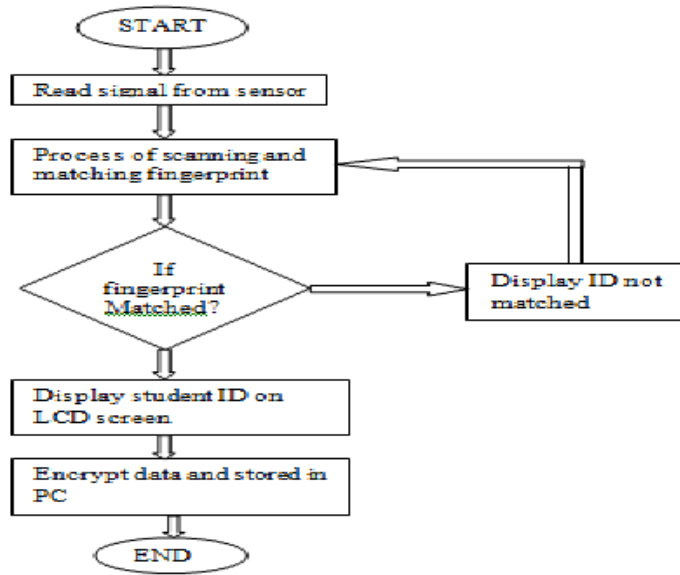The complete working of fingerprint attendance system can be seen from the flowchart shown in figure 4

Figure 4 Flowchart of the Fingerprint Attendance System

4.3.1 ENROLLMENT MODE

This module carries out the task of registering persons and their fingerprints into the system flash memory. During enrolment process, the fingerprints are captured and unique features are extracted from the fingerprint image and stored in a flash memory as a template along with the person's ID.

Figure 5 Fingerprint Scanner

4.3.2 AUTHENTICATION MODE

The purpose of authentication module is validation of a person's identity. The person interested in authentication indicates his/her identity and places his/her finger on the fingerprint reader. During the feature extraction stage, the biometric template is extracted for the fingerprint image captured earlier. Then matching algorithm takes over. It matches the image capture against the person's biometric template stored in the system flash memory in order to establish the identity.
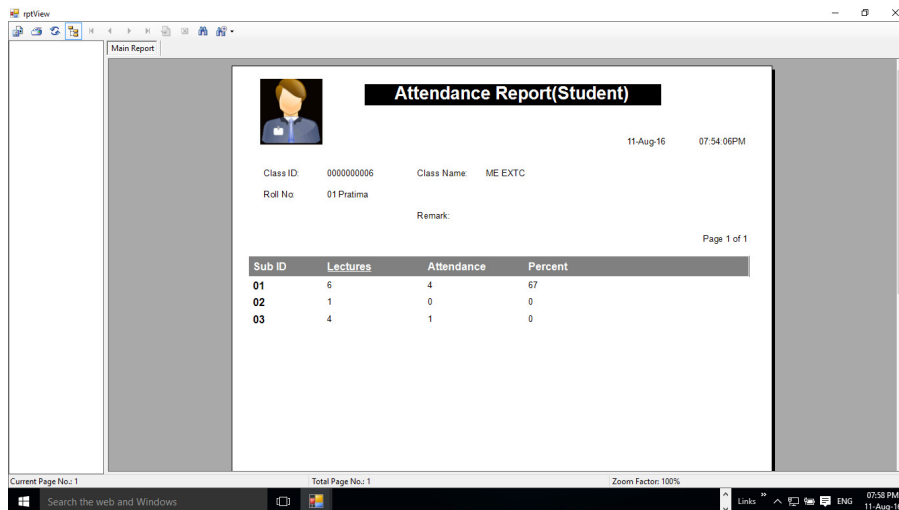
4.3.3 REPORTING

In the reporting, we can see all the attendance data of every student on the computer. The attendance record of every student is generated and stored into the computer. Further you can see or take a printout of the attendance data.

For wireless transmission we use Zigbee module that works @ 2.4 GHz and has a range of 30 meters. The fingerprint sensor can recognize up to 100 fingerprint ID's. Fingerprint module stores all Id's. This module is placed in a classroom. It includes power supply used for supplying the power- 5 volt to supporting IC and 3.3 volt to ARM7 LPC2148 Microcontroller, LCD device to display the student information and to display result. Function of Zigbee transmission is to transmit micro controller information to unit placed in HOD's cabin. It also works as trans-receiver i.e. it can also work as a receiver. It also receives information from unit placed in HOD's cabin, finger print controller and finger print module. Finger print module is nothing but the sensor that senses the student's finger and gives output to finger print controller. Then the finger print controller converts this output in digital form and gives output to ARM7 LPC2148 microcontroller.

5. RESULT OF PROJECT

The system scanned the fingerprints placed on the fingerprint scanner and compared them with those stored in the database efficiently. Because of its short execution time and automated report generation facility, the system was considered for implementation. The system has been tested by students in a class and was found working properly without any difficulties. This is a portable system by which the students gave their attendance. The system is reliable and avoids fraudulent issues. The attendance is later viewed to check whether they are marked present or absent through computer.

Figure 6 Student Attendance Report

6. CONCLUSION

The main objective of this project is to monitor the students' attendance in all lectures, tutorials and laboratory sessions in an efficient and cost-effective way. This system resists students from bunking classes. By now biometrics is being used successfully for more than a decade for "attendance system". Thus "Fingerprint attendance system" is a simple to use cost effective

system that relies on fingerprints for identification. The whole system is based on the premise that everyone has a unique fingerprint from which they can be quickly identified through a computer database. Even identical twins have different fingerprints.

The fingerprints of every student were successfully registered and saved to the database. The fingerprints were further checked and many dry runs were done to confirm matches or mis-matches for different fingerprint samples. The data transfer was made across a zigbee wireless channel connecting two terminals. Due to wireless communication the range was limited to a short distance but the data transfer process was efficient enough for the successful functioning of the system.

7. FUTURE SCOPE

Biometrics application has a very bright future. The wireless channel used was limited to a short range and hence the system could only be tested in the lab. Its performance can be improved in terms of speed and memory. By considering different channels we can go for an increased range and other different applications, even ensure fast data transfer and at the same time gives more flexibility. It is capable of recording attendance of even thousands of students. A speaking voice alarm can be added to alert a professor in case of unauthorized person attending a lecture.

It is possible to have voice call to parent's mobile number in case any student is regularly absent for four to six days by using GSM technology. The system can be improved by making completely web based system in that case, attendance reports could be generated anywhere. We can also add the feature like if any student came late during the lecture, machine will give indication. Current memory can be extended so that complete details of the student can be stored in database. Some features can be added in the system so that machine can track the arrival as well as exit time of every student for additional monitoring.

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