Wireless Fingerprint Based College Attendance System Using Zigbee Technology

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Abstract— In this paper we propose a system that takes attendance of student and maintaining its records in an academic institute automatically. Manually taking the attendance and maintaining it for a long time makes it difficult task as well as wastes a lot of time. For this reason an efficient system is designed. This system takes attendance with the help of a fingerprint sensor module and all the records are saved on a computer. Fingerprint sensor module and LCD screen are dynamic which can move in the room. In order to mark the attendance, student has to place his/her finger on the fingerprint sensor module. On identification of particular student, his attendance record is updated in the database and he/she is notified through LCD screen. In this system we are going to generate Microsoft excel attendance report on computer. This report will generate automatically after 15 days (depends upon user). This report will be sent to the respected HOD, teacher and student's parents email Id.

Index Terms—Fingerprints, Enrollment, Fingerprint sensor, Failure to enroll (FTE), Failure to capture (FTC), Verification, Fingerprint templates, identification.

I. INTRODUCTION

Fingerprint identification is the oldest method that has been successfully used in various applications. Each of our ten fingerprints is different from one another and from those of every other person. Even identical twins have unique fingerprints. That makes them ideal for personal identification. A fingerprint is made of a series of ridges and furrows on the surface of the finger. The uniqueness of a fingerprint is determined by the pattern of ridges and furrows as well as the minutiae points. Minutiae points are local ridge characteristics that occur when a ridge splits apart or a ridge ends.
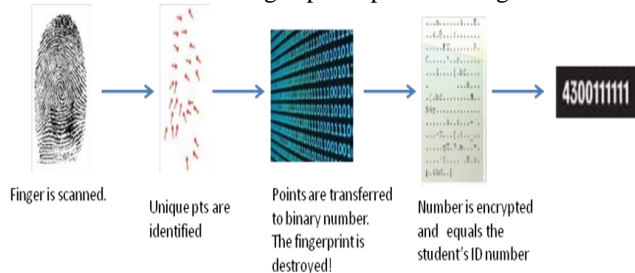

Fig 1: fingerprint conversion into digital

For attendance, the student places his/ her finger over the fingerprint device and the student's matriculation number is sent to the database as having attended that particular lecture [4].

At the end of the semester or year, reports are generated to enlist the name students that are eligible for exams and number of times the student attended lecture. A simple architecture is shown below.
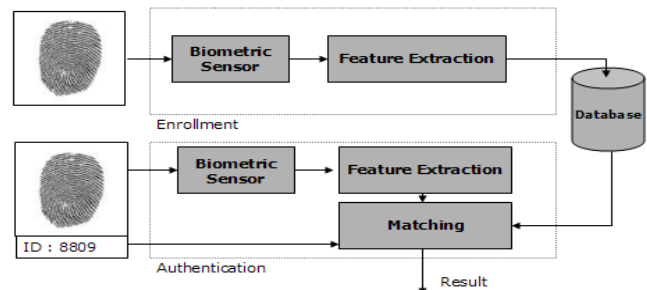

Fig 2: general architecture of biomatric system

II. PREVIOUS WORK

Generally the attendance systems use paper based methods for taking and calculating attendance.This manual method requires paper sheets and a lot of stationery material. Previously a very few work has been done relating to the academic attendance monitoring problem like RFID based systems. Some software's have been designed previously to keep track of attendance [1]. But they require manual entry of data by the teachers. So the problem remains unsolved. Furthermore idea of attendance tracking systems using facial recognition techniques have also been proposed but it requires expensive apparatus still not getting the required accuracy [2].

III. SYSTEM DESCRIPTION

3.1 HARDWARE:

Fingerprint scanner will be used to give fingerprint of teachers/students to the computer software. LCD display will be displaying rolls and name of those whose attendance is marked. Computer Software will be interfacing fingerprint scanner and LCD and will be connected to the network. It will input fingerprint, will process it and extract features of fingerprint for matching. After matching, it will update database attendance records of the students.

Fig 3: Fingerprint Module

3.2 SOFTWARE ARCHITECTURE:

The software architecture consists of the database and the application program.

Database: The database stores the records implemented in Microsoft SQL Server database. However, this can be changed to any other relational database of choice. SQL Server is fast and easy, it can store a very large record and requires little configuration [4].

Application Program: The application program is developed with Microsoft C# programming language using Microsoft Visual Studio framework and it provides a user interface for the Attendance Management System [4].The advantages of Microsoft C# programming language are its robustness, easy to program, has an excellent database connectivity [4], runs on the two most common operating system platforms like Windows and Linux.

3.3 RULES FOR MARKING ATTENDANCE:

- Student should scan his/her finger correctly on the fingerprint sensor module as shown in Figure 4. If fingerprint is not putted correctly on reader as shown in Figure 4, it could lead to error.
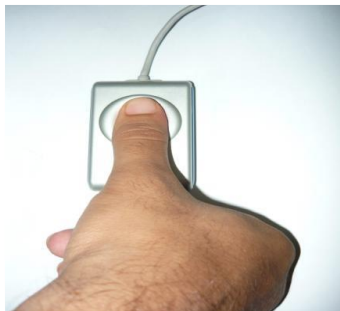

Fig 4: The correct method to place a finger on the device [5]

There are two reasons for error Failure to enroll rate (FTE) and Failure to capture (FTC) rate of biometric device. FTC rate depends on functionality of the system and FTE occur due to poor quality inputs [3].

Fig 5: The incorrect method to place a finger on the device [5]

- Students should mark their attendance within 20 minutes of start time of lecture. For example if a lecture starts on 7:45 am attendance shall not be marked after 8:05 am.
- If attendance has already been marked, student is not able to mark another attendance in the same lecture.This will show error on LCD screen.

3.4 SCENARIO OF AUTOMATIC ATTENDANCE SYSTEM:

Figure 6 shows the scenario of automatic attendance system which is implemented in a class room. Database storage contains the fingerprint templates of students along with

their information (names, registration numbers, roll number and Subjects/lectures). When student enrolls his/her finger on the fingerprint sensor module his/her fingerprint is matched with database to mark the attendance.
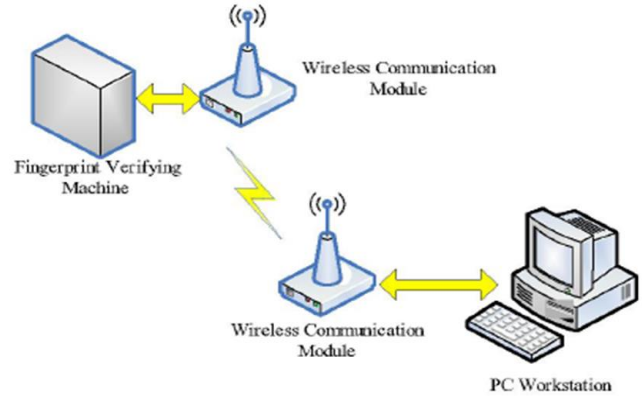

Fig 6: Scenario of Automatic Attendance system

Required hardware used should be easy to maintain, implement and easily available.

3.5 NETWORK AND DATABASE MANAGEMENT:

This attendance system will be spread over a wide network from classrooms via intranet to internet. Network diagram is shown in fig. 7. Using this network, attendance reports will be made available over e-mail. A 15 days report will be sent to each student, parents, HOD and teacher via email and will show the updated attendance. Using this database, attendance could easily be maintained for students.
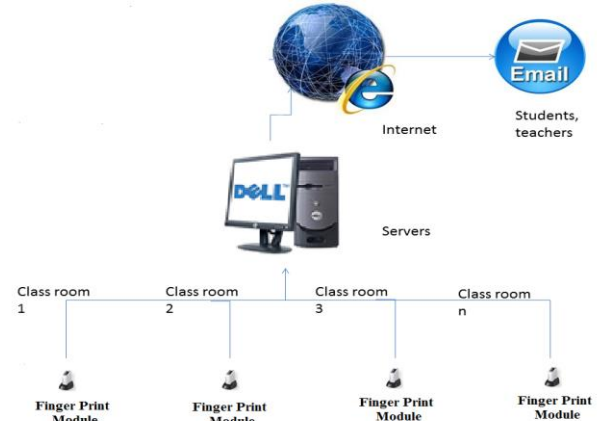

Fig 7: Network management

IV. COMPARISON WITH OTHER STUDENT ATTENDANCE SYSTEMS

There are various other kinds of student attendance management systems available like RFID based student attendance system and GSM-GPRS based student attendance system. Our system is better because first it saves time that could be used for teaching. Second is its portability. Portability has its own advantage because the device could be taken to any class wherever it is scheduled because it is dynamic.

In GSM-GPRS based systems, it use position of class for attendance marking which is not dynamic and if schedule or location of the class changes, wrong attendance might be marked.

Problem with RFID based systems is that students have to carry RFID cards and also the RFID detectors are needed to be installed. But, students may give proxies easily using friend's RFID card.

These problems are not in our system. We used fingerprints as recognition criteria so proxies cannot be given. If portable devices are used, attendance marking will be done at any place and any time. So our student attendance system is far better to be implemented.

V. RESULT

The proposed system has been tested for a class of 70 students. Four students were 20 minutes late than the lecture time. The attendance of these four students was not updated (see rules for detail). Out of other 66 students 65 students were properly identified and thus their attendance record was updated.1 unsuccessful identification occurred because student did not properly place his finger on the sensor (see rules for detail). The accuracy of the system is shown Tab. 1.

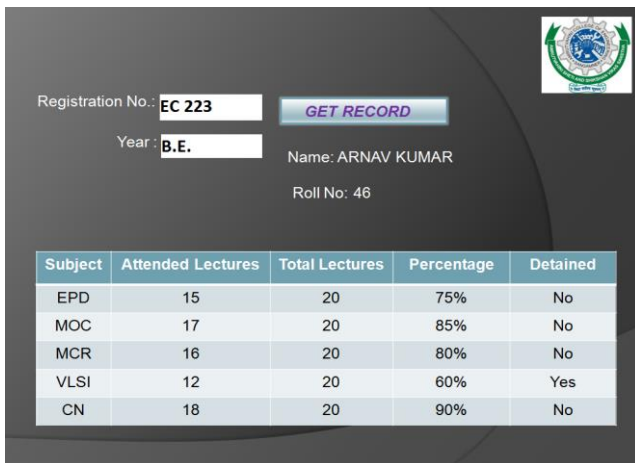| No. of students	No. of student attendance not counted	Successful Identification	Unsuccessful Identification	Accuracy
70	04	65	01	98.57%

Table 1: Attendance Accuracy

Fig 8: Representation of report

The proposed report of each student will be obtained after the insertion of registration number and year. Figure 8 represents one of the students attendance report after 1 month.

VI. CONCLUSION

It can be concluded from the all above discussion that a secure, fast, reliabl and an efficient system has been developed replacing a manual and unreliable system. The fingerprint sensor successfully captured new fingerprints to be stored in the database; fingerprints placed on the device sensor and compared them with those stored in the database successfully.

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