ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 3, March 2018

Indoor Mapping Based Smart Attendance System Using Biometric Authentication System

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ABSTRACT: Biometric security is advantageous as every individual has unique traits that cannot be forged, stolen or lost. That is, it is directly connected to a person because they make use of an individual's unique feature for identification and authentication.
Time and Attendance System provides many benefits to organizations, Offices, Colleges. It enables an employer to have full control of all employees working hours. It helps control labor costs by reducing over-payments, which are often caused by transcription error, interpretation error and intentional error. Manual processes are also eliminated as well as the staff needed to maintain them. It is often difficult to comply with labor regulation, but a time and attendance system is invaluable for ensuring compliance with labor regulations regarding proof of attendance. We implement Indoor Mapping Based Smart Attendance System Using Biometric Authentication System. In our system every college has a specific location, which is determine by the Wi-Fi. The location of an staff can be determined by Wi-Fi technology using smart device. If the location of staff and the location of college is same, then it should be said that, the staff is in the college, then system take input as a fingerprint for performing biometric authentication. When staff goes outside after marking attendance then the notification is send to server by using indoor mapping technique. This system use location as a proof of attendance and proposed a new time and attendance system based on location.

KEYWORDS:RSSI (Received Signal Strength Indicator), Indoor Mapping, Wi-Fi technology.

I. INTRODUCTION

Today, several institutions of higher learning areusing access cards as access control measure to gain access to their institutions and facilities. Security in general term can be considered as the provision of information integrity, confidentiality and available [1]. Security has become a great concern to individual, organizations and the government as they tend to find a better way to protect their information and valuable assets.Though, these cards are simple and convenient in terms of usage, they offer the lowest security strength as they are often prone to lost, theft, forget and clone. If compromised, valuable information and asset can be stolen or destroyed. However, every institutional security goal is to protect the students, staff, information and assets. Thus, to strengthen the security level, institutions should provide security measure that is difficult if not impossible to compromise.
This system presents an attendance system which is easier to use and less prone to error and makes use of technologies already existing in institutes. An attendance system should be easy to use by the teachers and students alike [1]. It should not require additional hardware or be incur additional costs. The attendance system must be less prone to errors or technological failures and should be robust. Digitizing the attendance system allows us to not only calculate the attendance faster but also helps us to track the staff who goes outside of college area after marking attendance. It will also help the teacher to generate salary record as per present days.

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II. PROJECT IDEA

This system presents an attendance system which is easier to use and less prone to error and makes use of technologies already existing in institutes. Anattendance system should be easy to use by the teachers and students alike. Itshould not require additional hardware or be incur additional costs. The attendancesystem must be less prone to errors or technological failures and shouldbe robust. Digitizing the attendance system allows us to not only calculatethe attendance faster but also helps us to track the staff who goes outside ofcollege area after marking attendance. It will also help the teacher to generatesalary record as per present days.

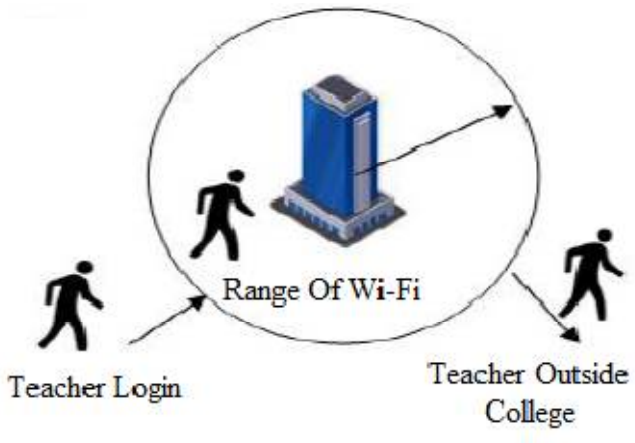

Fig1. Project Idea

III. PROBLEM STATEMENT

Biometric system is a technique that has been used for many years; The use of this system to monitor the attendance of staffs has revealed itself very successful as it increases the staff accountability and boosts the workers toward good professional conduct.

IV. LITERATURE SURVEY

A literature review can be refers to as a review of current system that the researcherhad done previously and the review of the system that will be developed.Literature review also focuses on the knowledge and ideas established
on a topic as well as their strengths and weaknesses. Nowadays, technologyis getting better and better to replacing the traditional system to speed up theprocess by introducing the computerized system. There are few types of attendancesystem that had been introduced nowadays in school, college, anduniversity.

4.1 Student Attendance Management:

This attendance system software is requiredto replace the traditional attendance system for a purpose to reduce theprocessing time and the paper work cost used in traditional attendance system.This system main objective is to indicate the disadvantage of the traditional attendancesystem compared to the proposed system. On the other hand, it hadshown that the proposed system only provide a very simple application withsome features that allow the users to manage their student attendance moreeasily and effectively. As mentioned in system, it did not include any specialhardware (such as fingerprint scanner, mobile phone, bar code scanner,and etc.) in order to make the software

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work. It only requires basic equipmentsuch as a set of desktop computer. In short, the proposed system onlyrequires the users to install the software to their laptop/desktop for managingtheir student attendance.

4.2 RFID Based Attendance Management System:

In this system RFID BasedAttendance Management System (Microtones Technologies, 2013), it hadknown that the attendance is needed to be taken in several places like school,college, university, and workplaces. This system main objectives had concernedabout to replace the old traditional attendance system technology withRadio Frequency Identification (RFID) technology. It is carry out to overcomesome existing problems occur in the traditional attendance system. It also mentioned that the RFID system is developed and issuitable to take the attendance of the students as well as employees. Thereare two modules introduced in the article which includes reader module andRFID module. In details, each student/employee must have a valid RFID cardof RFID tags with them in order to communicate with the RFID reader placedon their workplace/school. As mentioned in the system, the RFID reader willautomatically detect the student/employee attendance and record it while theRFID card gets closer to the RFID reader which means it is using the noncontacttype of reader and passive types of card. From the system, we canget to know that the attendance system using RFID technology is much betterthan the traditional attendance system in school/workplace as almost whole the system is done in automation and with high transparency process.

4.3 Bar Code Scanner Based Student Attendance System (SAS):

In this systemBar Code Scanner Based Student Attendance System (SAS) it had known thatstudent attendance and participation among a class is very important in order toachieve good academic outcome of a student and school. This system main objectiveshad concerned about to replace the non-automated attendance recordsystem with the barcode scanner technology in order to record and managethe student attendance records more efficiently and effectively. As mentionedin the system flow, RFID-based technology and biometric-based technologyis sometime too costly to implement into a school since it requires purchasingof certain hardware in order to get the system work. Compare to bothRFID-based technology and biometric-based technology, barcode technologyobviously shown that it is cheaper than both the technology.Barcode scannerattendance system had been introduced to improve the admin staff managing process such as process daily, weekly and yearly student attendance report. Inthe barcode scanner technology, student will be issued a student card for eachof them with the barcode displayed on the card for a scanning purpose everytime they attend the classes. Student attendance status will be automaticallychecked and record into the system once lecturer scan their student card withbarcode scanner.

V. PROPOSED WORK

The proposed system provides a solution to manual attendance taking problem. This system is a location based smart time and attendance tracking system based on the concept of web services which is implemented as an android mobile application.A unique user ID and location (W-Fi coordinate) was associated with the application. A time and attendance software was installed on workstation for process the data receive from user mobile and store the information (time, entry and leaving) to the Database.The user has to install the respective APK files developed for them on their android devices. At first it is important to save the college coordinates by entering the latitude, longitude and radius of area. User has to save the IP (internet protocol) address of the office internet. At the same time one user can save their information through the info menus of the App.
This location based time and attendance tracking system locates your position and logs your login and logout time. As the staff enters his workplace area, the system connects to the office internet and sends the staff id and local time to the server. Then the server gets the local time and stores the information in a database. Again when staff leaves the office area, the system notifies the office server that the staff is leaving.

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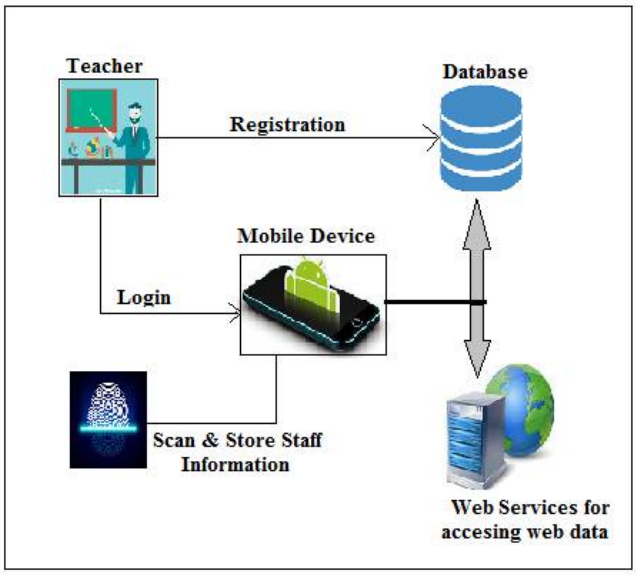

Fig 2. System Architecture

This system employs four hardware and software components, described as follows. The smart phone is built-in with a Wi-Fi receiver, which can receive radio signals from satellites, respectively.
Google maps API (Application Programming Interface) is used here for finding personal meaningful location; based on the GPS readings, the application can perform geo-locationing to estimate the current location of the user [9].
Then the application sends the location and user Id to Time and Attendance Management Software for further process. After processing the data the management software store the information to database.

VI. IMPLEMENTATION MODULES

1. Registration module:
In the system the staff/student first need to register. User details will be authenticated from the super admin and staff/student will be registered successfully.

2. User authentication:
Initially, when the professor runs the application for the first time, a loginscreen will be displayed that will prompt the professor to enter the usernameand password required for authentication. Only when the professor enters the correct username and password, a success message will be displayed and theprofessor will get authenticated and directed to the next screen.

3. Wi-Fi Module:
This module checks that the staff is present in college area or not. In this module,The web service thus invoked sends all this data to the server via Wi-Fi.The respective http files are executed on the server with the SQL queries andthe result of queries is sent back to the application.

4. Marking attendance module:
In this module attendance is mark when staff is present in college area andstaff is authorized.

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5. Biometric verification module:
For that, any unique biological specimen is needed which would prove the staffidentity. The best and most convenient way is to use fingerprints. Biometricfingerprint scanner circulated in the class and verification is done by matchingthe obtained fingerprint image with the fingerprint images stored on the server,and the student is notified for the same. If verification fails, then attendancemarked in process, is deleted from the database.

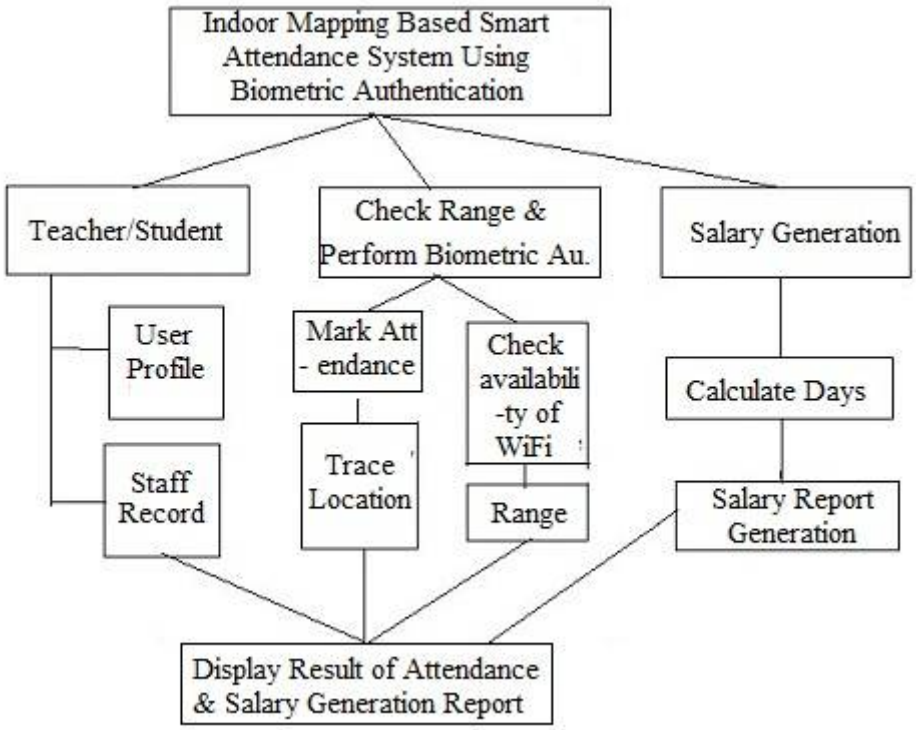

Fig 3. Implementation Module

6. Server Module:
On the server side its store the user information into database. The server havedatabase of registration, login information. The communication between theapplications is done using client server communication model (httpRequest,httpResponse).when the user login in to the system the information is retrievefrom the database authenticated. The login time information is saved into thedatabase. If the users are location remains same for specified time which is on the server, then server sends an alert. If user moves away from the range (minimum distance) then server automatically logged out the user.

VII. METHODOLOGY OF PROBLEM SOLVING

At first staff has to install the required system APK files into their android device.Mobile location service has to be on when the system was running. If mobile locationservice is off then the whole process will not go further. Mobile location servicehelps to trace the staff location. When the staff enters the college area, androiddevice of the staff is automatically connected to the college internet and then theattendance is mark by staff using biometric verification. When staff goes outsidethen the notification goes to server.

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7.1 RSSI (Received Signal Strength Indicator)
We propose a RSSI (Received Signal Strength Indicator) algorithm to detect the Wi-Fi network which is detected by devices. Signal Quality is a value from 0 percent to100 percent. The higher the number the better the link quality. These are theoreticalnumbers for ideal conditions in regards to local noise. Depending on the system anddevice you use it can be determined differently and is based on signal strength andSNR margin. Usually the signal is usable if the quality is above the level of 25-30percent.

SNR margin = signal(dBm) –noise (dBm)
E.g. if signal (RSSI) = -55db, and noise = -85db, then:
(-55db signal) - (-85db noise) = 30 SNR margin
Higher SNR margin values mean clearer signals. As an example, using the full
54 Mbps data rate will require at least 25 dB of SNR margin.

Generally,
db >= -50 db = 100 percent quality
db<= -100 db = 0 percent quality
For RSSI signal between -50db and -100db,
quality = 2 * (db + 100)
RSSI = (quality / 2) - 100
For example:
High quality: 90 percent = -55db
Medium quality: 50 percent = -75db
Low quality: 30 percent = -85db
Unusable quality: 8 percent = -96db
7.2 Fingerprint Matching Genetic Algorithms (GA)

Input: Fingerprint image
Output: Authentication
Method:
Step 1: Use of fingerprint manager package to record the fingerprint.
Step 2: 32 bit hex decimal value is calculate
Step 3: It also called as hash value which consist 0-9 and A-F.
Step 4: MD-5 algorithm
Step 5: Use of message digest method to calculate hash value.
Step 6: Detect image and generate result.
Step 7: Authentication Result.
Step 8: Display Result.

VIII. DEVELOPMENT ENVIRONMENT

The proposed system requires Eclipse that is an open source software development environment. Eclipse consists of an Extensible plugin system and an IDE. The Android project has been developed in the Helios version of Eclipse, as it has plugins that are mainly used for Android.
8.1 Android SDK: Integrated Development Environment (IDE) is used in Android development in order to make it more straight forward and quick. It has been recommended for the developers because of its simplicity in working. Android is basically a multitasking platform. To give an example, the application has one application for navigation, another application for games, and another messaging. These applications can work simultaneously because of this multitasking ability of the Android platform.

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8.1.1 ADT Plugin:ADT (Android Development Tools) is a plugin developed by Google. Its main purpose is for developing Android mobile applications in Eclipse. It makes it easy and convenient for all the Android developers working in Eclipse environment to quickly create Android projects and debug the programs whenever needed.
Text editor should not be used in the development of large applications having a large amount of code as the text editor cannot highlight wrong spellings.
8.1.2 Android Emulator: Android emulator is a virtual mobile device which is included in every Android SDK which runs on the user's computer. Android emulators are used to test Android applications, so there is no need of any physical device. Android emulator supports Android Virtual Device (AVD) configuration, which in itself is an emulator containing specific Smartphone Operating System. Using AVD, one can easily test his applications.

IX. RESULT

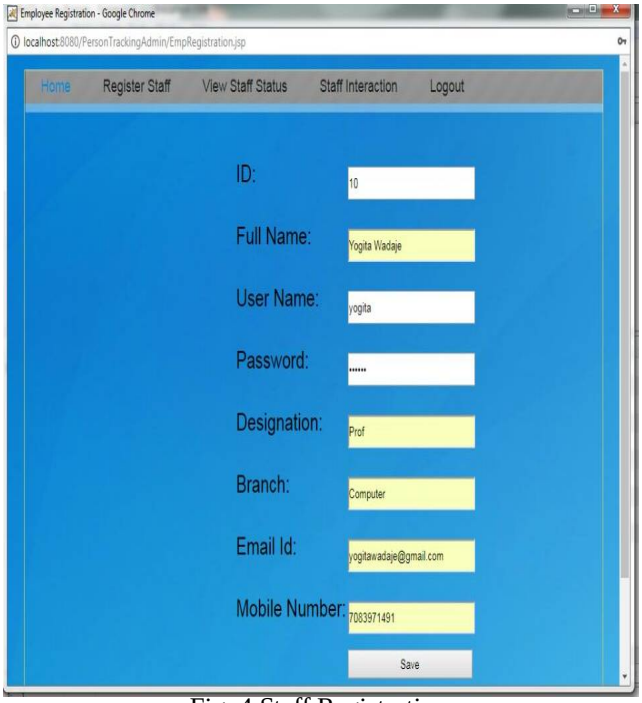

Fig. 4.Staff Registration

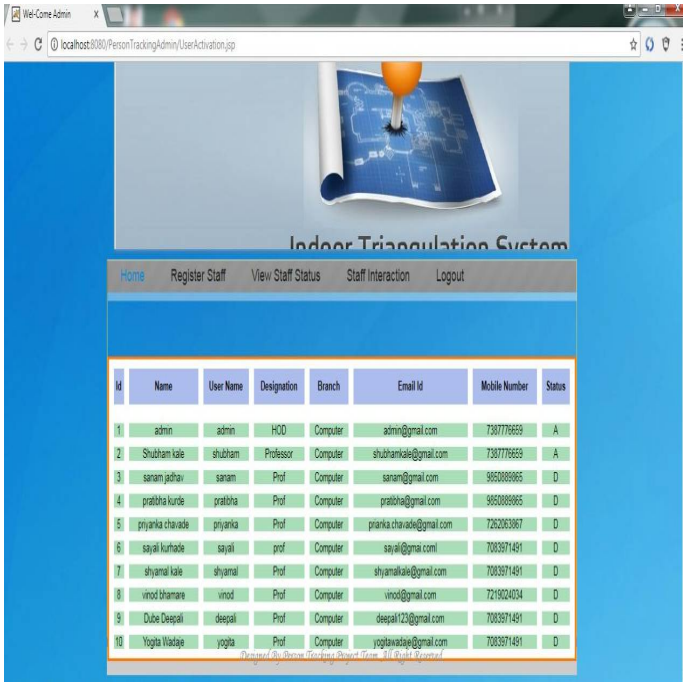

Fig. 5.Register Entry in Database

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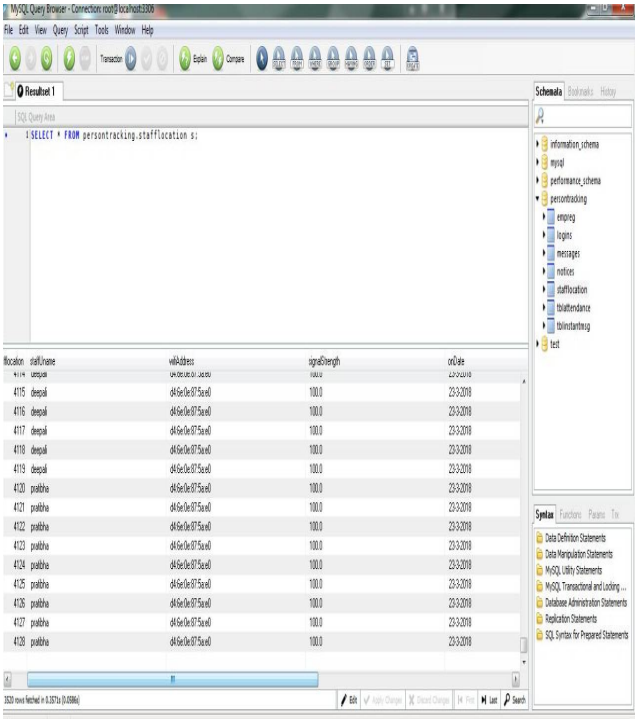

Fig. 6.Range Detection

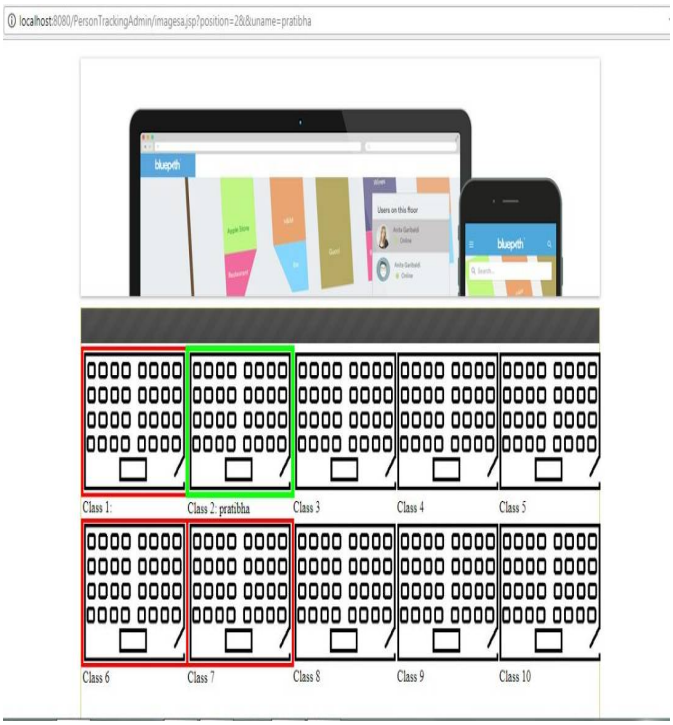

Fig. 7. Detected Staff Location in Class2

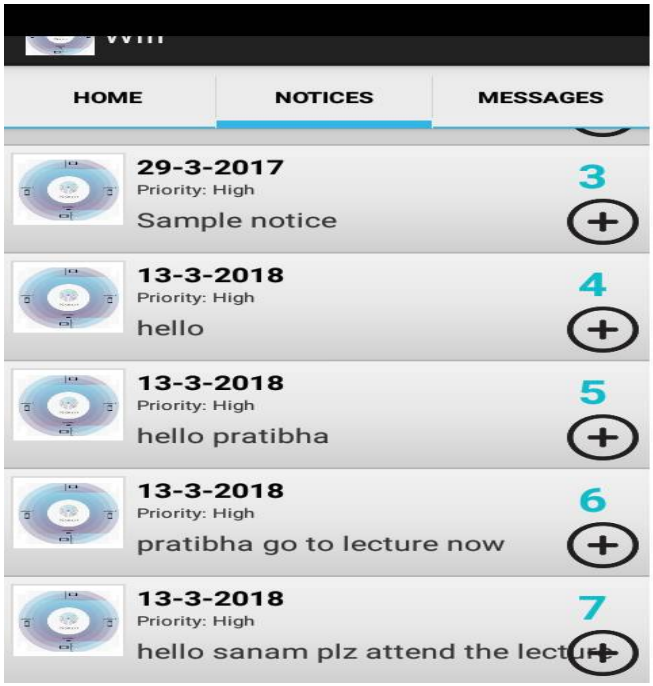

Fig 8.Notices send on Staff's Mobile

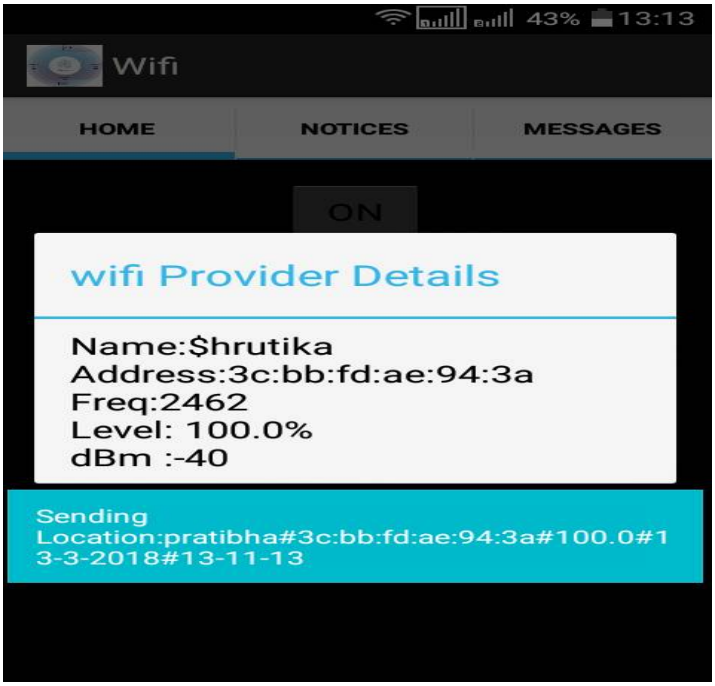

Fig 9.Server (Wi-Fi) Provider Details

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X. CONCLUSION

In conclusion, fingerprint recognition attendance system will be developed to replace the traditional attendance system that are currently widely using by many colleges and universities. This project will be considered succeed once hybrid staff attendance is developed. This system is designed to make the whole attendance taking and salary generation process to become more reliable, convenient, efficient, and accurate. Besides that, with the implementation of biometric technology will help in reduce errors and attendance data will be able to compile in easier way.

XI. FUTURE SCOPE

1. Performance can be increased in terms of speed and memory.
2. A speaking voice alarm can be used to indicate unauthorized person accessing the system.
3. The system can be made to communicate with modems or mobile phones.

XII. ACKNOWLEDGEMENT

I would like to present very special thanks to my project guide, Prof. N. R. Pinjarkar and Prof. P. S. Kale who had guide me since the beginning of Paper Writing. Thanks to him for provide guidance, advice, and useful feedback either in documentation parts or technical parts. Besides that, my thanks also go to my friends who keep on encouraging me while I facing problem.

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