

Portable Biometric Attendance System using Raspberry Pi

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Abstract- In the entire world every educational organization is concerned about the attendance of individuals because this has an adverse effect on their overall performances. In conventional method attendance of students is taken by calling out the names of students or signing on paper which is extremely time overwhelming. To eliminate this problem one of the solutions is a biometric-based attendance system that would be able to automatically capture the students' attendance by recognizing their fingerprints. Fingerprint recognition is regarded as one of the most reliable, accurate and efficient biometric identification system. The module enrolls the student's fingerprints. Enrolling is a one-time process. The fingerprints are stored in the fingerprint sensor. The attendance of each student is displayed on LCD. At the same time it is updated in a database. When the users log into the database, the data is sent through Wi-Fi to the server. Server maintains the records of the students. If the student's attendance goes below certain percentage, a SMS will be sent to their registered mobile number. In many real time applications biometric authentication is used.

Key Words: Biometric, Fingerprint, GPS, Raspberry Pi, RFID, Bluetooth, Barcode

1. INTRODUCTION

Now-a-days people face many problems and fake identity is one of the core problems in the whole world. Moving towards the digital era biometric technologies have become more and more popular. Attendance is a concept that exists in different places like institutions, organizations, hospitals, etc. during every lecture to mark a person's presence. The way of taking attendance in a class includes a pen, attendance sheet and a person. Thus the drawbacks arise as it consumes time, needs manual work and the most important, information or the attendance can be manipulated. The new procedure of taking attendance using fingerprint is easier and therefore overcomes all the above mentioned drawbacks.

A fingerprint is based on biometric system that records the attendance automatically. This attendance system consists of a Raspberry-pi, the heart of the project and fingerprint sensor which is used to detect the person's identification. For example, in colleges or schools, the student needs to

place their finger on the fingerprint sensor to obtain their attendance. The fingerprint captured is recorded in a flash memory. Each time it is checked whether the obtained fingerprint matches with the record in the flash memory. By making use of this system, we overcome the problems such as proxy signature and security risk by recognizing their fingerprints.

Enrolling is a onetime process. The fingerprints are stored in the fingerprint sensor. The attendance of each student is displayed on LCD. At the same time it is updated in a database. When the users log into the database, the data is sent through Wi-Fi to the server. Server maintains the records of the students. If the student's attendance goes below certain percentage, a SMS will be sent to their registered mobile number. In many real time applications biometric authentication is used to eliminate proxy so no student can give attendance for their friends who are absent. The software platform used is Raspberry-pi (Linux OS), Python programming language.

2. LITERATURE REVIEW

There are various other kinds of student attendance management systems available like RFID based student attendance system and GSM-GPRS based student attendance System[2]. These systems are having their own pros and cons. Advantages includes that system can be accessed remotely, generation of the attendance performance graph and limitations include complex software design, lack of security, etc.

Fingerprint based system is better than the other because it saves the valuable time that could be efficiently used for teaching. Portable Attendance system has its own advantage because the device could be taken to any class wherever it is scheduled. While GSM-GPRS based systems use position of class for attendance marking which is not dynamic and if at sometimes the schedule or location of the class changes, wrong attendance might be marked.

The problem associated with RFID based systems is that students have to carry RFID cards and also the RFID detectors are needed to be installed. Nonetheless, students may give proxies easily using friend's RFID card[2]. These problems are not in the Fingerprint based system, so proxies cannot be given. If portable devices are used,

attendance marking will be done at anyplace and any time thereby providing the portability.

A. RFID Based Attendance

RFID technology is used in the attendance system where student has to swipe RFID card to mark the attendance[2]. An android application is developed through which system can be accessed from any remote location and record of any student can be checked[2]. The system is able to detect the location of the students as well as faculty members. The parents can be informed about the student's attendance through the Online SMS service.

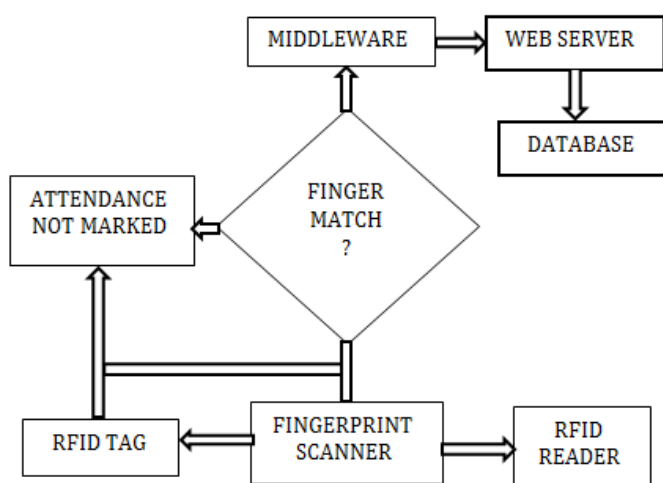


Fig-1: Block Diagram of RFID Based Attendance System

B. Barcode based

Student academic attendance is very important tool as it give academic outcome of a student[5]. It is essential to keep the students attendance record due to increasing number of college students. The paper based attendance system of taking attendance manually is time consuming. By using barcode based attendance system this tedious task can be avoided. In this system each student provided with its individual id card on which a unique barcode is printed & by using this each student can scan a unique barcode & attendance will be marked. The attendance of individual student can be display after scanning his barcode But this record can be modified by only administrator[8]. The system consist of a barcode reader to scan the barcode which contains the student information. Then the twelve digits are sent to the attendance system and it will display student record for 5 seconds. Then this recorded data will be sent to the database[8]. This system can be easily accessed by administrator also the reports can be generated in real-time processing. Thus, it is possible to maintain records with backup functionality[9].

RFID System is less reliable than barcode system .Also RFID tags requires more memory than barcode labels and at a same time more than one tag can respond. Barcode system is very cheap & also accurate than RFID based attendance system[6]. Student attendance can be automatically checked & calculated. Administrator or teachers are also free from tedious job of taking attendance manually [7]. There are some positive points or strengths of barcode compared to that of traditional attendance system. First is that the system is automatic & provides various modules which allows admin to calculate attendance automatically not manually which reduces time[7]. However some drawbacks that are observed are that , students require their ID along with unique barcode each time .If a student forgets ID at home & comes for the lecture ,his attendance could not be marked[5]. Also there are possibilities of cheating. Anyone can bring ID of another student & mark the attendance[1].

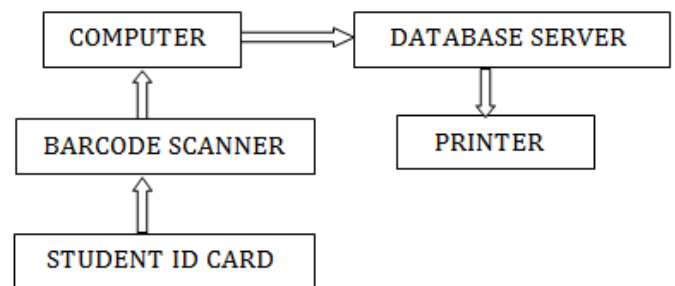


Fig-2: Block Diagram of Barcode Based Attendance System

C. GPS/Bluetooth based

This basically serves the GPS based attendance system which is used to find out the location of the student in the campus. Thus this system is basically a location based smart time attendance system which only depends on the applications of smart phones [10]. This GPS based system consists of 4 sections which are described as the first is the smartphone which is basically an in build GPS receiver which is basically used to receive the signals from the satellite [11]. The next is the application and user interface which is used to find the current location of the user, then the user location will be send by the application to the attendance management software for the further process, after the whole process is executed it is then finally stored in the database [11]. Here the various softwares are connected to the database for the data storage [10]. Management/Application Software operation-

- 1) Data receiving from the mobile application software.
- 2) Data Decryption.
- 3) Check the user ID from database.
- 4) Identification of appropriate user
- 5) Information storage [10]

This serves the use of Bluetooth in many applications which is basically a wireless technology used in security and home entertainment industries. It is an automated identification and the collection of system data [12]. Bluetooth smart technology combines microchip and the radio frequency technology for a better secure system [12]. There is use of the electronic tags which are designed to be embedded in the system. Thus by using this system or application the professor is able to track the exact location of the student through the Bluetooth software which consists of the electronic tags [13].

3. COMPARATIVE ANALYSIS

Table -1: Comparative Analysis

TECHNIQUE	SPEED	SECURITY LEVEL	COST	PORTABLE
Paper based attendance system	Very low	Least	Low	Yes
RFID based attendance system	High	Moderate	High	No
Barcode based attendance system	High	Moderate	Moderate	No
GPS/Bluetooth based attendance system	High	Moderate	Moderate	Yes
Fingerprint based using Raspberry Pi	High	High	Low	Yes

The existing attendance systems are compared on the basis of speed of the system in recording and maintaining attendance, security of the system, power consumption of different units of the system, system cost, portability and functionality in Table 1.

4. PROPOSED SYSTEM

The system would comprise of three major elements viz Raspberry Pi, NodeMCU module and fingerprint sensor module. The NodeMCU module would enroll the student's fingerprints. Enrolling would be a one-time process. The fingerprint sensor stores the fingerprints. The LCD displays attendance of each student and at the same time it is updated in a database. When the users log into the database, the data is sent through Wi-Fi to the server. Server maintains the records of the students. If the student's attendance goes below certain percentage, a SMS would be sent to their registered mobile number.

5. CONCLUSION

This paper has successfully presented the design and development of portable attendance system which is based on fingerprint identification. The system would help to reduce many issues such as, avoiding the possibilities of marking fake attendance, helps to ease the lecturers to keep track of students' attendance, the encryption technique adds more security so there will be no anonymous fingerprint which will be able to hamper with the recorded data, and the portability saves time in taking attendance instead of queuing in a line

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