AN IMPLEMENTATION OF FINGERPRINT AND AADHAR BASED STUDENT ATTENDANCE SYSTEM

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ABSTRACT

Abstract: Whole world and managements of Educational Institutions' are worried about consistency of student attendance, which affects in their complete academic performance and finally affects the development of education in students'. Proper attendance recording and management has become important in today's world as attendance and achievement go hand in hand. Attendance is one of the work ethics valued by employers. Most of the government organizations and educational institutions in developing countries still use paper-based attendance method for maintaining the attendance records. There is a need to replace these traditional methods of attendance recording with biometric attendance system. Besides being secure, Fingerprint based attendance system will also be environment friendly. Fingerprint matching is widely used in forensics for a long time. It can also be used in applications such as identity management and access control. This review incorporates the problems of attendance systems presently in use, working of a typical fingerprint-based attendance system, study of different systems, their advantages, disadvantages and comparison based upon important parameters. Presently the conventional methods for taking attendance is calling name their name/roll no or by signing on a paper, which practically time consuming and less secure also since there are many chance of proxy attendance. Hence, for preserving attendance there is a necessity of a computer-based student attendance supervision system which will assist the faculty. The paper reviews several computerized attendance supervision systems which is being developed by using different techniques.

Keyword: — *Biometric, Fingerprint, GSM, LabVIEW, Android, MATLAB, RFID, ZigBee systems*

1. INTRODUCTION

There is a significant correlation between students' attendances and their academic performances for Empirical evidences[1]. There was also a statement stated that the students who have poor attendance records will generally link to poor retention [2]. This is also agreed by Dimitrova and Mazza where they both claimed that the students' attendances to the course may indicate their behaviors towards the subject where it can be used to judge their tendency and commitment to the course [3]. Attendances of every students are being maintained by every school, college and university. Faculty has to sustain proper record of the attendance. The manual attendance record system is not efficient and requires more time to arrange record and to calculate the mediocre attendance of each student. Hence there is a necessity of a system that will resolve the problem of student record arrangement and student average attendance calculation. The proposed system should store the absent and present student's attendance information in electronic format so that management of attendance becomes easy.

Various Automated Systems are:

A. Fingerprint based Attendance System

B. Mobile Based Attendance System

C. RFID based Attendance System

D. Iris Based Attendance System

E. Face Recognition based Attendance System

While the move towards the digital era is being fast-tracked every day, biometrics technologies have begun to affect People's daily life. Biometrics technologies verify individuality through characteristics such as fingerprints, faces, irises, retinal patterns, palm prints, voice, etc. These methods which use physical data, are receiving attention as a personal verification method that is more appropriate than conventional. [7] It is important to identify the correct tools to use in marketable and scientific studies. Barcode readers, Radio Frequency Identification (RFID) system, Bluetooth and NFC are just a few of the examples of such tools [4]. They were expensive when first announced and therefore those were used for only limited purpose. Today, these tools have become cheaper and they can be used in various applications, such as, identification, tracking, positioning, etc. Barcodes and their readers are greatly used in markets to identify the sales product. Now a days, attendance of students in most colleges is taken by the teacher on paper based attendance registers. There are various disadvantages to this approach such as data is not available for analysis because paper based registers are not uploaded to a centralized system, time taken for data collection reduces the fake attendance and effective lecture time by students. Some universities also use wall mounted RFID swipe card systems. RFID (Radio Frequency Identification) is a wireless technology which uses electromagnetic waves for communication between RFID reader and RFID tag. Biometric techniques can be used to solve these problems. Biometric is derived from two Greek roots "bios" meaning life and "metrics" meaning measurement. Biometric technology identifies a person uniquely based on his/her characteristics which can be physiological or behavioral. Among the various biometric techniques, there are nine main biometric techniques which are widely used. These include fingerprint, face, hand vein, hand geometry, iris, retinal pattern, voice print, signature, and facial thermograms. Comparison of different biometric techniques has shown that fingerprint biometric is a reliable, mature and legally accepted biometric technique [1]. Therefore, Fingerprint based attendance system can be used for identification of large number of students in institutes and also for attendance monitoring of employees in organizations.

2. LITERATURE SURVEY OF DISTRIBUTED DENIAL OF SERVICE

2.1 "RFID and Android"

An android application is developed through which system can be accessed from any remote location and record of any student can be checked. Online SMS service is used to inform the parents about student's attendance. This RFID based attendance monitoring system uses technology where student has to swipe RFID card and his fingerprint to mark the attendance as shown in Fig.

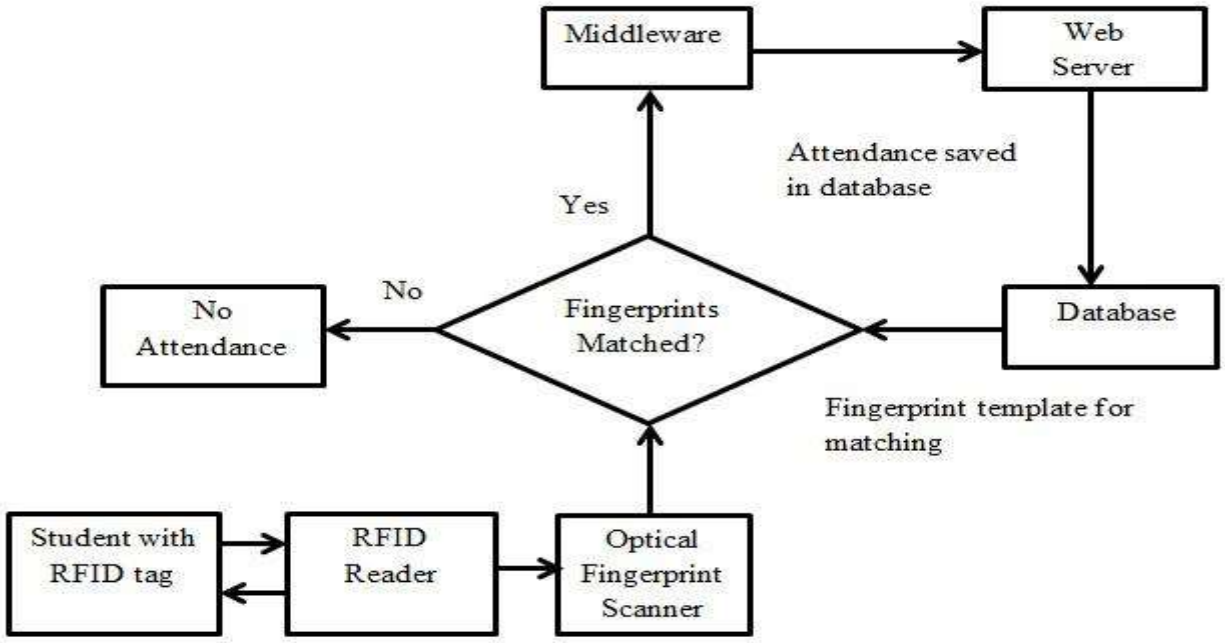

Fig- 1: Flowchart of attendance recording process.

An android application is developed through which system can be accessed from any remote location and record of any student can be checked. The system can also detect the location of all members and students anywhere inside the campus [8]. Online SMS service is used to inform the parents about student's attendance.

Advantages:
1. More secure (RFID+ Biometrics)
2. More functionality
3. System can be accessed remotely (via android application)
4. Attendance performance graph will be generated
5. RFID cards can serve as library card, mess card
6. RFID cards are difficult to tamper
7. Free bulk SMS service used instead of GSM (Lower cost)

Disadvantages:
1. Complex software design
2. Android application development difficult.

2.2 "ZigBee, DSP and MATLAB"

The system comprises of transmitter section, receiver section element and attendance supervision terminal [9].Transmitter section consists of optical fingerprint sensor OP-100N, ADSP-BF532 & ZigBee transmitter as shown in Fig. 6. DSP processor makes the processing faster. Fig. 7 depicts receiver section which consists of microcontroller and ZigBee receiver. Image enhancement is performed using MATLAB. Steps involved in image enhancement are shown in Fig. 8. MS-access and Visual basic are used for database implementation. Radio frequency(RF) module can be in place of ZigBee to increase the range.

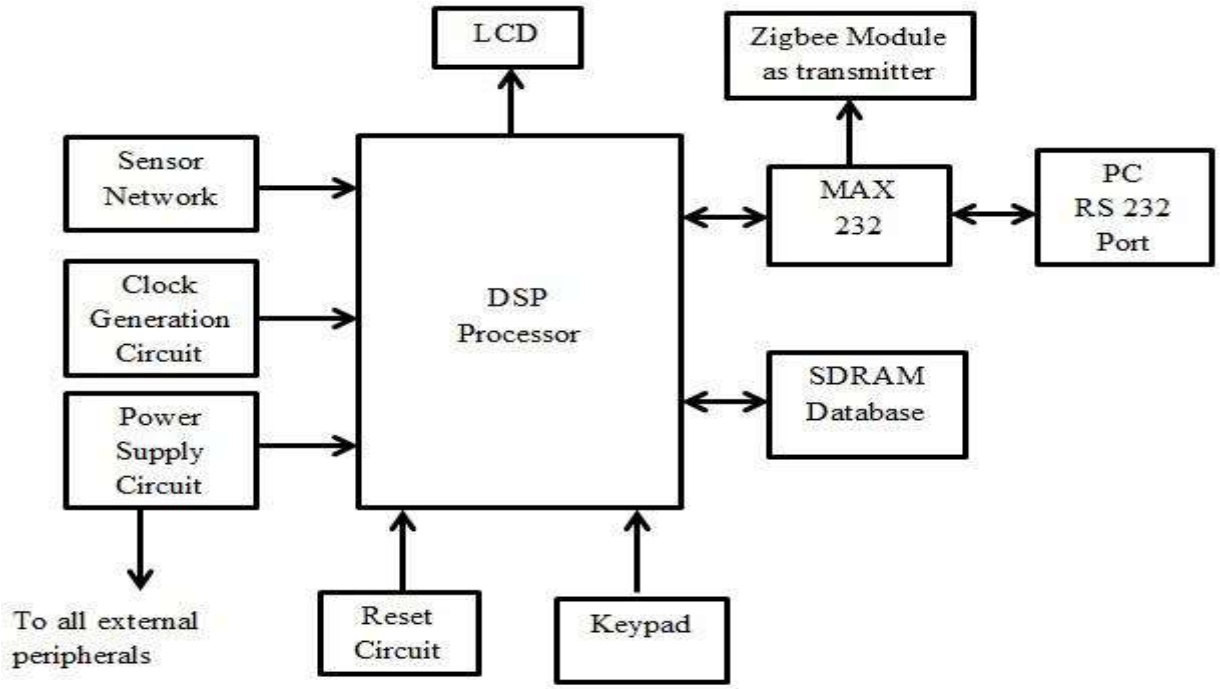

Fig 2: Transmitter section block diagram

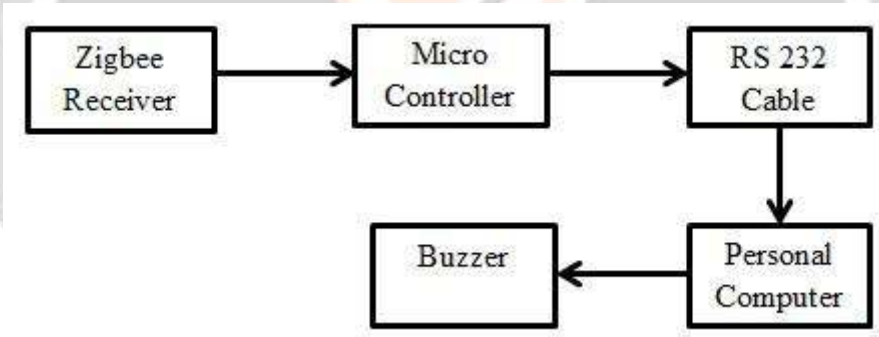

Fig 3: Receiver section block diagram.

Advantages:
1. Low power consumption
2. Good accuracy (Gabor image enhancement).
3. Flexible user modes
4. High resolution of fingerprint sensor
5. Wireless (portable)
6. Low cost

Disadvantages:
1. Three different supply voltages required (3.3V, 5V, 12V)

2.3 "Cryptographic attendance system"

A portable fingerprint attendance system is designed using Arduino board based on ATmega1280. Different blocks of the system are shown in Fig. 9. Fingerprint scanner ZFM 20 is used having its own processor and memory. TFT touch screen provides user friendly interface. SD card is used for storage of student's records. RTC (Real time clock) provides the exact attendance date and time. Caeser Cipher cryptographic technique is used so that data cannot be manipulated by unauthorized user.

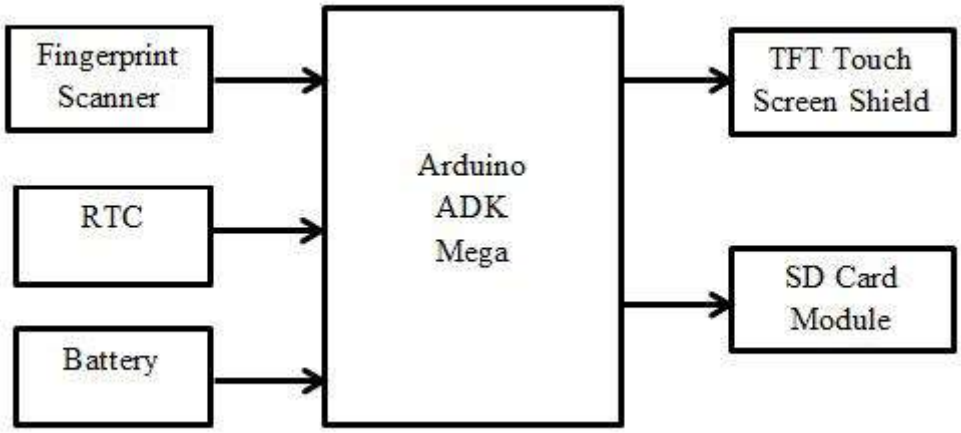

Fig 4: Portable Attendance System

Advantages:
1. User friendly design
2. Portable
3. Small size
4. Security enhancement (encryption of data)
5. Faster than fixed fingerprint reader

Disadvantages:
1. Limited battery life 2. Limited Functionality

2.3 "RFID, GSM and .Net"

The system combines GSM and RFID technology with biometrics for attendance management. Students ID (identification) card is tagged with their RFID tag. RFID tag is matched with the database and attendance is finalized after fingerprint is verified using fingerprint sensor. GSM Modem is used for sending SMS to parents regarding student's attendance. RFID transponders are installed in classrooms, laboratories and staffrooms through which location of the student and staff can be traced .A website is designed through which teacher, students and guardians can view the location of a student in the campus and also the attendance record of the student. vb.net is used for server application and asp.net for website [12]. System using NFC (Near Field Communication) is implemented by [13]. NFC based system has lower range than RFID based systems.

Advantages:
1. More Secure due to RFID and biometrics
2. Complete system is automated
3. Small size of RFID cards
4. Fast processing speed
5. No line of sight required for RFID
6. Many tags can be read simultaneously
7. .net framework simplifies debugging

Disadvantages:
1. Software design is difficult.
2. System should always be kept ON
3. Costly

2.4 Comparative Analysis

Parameter / Technique	Speed	Security	Power Consumption	Cost	Portability	Functionality
LabVIEW	High	Moderate	Low	Low	No	Limited
Internet of things	High	High	Moderate	High	No	Wide
GSM, ZigBee	Moderate	Moderate	Low	High	Yes	Wide
RFID, Android	High	High	Moderate	High	No	Wide
ZigBee, DSP, MATLAB	High	Moderate	Low	Low	No	Limited
Cryptography	High	High	Low	Low	Yes	Limited
RFID, GSM, .Net	High	High	Moderate	High	No	Wide

Fig 6: Comparison of fingerprint based attendance systems

Comparison shows that more functionality requires more complex circuit and difficult software development. There is a tradeoff between speed and power consumption and also between large databases and accuracy of fingerprint matching. Parameters required for a particular application varies and this comparison table can be used to make a proper choice for the implementation of Fingerprint based attendance system. Different technologies can be combined to implement a system an efficient and ease to use system.

3. PROPOSED SYSTEM

The system operates at different phases: enrollment, verification, server interaction and SMS alerts. In the enrollment phase, student details are entered through keypad and are stored into the memory used in the WFT with their corresponding roll numbers. This is onetime process and is executed only once at the beginning of an academic year to enroll the details of students admitted in each class. This database is referred to as WFT database. During the server interaction phase, the WFT communicates with the server for exchanging different data. These data transfers require an IP address in order to connect to the Internet. The WFT gets an IP address assigned to it by using Point-to-Point Protocol (PPP) network interface. During the verification phase, the fingerprint verification is done to record the student attendance which can be done in two different approaches which are described in the flow chart of proposed system.

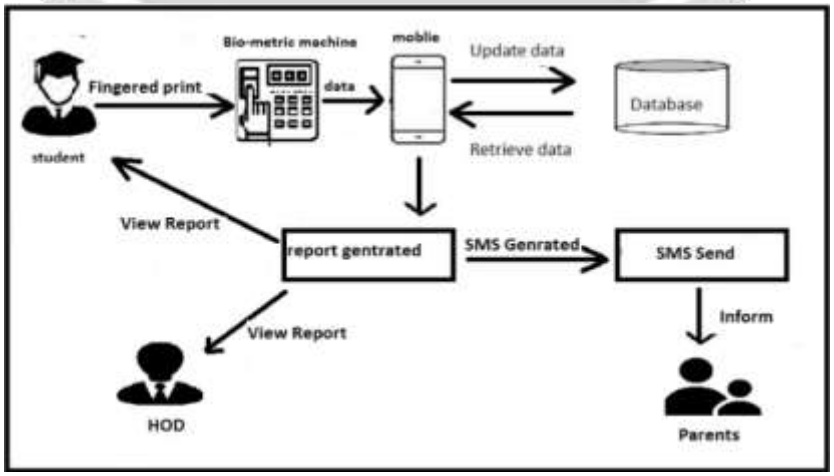

Fig 6: System Architecture

3.1 Characteristics of Proposed System:

User Friendly: The storing and retrieval of data is fast and data is maintained efficiently hence the system is user friendly. Moreover, the graphical user interface is provided in the proposed system, which provides user to deal with the system very easily.

Very Less Paper Work: Very less amount of paper work is there in this system. All the data is fetched into the computer fastly and reports can be generated through computers.

Computer Operator Control: There so no chance of errors because of computer operator control. Moreover, retrieving and storing of information is easy. So work can be done speedily and in time.

3.2 MATHEMATICAL MODEL

Set theory of the proposed system: S = I, P, O

I= Input to the System.

P= Processing of System.

O= Output of the System.

I =i1,i2,i3,i4

i0= Staff Registration and Login Credentials.

i1= Student Fingerprint registration.

i2= Fingerprint input from WFT.

i3= Fingerprint Detection from input samples.

i4= Date and Time of attendance.

P ={p1,p2,p3,p4} where,

p0= Registering staff (teachers).

p1= Registering fingerprint samples of students with details.

p2= Recognition of fingerprint from the input finger of student.

p3= Attendance marking for detected faces.

O= {o0, o1, o2} where,

o0= Detected fingerprint of the present students.

o1= Attendance Marked for detected student.

o2= Staff wise attendance records.

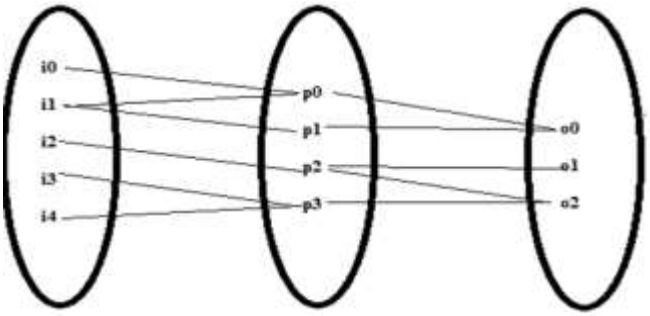

Fig 7: Mathematical Model

4. CONCLUSION

In this paper it is analysed that biometric technology is a reliable tool for authentication. Various fingerprint based attendance systems have been reviewed .Some of the systems look promising to be practically implemented in developing countries. The existing systems can further be improved or combined which helps in making the system more user friendly, secure and fast. This paper presents an analysis of different technologies which are used for attendance making system. Traditionaly student attendance is taken by professor. It is waste of much time in lectures. Too much of proxy attendance can be recorded in manual system. This can be replaced with computerized system i.e. Mobile Based Attendance System, using Android OS and Quick Response Code. The same android application can be used for much purpose in future such as for payments in canteen, issuing book from library by generating static QR code for students.

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