



## Biometric Based Attendance Management System Using Wi-Fi

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### Abstract

The importance of attendance taking and processing in educational institutions and corporate organizations cannot be over emphasized. Up till date, most institutions engage in the use of paper and pen in taking and processing of class attendance and this has proven to be very stressful, time consuming, unreliable, inaccurate and inefficient. However, it has been empirically proven over the years that no two human beings have the same fingerprint. Therefore, we adopted fingerprint biometrics in this work to develop a wireless attendance management system using wi-fi for processing and management of class attendance. The developed system is not only robust but trial tests conducted using 5 sample students at Dr Ambedkar Institute of Technology, Bangalore, India, achieved good level of accuracy for the first signing attempt.

**Keywords:** *Biometrics, Fingerprint Recognition, Attendance Management System.*

### 1. Introduction

The human body has the privilege of having features that are unique and exclusive to each individual. This exclusivity and unique characteristic has led to the field of biometrics and its application in ensuring security in various fields. Biometrics has gained popularity and has proved itself to be a reliable mode of ensuring privacy, maintaining security and identifying individuals [1–8]. It has wide acceptance throughout the globe and now is being used at places like airports, hospitals, schools, colleges, corporate offices etc.

Accuracy and reliability are the two most important parameters when it comes to biometric applications. Fingerprint is one of the oldest known biometric techniques known but still is the most widely used because of its simplicity and good levels of accuracy. It's a well-

known fact that every human being is born with a different pattern on the fingers and this feature is exploited to identify and differentiate between two different persons.

A model for fingerprint based student attendance system using GSM was developed in [1]. Here a GPRS based system stores fingerprint data student details. Administrators can interact data being sent using this device from a central server. An RFID technology based attendance management system in which every RFID tag has a unique ID consisting of details of the student [2]. The RFID tag can be read from the details of the student using RF wave's transponder and antenna. A low cost remote attendance tracking system named as Hyke is presented in [3] for developing regions in which the students were identified based on their spoken words. The spectral content of the voice was analyzed to build model for speaker recognition. An implementation of a wireless network for class attendance system using face recognition and GSM in which the system consists of camera that captures the images of the classroom and sends it to the image enhancement module [4]. The attendance is marked on the database server. Classroom and authenticated authorities are connected through Zigbee network. In authors in paper [5] developed a Wireless Iris Recognition attendance management system. Here a digital image of a person's eyes to be verified is captured, a feature extracting algorithm is carried out and minutiae are extracted and stored as a template. These templates are compared against stored templates in the database and the attendance is marked for corresponding students.

The fingerprint recognition and verification technique can easily replace an attendance sheet and save time wasted on calling out roll numbers in the class. A

fingerprint detecting device needs to be placed in each classroom and students would be made to swipe their finger over the sensor so as to mark their presence in the class. The database would contain all the fingerprints beforehand. So, the moment a finger would be swiped, a check would be carried out with the existing database and the corresponding student would get a present mark on his attendance record maintained in a server.

The transfer of the fingerprint from the device to the server can be carried out wirelessly using certain wireless adapters which can together form a wireless network in a short range and carry out the verification process. The communication channel needs to be secured and should be kept free from interference as far as possible. For further security of the entire system and to detect illegal activities, a security camera can be installed to keep track of the enrollments made in the classroom.

The paper is organized as follows. In Section II, the block diagram of the proposed system is given. In Section III, the Circuit diagram is explained. Results and discussion is presented in Section IV and finally the paper is concluded in Section V.

## 2. Proposed Attendance Management System

In this section the block diagram of the proposed system and the circuit diagram is presented.

### 2.1 Block Diagram

The block diagram mainly consists of the following block elements as shown below in Fig. 1.

- **LPC-2148 Microcontroller-** Master controller which processes the input/output and controls the working of the entire system
- **Wi-Fi Module-** Used to transmit data wirelessly b/w classroom and server/PC
- **Bio-metric Fingerprint Device-** Used to capture and process the fingerprint
- **LCD Module-** Used to display the output of the system
- **Database-** Used to store the student attendance related information

The module-wise approach to the design of the system helps in better understanding of the individual function levels. Also, a parallel approach to the system helps in distributing the effort on a multi-level range and helps in identifying the best features and available products in the market that suit the design requirements.

To view the system as an assemblage of sub-components helps in simplifying the design problems -

- Module
  - Fingerprint Capture
  - Wireless module
- form the Client Hardware Module.

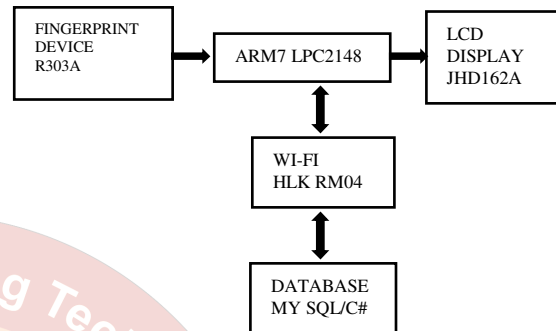


Fig. 1. Block Diagram of the Proposed System

### 2.2 Circuit Diagram

The circuit diagram of the proposed Wireless Attendance Management system is shown in Fig. 2. The data lines D4-D7 are used to transmit the data (to be displayed on the LCD module), from the microcontroller to the LCD. The En pin is connected to P1.25 of the microcontroller; a pulse on this En pin enables the LCD to receive data. The Wi-Fi module is connected to COM1 port of the microcontroller. Fingerprint device is interfaced through COM0 Port. The microcontroller is fed through a 9V power supply and the Wi-Fi module through a 5V.

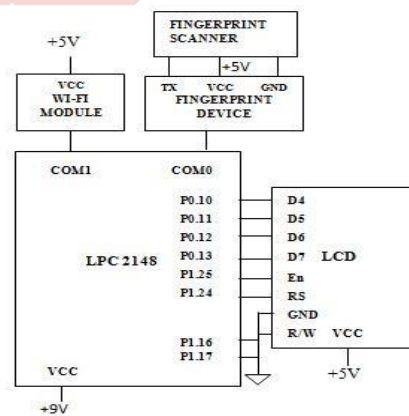


Fig. 2. Circuit Diagram of the Proposed System

## 3. Results and Discussions

To All sections of the system were tested starting with the administrative part of the attendance. The test results shows that the system is effective and it has a fast response. There was no false identification of students, few cases of false reject which was later accepted and only pre-registered students were authenticated. The identified students were enrolled for attendance automatically.

The system can store a maximum of 256 fingerprint templates. However, for testing purpose, the system was tested using the fingerprints collected from 5 students from the Department of Electronics and Communication Engineering. The Wi-Fi router in our system could successfully transmit the data up to a range of about 15m, indoor.

The testing of the system was done in three phase:

- A. Enrolment and registration phase
- B. Verification and normal attendance usage phase
- C. Attendance update and report phase

### 3.1 Enrollment and Registration Phase

In this phase is the user fingerprint as well as the other bio-data is stored for the first time into the database for student registration. The courses, lecturers are also registered at this phase. All data and information required for the proper recording of attendance are enrolled. Fig. 3 shows a fingerprint being enrolled.



Fig. 3. Fingerprint enrolment

### 3.2 Verification and normal attendance usage Phase

The lecturer selects the course and then the student places his/her fingerprint on the fingerprint reader. The fingerprint recognition unit compares the fingerprint with those stored in the database. The possible cases are:

- Match (of Fingerprint): captured user fingerprint features are matched with stored fingerprint templates. The user is automatically recorded for that lecture. A message, as shown in Fig. 4, is displayed to show that the user has been recorded for the attendance.
- Non-match (of fingerprint): the user is not accepted for attendance and a message, as shown in Fig. 5, is displayed on the LCD that the fingerprint is not found.



Fig. 4. Match of fingerprint and attendance enrolled



Fig. 5. Non-match of fingerprint

### 3.3 Attendance update and report Phase

The administrator can login in with the credentials to view the student attendance report as shown in Fig. 6.

Reports are generated for each course and the total number of students who have enrolled for a particular course and their attendance status is updated as shown in Fig. 7.



Fig. 6. Administrator login

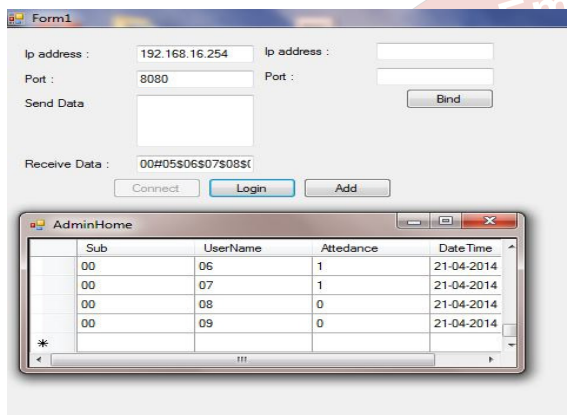


Fig. 7. Students' attendance report

The students could also login with their credentials to view their attendance report as shown in Fig. 8. This is a “read-only” access.

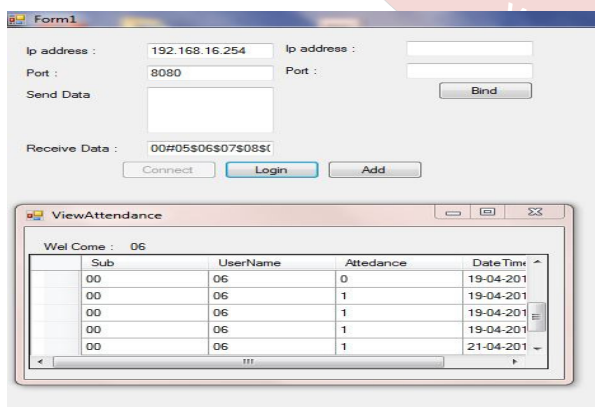


Fig. 8. Individual student attendance report

In the test, there was no false acceptance i.e. a person that was not pre-registered was not falsely enrolled for attendance. There were a few false rejections during the test in which the system failed to identify some pre-registered users. The false rejects could be attributed to improper placement of the finger on the scanner and fingers that have been slightly scarred due to injuries.

The fingerprint identification, in which the comparison of the fingerprint image is done many times, is completed within a short time. The total period to register a new user i.e. sense the fingerprint and input the bio-data is about 7 seconds. For the actual attendance collection process, the total time taken to sense the fingerprint, identify the user and record the attendance for that particular course is less 5 seconds. Thus it can be effectively implemented in classes with large population.

Thus the proposed system scanned the fingerprints placed on the device sensor and compared them against those stored in the database successfully. The performance of the system was acceptable and could be considered for full implementation especially because of its short execution time and reliable report generation.

The advantages of the proposed system are,

1. It is convenient to use for both the students and lecturers.
2. This application is very useful in all the educational institutions.
3. This application is easy to install and easy to operate.
4. Manpower can be saved.
5. Faster and reliable than manual operation.

## 4. Conclusions

The system successfully simulated attendance recording. The prototype successfully captured new fingerprints to be stored in the database; scanned fingerprints placed on the device sensor and compared them against those stored in the database successfully. The performance of the system was acceptable and would be considered for full implementation especially because of its short execution time and reports generation.

It can be concluded from the all above discussion that a secure, fast, reliable and an efficient portable system has been developed replacing the manual and unreliable system of marking attendance

## References

- [1] Zhang Yongqiang and Liu Ji ,”The design of wireless fingerprint attendance system”, Proceedings of ICCT '06, International Conference on Communication Technology, 2006.
- [2] Younhee Gil, Access Control System with high level security using fingerprints,IEEE the 32nd Applied Imagery Pattern Recognition Workshop (AIPR '03)
- [3] Jain, A.K., Hong, L., and Bolle, R.(1997), “On-Line Fingerprint Verification”, IEEE Trans. On Pattern Anal and Machine Intell, 19(4), pp. 302-314.
- [4] D.Maio and D. Maltoni. Direct gray-scale minutiae detection in fingerprints. IEEE Trans. Pattern Anal. And Machine Intell., 19(1):27-40, 1997.
- [5] Lee, C.J., and Wang, S.D.: Fingerprint feature extraction using Gabor filters, Electron. Lett., 1999, 35, (4), pp.288-290.
- [6] L. Hong, Y. Wan and A.K. Jain, "Fingerprint Image Enhancement: Algorithms and Performance Evaluation", IEEE Transactions on PAMI ,Vol. 20, No. 8, pp.777-789, August 1998.
- [7] Luigi Rosa, “Fingerprint Recognition System”.
- [8] Shlomo Greenberg, Mayer Aladjem, Daniel Kogan and Itshak Dimitrov, “Fingerprint Image enhancement using Filtering Techniques”.
- [9] <http://ww1.microchip.com/downloads/en/DeviceDoc/39630C>
- [10] Wi-Fi (wireless networking technology)". Encyclopædia Britannica. Retrieved 2010-02-03.
- [11] [http://sviehb.files.wordpress.com/2011/12/viehboeck\\_wps](http://sviehb.files.wordpress.com/2011/12/viehboeck_wps)
- [12] <http://www.datasheetcatalog.org/datasheet/vishay/128g0641>
- [13][http://www.geeetech.com/wiki/index.php/Graphic\\_LCD\\_128x64\\_STN\\_LED](http://www.geeetech.com/wiki/index.php/Graphic_LCD_128x64_STN_LED)

