

Automatic Attendance Reporting System

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ABSTRACT: *This review paper is about Implementation of “Automatic Attendance Reporting System”. The purpose of this review is to facilitate students and administration, using a more reliable and efficient attendance system. The problem with our current system is inefficiency; as it is affected by considerable human errors and maximum chances of proxy. The old paperwork system for marking attendance is also time-consuming. Implementation of automatic attendance reporting system will not only make the system reliable but it will also reduce the time and proxy chances. The student can mark his attendance and can get its acknowledgement within a fraction of a second. Moreover, in this review we have added a database and a server to control the class schedules and to record the attendance data. Every student has its own module which contains a biometric component to make a proxy-free attendance. Nodes will collect the data of all students and communicate it to the server. Server will record the attendance by entering it to its database. We are moving towards a highly service-oriented sensor-node network where we can apply highly interactive embedded applications. Our designed infrastructure will not only appreciate the attendance reporting application but also provide compatible services for applications which are generally used with a sensor-node network.*

Keywords: Automatic attendance, Sensor network, Automatic Reporting

Received: 12 June 2016, Revised 15 July 2016, Accepted 22 July 2016

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1. Introduction

Marking an attendance is a daily based routine work which was started on paper decades ago. Due to its importance it should be automatic. Countless systems have been developed in institutes and industries to keep a track of the attendance. These systems are good but they are plagued with performance and they are not suitable. The attendance marking techniques includes Biometric verification system, Bluetooth system, RF-ID system and Image processing system.

The old and inefficient way is to mark an attendance in all our universities/colleges/schools. It is very time taking and it is not reliable to eliminate proxy because of the presence of human error. The biometric verification systems usually take a unique element of the body and use it for marking attendance, for example iris, palm, fingerprints etc. These systems are perfect for high profile security agencies but these systems cannot be used in educational institutions and factories. The data keeps scaling up and the system needs to be maintained and refreshed for further use. The iris recognition system is another useful system and is proxy-free but the main drawback being injuries to the eye due to the beam.

Bluetooth system has high usability and proxy removal techniques can be included to make the system perfect. However the system is not scalable and requires cannot have more than 8 connections [1] active at a time. This makes it a viable resource for a limited population.

The RF-ID systems are more popular. Students are given RF-ID cards along with their identity cards. These cards need to put in the RF-ID reader before the student enters the classroom. Systems like these require permanent supervision because students can sense two cards leading to a proxy and also improper usage can harm the RF-ID reader. It also requires maintenance. Image processing system requires a large data to transfer and is expensive as well.

2. Overview of Differentiate System

There are four main systems that are used worldwide to mark the attendance indifferent institutes.

- Conventional System
- RF-ID system
- Biometric verification system
- Image processing system

Each system uses different techniques to mark attendance, to have communication with the server and to keep the data record. Now we will describe each system to show their working based on different techniques.

2.1 Conventional-System

The old and inefficient technique is to mark the attendance manually. The system was developed decades ago for the attendance purpose, but remains no longer reliable with the passage of time. In conventional system, the instructor will have to mark the attendance of each student by calling their name or registration number. Human error chances are also available as the whole process is by the human itself.

Disadvantages of conventional systems are :

1. Time consuming process
2. Unreliable and inefficient
3. High chances of proxy
4. Difficult to handle record

2.2 RF-ID system

Every student is issued an identification card which is RF-ID based on their name, photo, class and other related information. This card is used by students to mark their attendance on the card reader machine. Each card has different pattern that vary from card to card. When the student ID card came in contact with the RF-card reader, the reader will then detect and show the status of the ID card. But the reader can detect only one card at a time.

This requires time which is directly proportional to the strength of the class. There is a bright possibility that a student can take the other student's card for the purpose of proxy, which makes the system unreliable. The card reader sends the data of 40 kbps [2] to the server. Server will then arrange the data according to the instructions given by the operator.

Disadvantages of RF-ID system are:

1. Time consuming process
2. Maximum chances of proxy
3. Unreliable

2.3 Biometric verification system

Biometrics is the emerging technology used for identification. Biometric refers to automatic identification of a person based on biological characters such as fingerprint, iris, palm etc. Each part of the body requires different technique for marking attendance. Two major techniques which are widely used for verification of individuals are:

1. Thumb Scanning
2. Iris detection system

The thumb scanning is the technique that is used frequently worldwide. The thumb scanner is used to detect the specific pattern of each student's thumb. In thumb scanning technique, the impression of the thumb of each student is being stored into the server database along with their identity (name, roll number, picture etc.).

When a student place the thumb at the scanner, the scanner will search the whole data stored in it and compare it with the new input thumb expression. In case of verification, the scanner will automatically send the signal to the server to mark the attendance of the respective student. It wouldn't mark attendance, if the match doesn't found in its database. This system will help to eliminate the proxy factor.

Another problem is that thumb scanner's usually contain a large number of data to represent a unique personality. That's why system should need to send huge data packets [3] for every identity confirmation at the server. Disadvantage of this technique is that the process is again time consuming as every student have to mark the attendance turn by turn. It requires a huge amount of data to be transmit to the server which makes the system's processing speed slow.

Iris detection system is the system which is widely used by high security institutions. An individual's irises are unique and structurally distinct, which allow for it to be used for recognition purposes. Iris detection system will make an impression of the iris in its server with the help of iris scanner. Iris scanner throws a light beam to extract all information regarding specific iris. The scanner will then send the information to the server for the purpose of storing it. In such a technique, the irises information of all the students is first stored into the server with the help of iris scanner.

When any student came in contact with the scanner to mark the attendance, it will compare its iris pattern with the patterns that were stored in its database. Then the scanner will send the signal to the server to whether mark the attendance or not. The average execution time for the system is 4.29 second [4]. An Iris system sends approximately 2048 bits/second [5] to the server.

Biometric Technology	Accuracy	Cost	Devices Required	Social Acceptability
Iris Recognition	High	High	Camera	Medium Low
Retina Scan	High	High	Camera	Low
Facial Recognition	Medium Low	Medium	Camera	High
Voice Recognition	Medium	Medium	Microphone, Telephone	High
Hand Geometry	Medium Low	Low	Scanner	High
Fingerprint	High	Medium	Scanner	Medium
Signature Recognition	Low	Medium	Optic Pen, Touch Panel	High

Table 1. Comparison of different biometric techniques

Table 1. shows the comparison of different methods and their costs. It shows which method is cheaper and also tells its accuracy. The devices required for each method is also mentioned here and their social acceptability.

Disadvantage

- Maintenance is required due to high data traffic
- Expensive than other verification systems
- High data rate
- Infrared iris scanner beam is injurious to eye

2.4 Image processing system

The face is the identity of a person. This system consists of four phases:

- Face database
- Face detection
- Face recognition
- Marking attendance

This attendance is recorded by using a camera attached in the classroom that is continuously capturing images of students. The system first stores the faces in the database, then the faces are detected in the images.

The detected faces are compared with the faces stored in the database during face recognition. If the system recognizes faces, the attendance gets marked immediately of recognized faces. As image is the collection of hundreds of pixels and each pixel contain several bits. Hence, an image is usually a collection of megabits which is to be transmitted to the server.

Therefore, it increases the data traffic i.e. 1.347 MB/second [6]. As from above discussion, it is cleared that due the attendance will be marked on the basis of camera detection hence proxy element is eliminated. Disadvantages of image processing are:

- It is relatively expensive than other techniques
- High data transfer rate
- Low social acceptability

3. Frame Work

The problems from the previously mentioned systems lead us to design such a system which stops the proxy factor by authentic identification of each student which can be possible only with some biometric techniques.

The biometric technique will help to initiate the unique data of each student. Here a device is being introduced having a biometric component. This stops the proxy element as each student have their own biometric identity which can't be operate by other students.

Finalized framework

Each student will have their own device which will be provided by the institute, which will act as its id. The student device will have a biometric component patched onto it, which can only be operate by that specific student. As no other student can operate the other student device so the proxy couldn't be marked.

When the student operates its own specified device assigned to him, the data from the device will go into the node, which will be received by the data receiver. This data receiver should have the ability to communicate with a large number of devices. This received data will be send to the Micro-controller unit which transmits the data to server with the help of LAN (local Area network). The server will then receive the data for final operation as shown in Figure 1.

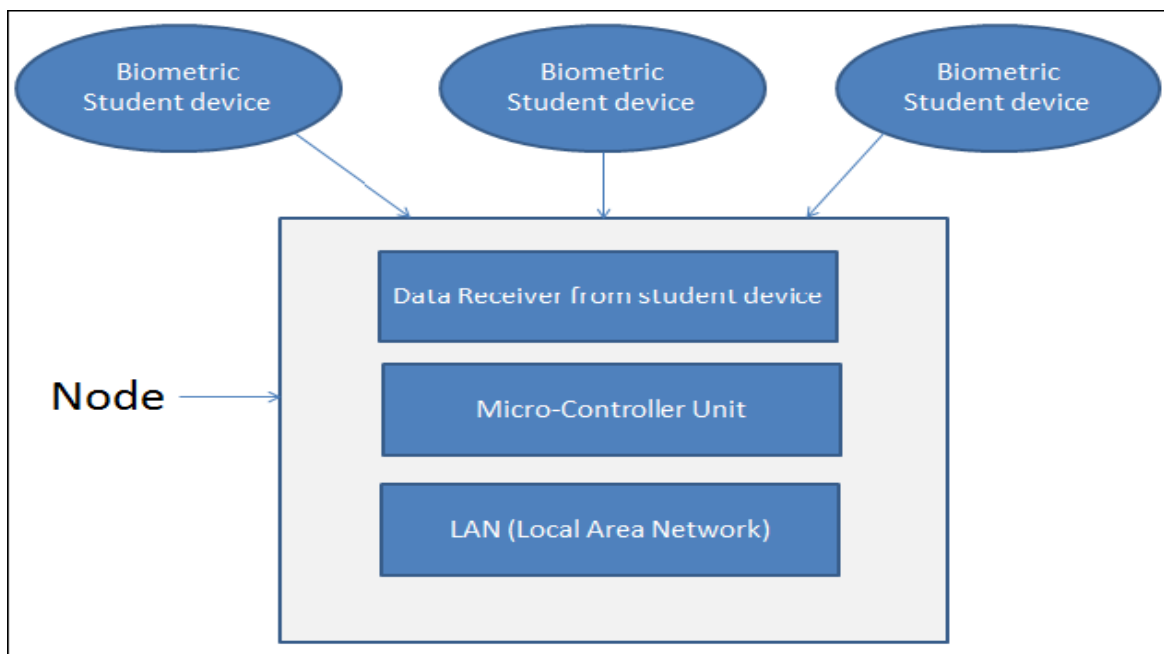


Figure 1. Flow chart for student attendance system

4. Methodology

The system is placed inside every classroom where we want to get the data of the attendance of students. It consists of 16X2 LCD, Arduino micro-controller and Xbee.

Purpose of this module is to:

- Receive the data of all student devices present inside the classroom.
- Sends the data to the server

The data transmitted by the Xbee present on the student device is received by the Xbee present on the Node. The Xbee is connected with the Arduino and the Arduino is further connected with the 16X2 LCD.

Now discussing the scenario that suppose a student thumb impression is stored in the student's assigned module. When the specific student place his/her thumb onto the R305 thumb scanner module the micro-controller in the student module will compare the thumb impression stored in it with the thumb placed onto the scanner.

In case that the thumb is matched then the Xbee present on the student device will transmit the data (the specific student is present in the class) to the Xbee present onto the node and command to mark the attendance of the particular student.

16X2 LCD and buttons are added for the purpose to check the status of the node. It is used in our prototype. Moreover buzzer is also added on Pin-11 of Arduino that will generate a beep incase the attendance is marked.

5. Comparison of Different Attendances Systems

Comparison of different attendance marking systems is given in Table 2.

Different Systems	Accuracy	Cost	Device Required
RFID	Medium	Medium	Card
Conventional	Low	Low	Only Paper Work
Biometric	High	High	Scanner
Image Processing	High	Very High	Camera

Table 2. Comparison of different marking attendance systems

6. Recommendations

This is a very basic project in this new field of engineering so it provides a very vital platform for future work and research. This project is not a prototype for commercial implementation so it needs a lot of future work to produce a commercial model for any industrial or domestic use.

As far as the communication is concerned, fifty years ago, the tools we rely upon to communicate today were only science fiction. But today, we have very much advanced communication technologies like 3G, 4G, ZigBee etc. We will see many new kinds of communication technologies in future as well, which we are not so familiar with today. In near future, we will be able to make more secure and reliable communication that would make us capable to create more intelligent and more efficient system.

The communication technique we are using in this project can be used in a more reliable way and for the easiness of customer interface. This technique is more advanced from the previous ones and can be seen in future in different fields for marking the attendance.

References

- [1] Satija, Namit (2015). Bluetooth Attendance System, Department of Computer Science and Engineering, Dronacharya, College of Engineering, Khentawas, Farukhnagar, Gurgaon, India
- [2] Saparkhojayev, Nurbek., Guvercin, Selim (2014). Department of Systems Analysis and Management, L.N.Gumilyov Eurasian, National University, Astana, 010008, Kazakhstan Engineering Faculty Suleyman Demirel University, Kazakhstan
- [3] https://www.researchgate.net/publication/228343257_Wireless_attendance_management_system_based_on_iris_recognition
- [4] <http://www.academicjournals.org/journal/SRE/article-abstract/29903A917333>