

Hostel In Out Management and Monitoring System Using RFID, Face and Thumb Recognition

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ABSTRACT: Security in the hostel is one of the most persistent problems that organization needs to address. Nowadays security is a prime concern in every human beings life. To maintain daily attendance record is complicated and time consuming system for the hostel management. The numbers of existing systems are based on RFID monitoring and making students attendance at school but having limitation. To avoid this entire problem hostel in/out management and monitoring system is proposed. The system makes automatically monitor entry/exit of student from hostel and gives alert SMS to student parents for high safety. In this system each and every student has to store their finger print data base, unique RFID card No. and photograph with their parents' mobile number. Face recognition is known to be the most natural ones, since that uses to identify students in hostel. Fingerprint identification also provides better performance. The system is based on the ARM 11 microcontroller, Finger print scanner, Camera, GSM module, RFID reader and passive RFID tag. Microcontroller ARM 11 is heart of system which will process the functioning of total system. In present system In/Out management and monitoring of student in hostel is done by using RFID technology, Face Recognition system and Finger Print scanner. Alert student parents by sending SMS using GSM module. This system is working without human interface. The goal of our system is to provide security to hostel students and alert their parents about their in/out timing in the hostel. Parents get the sense of security by knowing the current information about in and out of their child in hostel.

KEYWORD: RFID card reader, camera, fingerprint scanner, raspberry pi

1. INTRODUCTION

Security in the organization is one of the most persistent problems that organization needs to address. Nowadays security is a prime concern in every human beings life. In today's fast life parents do not have time to visit the college hostel to know the student in/out time in hostel. Today students' attendance is become more important part for any organizations. Recording and monitoring of hostel attendance is an area of administration that can require significant amounts of time and effort in a hostel environment. The system having student name, roll no., branch, year, photo, figure print and parents mobile number stored in hostel database. The system is specially proposed for hostel management and monitoring. The system is based on the ARM 11 microcontroller, finger print scanner, Face recognition system, GSM module, RFID reader and passive RFID tag. The system automatically takes attendance of student present in the hostel which is helpful for hostel management. In the proposed system the in/out monitoring of student is done by using finger print scanner, RFID card and Face recognition system and send alert SMS to parent of student with the help of GSM module.

The ARM11 is heart of this project, ARM is Advanced RISC Machine. ARM is based on the ARMv6 instruction set architecture. GSM is most widely used among the digital wireless telephony technologies. The GSM modem equipment has a Subscriber Identity Module (SIM) with security and authentication. The advantage of GSM is its international roaming capability in over 100 countries, improved battery life, efficient use of spectrum, advanced features such as short messaging and caller ID, a wide variety of handsets and accessories, high stability mobile fax and data up to 9600 baud. RFID is an electronic technology by which digital data encoded in an RFID tag is decoded

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utilizing a reader. RFID system do not required line of sight access to the tag in order to retrieve the tags data and they are well matched to harsh environments. RFID tags consist of an integrated circuit (IC) carrying of an antenna, a small coil of wires with some defensive packaging as determined by the application requirements. RFID tags are either passive or active. The benefit of passive RFID is that it does not require internal power source, actually the circuit on the tag is powered by the carrier signal. Finger print scanner is used for the biometric attendance of student in hostel. Optical biometric fingerprint reader with great features and can be embedded into a variety of access control, attendance, safety deposit box. It is having Low power consumption, low cost, small size, and excellent performance. Camera is used for face recognition system. Face recognition is an important part of the capability of human perception system and is a routine task for humans, while building a similar computational model of face recognition. Face recognition system is having most importance in this system.

In proposed system, entry and exit of each and every student is monitor by using RFID card, figure print scanner and face recognition system. Every student has the passive RFID tag as identity card. Every tag is having unique card number. When the RFID card number, face and finger print is compared with stored database of the student and if the database is match then the students allowed to entry or exit from hostel. At the time of entry/ exit of student information about entry/ exit is saved into database and sends information is sent to student parents via SMS using GSM module. The system is fully automated system.

The goal of our system is to provide the security to hostel student and develop fully automated management system for hostel and send alert SMS to parent of students about the entry and exit of student form hostel.

II. RELATED WORK

Yohei Kawaguchi et.al proposed, the system to take attendance of students for classroom lecture automatically using face recognition [1]. This method estimate the attendance precisely using all the results of face recognition obtained by continuous observation and improves the performance for the estimation of the attendance. The lecture attendance system based on face recognition, and applied the system to classroom lecture. The system estimates the attendance and the position of each student by continuous observation and recording. The result of our preliminary experiment shows continuous observation improved the performance for estimation of the attendance. The face is the identity of a person. The methods to exploit this physical feature have seen a great change since the advent of image processing techniques [2]. The system describes aims to deviate from such traditional systems and introduce a new approach to identify a student using a face recognition system i.e. the generation of 3D Facial Model. This system implemented an attendance system for a lecture, section or laboratory by which lecturer or teaching assistant an record student's attendance. It saves time and effort, especially if it is a lecture with huge number of students. The complete system is implemented in MATLAB.

Managing people is a difficult task for most of the organizations, and maintaining the attendance record is an important factor in people management [3]. To overcome this problem system is developed, it takes attendance electronically with the help of a fingerprint sensor and all the records are saved on a computer server. Fingerprint sensors and LCD screens are placed at the entrance of each room. In order to mark the attendance, student has to place his/her finger on the fingerprint sensor. On identification student's attendance record is updated in the database and he/she is notified through LCD screen. The system will save time, reduce the amount of work the administration has to do and will replace the stationery material with electronic apparatus. The integration of RFID with biometric technology is to enhance the security level in the boarding school management system [4]. The application of boarding school monitoring system will improve school management procedure, monitor the interest group movements automatically and increase assets security thus offers an important implication for monitoring the BS assets and eases the workload of the school management and save time for various student activities. When the metric card passes through the RFID reader, it will trigger the system to read the data from the RFID tag to the database where the access data can be viewed online by BS management for monitoring purposes. For the facilities room access, RFID will be detected when someone with an RFID tag passes through the RFID reader and verify by matching fingerprint image.

In 2012, Rajan Patel, Namisha Patel et. al. proposed, the system having integration of ubiquitous computing systems into classroom for managing the students' attendance using RFID technology [5]. A real time intelligent system is implemented in conjunction with RFID hardware to record students' attendance at lectures and laboratories in a school/university environment. RFID is allows for a tag affixed on identity card to communicate wirelessly with a

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reader, in order for the tag's identifier to be retrieved. It is easy, accurate, fully automated students attendance monitoring system and providing more services to automate educational institution's processes. The fingerprint matching based on minutiae matching was proposed by Hemlata Patel. Fingerprint technique is one of the most popular applications in both identification, and verification [6]. In the biometric technique there is a need of biometric device and this technique is not available everywhere. The method based on minutiae matching that is to extract features of so called minutiae points from the fingerprint image, and check matching between the sets of fingerprint features. After checking it verifies the fingerprint and show identification of employee. Checking students' attendance is one of the important issues for universities, because many universities evaluate student's attendance and while giving the final grade, professors consider their total number of appearances on classes during the whole semester [7]. RFID based attendance control system is flexible, which means that it may be extended by adding more modules. The cards that have been employed for this specific system are RFID cards, and the algorithm used has shown stable and reliable results. These cards can be put to use at the university and may replace student ID cards. RFID technology continues to develop, and the time has come for us to avail ourselves of its promise and convenience.

O. Shoewu, O. A. Idowu proposed, an attendance management system using biometrics. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time [8]. For student identification, a biometric identification based system is used. The results show improved performance over manual attendance management system. Attendance is marked after student identification. The system successfully took the attendance both at lectures and examinations. The prototype successfully captured new fingerprints to be stored in the database and scanned fingerprints placed on the device sensor and compared them against those stored in the database successfully. Students attendance in the classroom is very important task and if taken manually wastes a lot of time [9]. This work describes the efficient algorithm that automatically marks the attendance without human intervention. This attendance is recorded by using a camera attached in front of classroom that is continuously capturing images of students, detect the faces in images and compare the detected faces with the database and mark the attendance. Face recognition has been a fast growing, challenging and interesting area in real time applications [10]. A large number of face recognition algorithms have been developed in last decades. This include PCA, LDA, ICA, SVM, Gabor wavelet soft computing tool like ANN for recognition and various hybrid combination of this techniques. This review investigates all these methods with parameters that challenges face recognition like illumination, pose variation, facial expressions. Present study reveals that for enhanced face recognition new algorithm has to evolve using hybrid methods of soft computing tools such as ANN, SVM, SOM may yields better performance.

Then in 2013, Seema Rao and K. J. Satoa had aim is to develop an accurate, fast and very efficient automatic attendance system using fingerprint verification technique [11]. It is the system in which fingerprint verification is done by using extraction of minutiae technique and the system that automates the whole process of taking attendance. The study was conducted using a quantitative approach by designing a questionnaire as the data collection instrument based on fingerprint matching biometric technologies. The results however show that fingerprint biometric identifier was found suitable for the employee attendance management system of the organization. This system replace manual monitoring by RFID based monitoring at School and reduces man power [12]. Reader is located on fixed location sends signal to passive RFID chip detected in range of reader. Chip re-transmits the acknowledgement signal with its unique Identifier code, hence chip is identified. Single reader can identify many no of chips in very short period of time. For better performance and security webcam module is used. The major problem faced by organizations is time consumption in taking attendance. This system totally eliminates the paper work in maintaining the attendance of each student in schools, colleges or universities [13]. This instrument is easily scalable up to 150 students in 8 different subjects. Our goal is to have electronic files containing details about each student and their attendance status. The system tries to organize the current attendance record system that will be much quicker and save time of instructors. The system is based on microcontroller.

In 2013, V. Sivasankaram, S. Muruganand proposed Advanced Embedded System Assisted GSM and RFID based Smart School Management system. Global System for Mobile Communication (GSM) is an efficient and fast technique for real time object identification and fast reporting [14]. The RFID system monitors the student. The designed model is studied under laboratory scale and the results are analyzed. The efficient utilization of the RFID assisted GSM technology is successfully designed and implemented at the laboratory scale. The accuracy and security level may be extended to the public level. Developments in RFID and GSM technology continue to wider reading ranges, yield

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larger memory capacities, and faster processing as real time system. The block diagram of RFID based smart school management system is shown below.

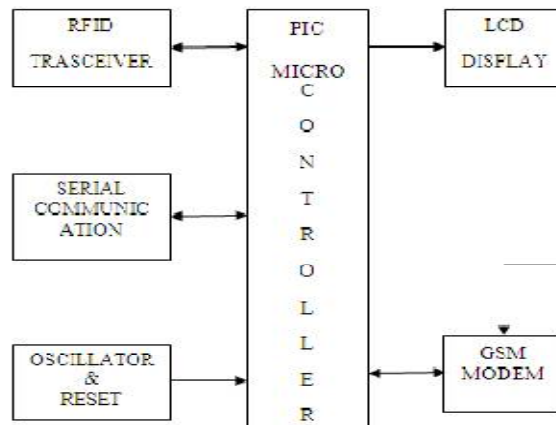


Figure 1: Block diagram of RFID based smart school management system.

Pallavi Verma, Namit Gupta, et.al. proposed, the system realize automatically functions as information acquisition of fingerprint, processing, and wireless transmission, fingerprint matching and making an attendance report [15]. After taking the attendance, the system sends the attendance of every student to their parent's mobile through GSM. The main purpose of this system is to monitor the student attendance in lecture, tutorial and laboratory sessions in more efficient way and send this attendance to their parents. Fingerprint attendance system is a cost effective simplified system that uses fingerprints for identification. Attendance Management System (AMS) can be made into smarter way by using face recognition technique, where we use a CCTV camera to be fixed at the entry point of a classroom, which automatically captures the image of the person and checks the observed image with the face database using android smart phone [16]. It is typically used for two purposes, marking attendance for student by comparing the face images produced recently and recognition of human who are strange to the environment.

In 2013, the face recognition method was very sensitive to face background and head orientations [17]. Changes in the illumination did not cause a major problem to the system. Besides, presence of small detail such as dark glasses or masks was too far from being a real challenge to the system. There exists a tradeoff between the correct recognition rate and the threshold value. As the threshold value increases, numbers of misses begin to decrease, possibly resulting in misclassifications. The eigenface method is very sensitive to head orientations, and most of the mismatches occur for the images with large head orientations. The Student Attendance System using Radio Frequency Identification technology with object counter will significantly improve the current manual process of student attendance recording and tracking system. The system promotes a fully-automated approach in capturing the student attendance and monitoring the student in the university campus [18]. The system is user friendly with easily accessible switches and communication ports. Attendance can be stored and retrieved easily. The system can easily integrate with other campus activity such as RFID book library, automatic payment system in canteen etc. This system does not required additional cost and it is one time investment and having long life.

Chiwa, Musa Dalah proposed system for attendance management. The system provides the necessary security and skills that is required for the progress of the organization [19]. Employees come to work late and leave early. Some sign attendance for others and some does not come to work but still receive wages/salaries. These problems can be solve by using biometric authentication technology using fingerprint since a person's biometric data is undeniably connected to its owner, is non-transferable and unique for every individual. The system has been integrated using fingerprint biometric technologies that will efficiently enable organizations manage the attendance of their employees which will greatly improve the progress of organizations. The development of embedded network video monitoring terminal which is cost effective and efficient video transmission system without latency and jitter is main aim [20].

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Digitalization network video monitoring system, which has advantages of unlimited distance control, flexible extension and so on, is becoming a new standard of security system. To maintain the high quality of the compressed signal and to minimize the amount of data an embedded network video monitoring terminal consisting of dedicated MPEG-4 compression. The video captured through the camera is processed and it is transmitted into the internet. The PIR sensor is used to detect the motion present in front of the camera and it triggers the GSM modem to send the notification to the authorized users.

In 2014, V. Bharani, S. Janani, et. al proposed Student's automation system which is more important part for any organizations/ institutions [21]. The system has integration of ubiquitous computing systems in classrooms for managing student's attendance using RFID. RFID is used to solve problems where it is necessary to automatically record the student's attendance in classrooms of university environment. A real time intelligent system is implemented in conjunction with RFID hardware to record student's attendance at lectures in a university environment. The application will improve management procedure. It is mainly used to avoid the proxy attendance. Face detection technology has widely attracted attention due to its enormous application value and market potential, such as face recognition and video surveillance system [22]. Real time face detection algorithms integrated on an existing Learning Management System (LMS), which automatically detects and registers students attending on a lecture. The system represents a supplemental tool for instructors, combining algorithms used in machine learning with adaptive methods used to track facial changes during a longer period of time. The system aims to be less time consuming than traditional methods, at the same time being nonintrusive and not interfere with the regular teaching process.

Rekha A. L., Dr. Chetan H.K. developed the automated system for human face recognition in a real time background for an organization to mark the attendance of their employees or student [23]. The task is very difficult as the real time background subtraction in an image is still a challenge. Video surveillance is used to detect the object movement thereby the captured image undergoes face detection and recognition process and searches the student database and enters the attendance if it is valid in the list. It is reliable, secure, fast and an efficient system developed for replacing a manual and unreliable system. This system can be implemented for better results regarding the management of attendance and leaves. The system will save time, reduce the amount of work the administration has to do and will replace the stationery material with electronic apparatus. In this novel approach face detection & face recognition system are used. This face detection differentiates faces from non-faces and is therefore essential for accurate attendance [24]. The other strategy involves face recognition for marking the student's attendance. The Raspberry pi module is used for face detection & recognition. The camera will be connected to the Raspberry pi module. The student database is collected. The database includes name of the students, there images & roll number. This raspberry pi module will be installed at the front side of class in such a way that we can capture entire class. Thus with the help of this system, time will be saved. It is so convenient to record attendance and can take attendance on any time.

Then Umar Farooq, Mohmoodul Hassan et.al, proposed the system uses radio frequency identification with biometrics technology to differentiate between valid and invalid users [25]. The system accomplishes the security and access control task by processing information from sub-controllers. These controllers include entrance monitoring, exit monitoring and mess monitoring installed at entrance gate, exit gate and mess gate respectively. These controllers read RFID tag issued to the user and search 314 tag number in non-volatile RAM. On a successful match, the controllers request the computer terminal to capture the user image. The computer system uses neural network trained face recognition module. This system is made centralized with the help of a web server. The web server takes information from computer terminals in hostels and keeps track of a particular user. Attendance Management System (AMS) is the easiest way to keep track of attendance for community organizations such as school clubs, scouting units, church groups, business organizations and volunteer groups. Face recognition is known to be the best method for person identification. The face modality is the modality that uses to identify people in everyday lives. The strategy involves face recognition for marking the student's attendance [26]. The Raspberry pi module is used for face detection & recognition. The camera will be connected to the Raspberry pi module. The student database is collected. The database includes name of the students, there images & roll number. This raspberry pi module will be installed at the front side of class in such a way that we can capture entire class. With the help of this system we save time and send convenient record of attendance.

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In 2005, Biometric technology is an effective tool to verify identity and detect fraudulent issues [27]. Analysis confirmed that the biometric data can be set and confirm the identity of the user. Expanding the use of biometrics will enhance the ability to detect fraudulent issues in the presence of the students in class or employees in an organization. The system can be enhanced to track the arrival and exit time of the student or employee for additional monitoring. Amol Sapkal, et.al, proposed the system provides the security for the girls in the hostel and save the time [28]. The system uses the Real Time Security Management System which enables efficient and easy way of security monitoring in big organization. Real time status monitoring and smart massaging definitely make the security management more efficient and reliable. RFID card can be used for identification but it is not safe. So to overcome this drawback, we use fingerprint technology, hence no one can use the other name as the every human being has different design pattern on finger.

In 2015, Sabeha, K proposed the system that which sense the finger prints of the students and compare them with the stored data base [29]. If that system matches the impression then the result will be generated as “MATCHED” then they are allowed to exit if it is “NOT MATCHED” not allowed to exit until they place in warden room. And at the same time the SMS is send to the parents using GSM module. If SMS is not delivered the report will be submitted to the hostel PC. And manually the SMS is send to the related guardian’s mobile number. Then the result of present and absent will be recorded correctly.

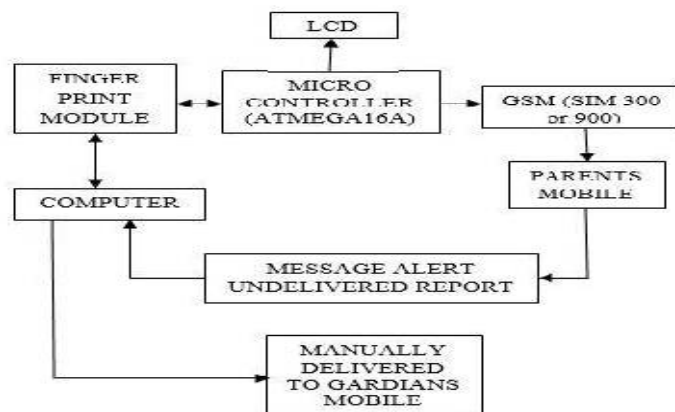


Figure 2: Block diagram of E-Hostel management

III. PROBLEM STATEMENT

Existing systems are based on face recognition, RFID and finger print technology for attendance management at school, collage, university and other organization. The existing system uses only one technology in each system. The existing systems are having small area of application. Existing system have some drawback. To overcome the drawback of existing system new system is proposed.

IV. PROPOSE SYSTEM

The system is basically fully automatic in/out management and monitoring of students using RFID, face and thumb recognition system. The system consists of ARM 11 microcontroller (Raspberry pi board), Finger print Scanner, Camera, GSM/GPRS module, RFID tag, RFID reader and LCD output display. In this system, RFID technology, figure print scanner and face recognition system i.e. camera all are used. The combination to theses technologies monitor the entry and exit of student from hostel. The system having all information about student is saved in it. Every student is having unique RFID tag number. RFID reader, camera and finger print scanner is monitoring the entry /exit of students in hostel and send signal to microcontroller. The system is helpful for automatic hostel management. Microcontroller is process the signal and sends SMS to parents of student. Essential information is displayed on output display.

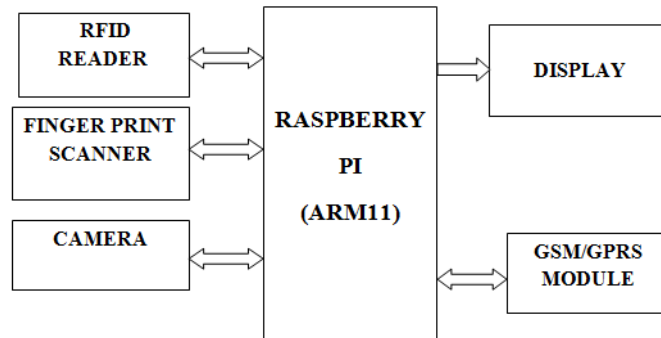


Figure3: Block diagram of proposed system.

V. EXPERIMENTAL RESULT

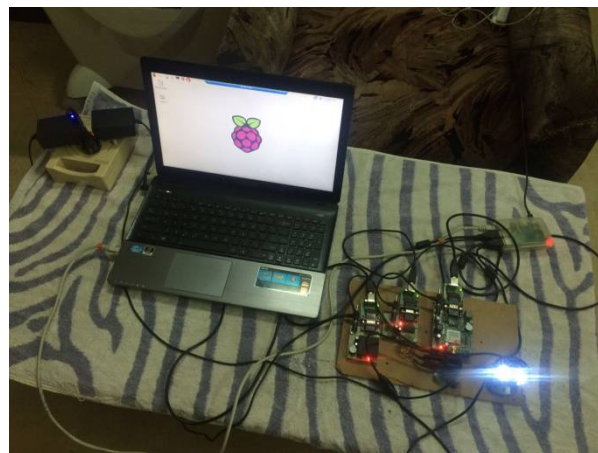


Figure 4: Experimental setup

Figure 4 shows a complete experimental setup of proposed system model of “Hostel In/Out Management and Monitoring using RFID, Face and Thumb Recognition”. It is based on Linux operating system. The Raspberry pi ARM 11 microcontroller plays a vital role in overall system operation.

Figure 5 shows interfacing of embedded board with RFID reader, fingerprint scanner, camera and GSM module. RFID reader is interfaced with microcontroller to detect entry/exit of student into the hostel. Fingerprint scanner is biometric scanner, it is used to detect the thumb identification of each student enter/exit from hostel. Camera is interfaced with microcontroller to detect face of the student enter/exit from the hostel. GSM/GPRS model is interfaced with microcontroller to send SMS to parent of student. The microcontroller is interfaced with laptop using LAN connection to see visual operation and output of proposed system.

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Figure 5: RFID reader, Fingerprint Scanner, Camera and GSM/GPRS Module is interfaced with embedded board

When system is ON, The system initializes all the modules connected to the microcontroller and compare all the student images stored into the database of the system. The system operated serially in such a way that RFID reader then Fingerprint scanner then Face recognition with the help of camera and when the all this conditions are true then system send SMS to the parent of student using GSM/GPRS Module.

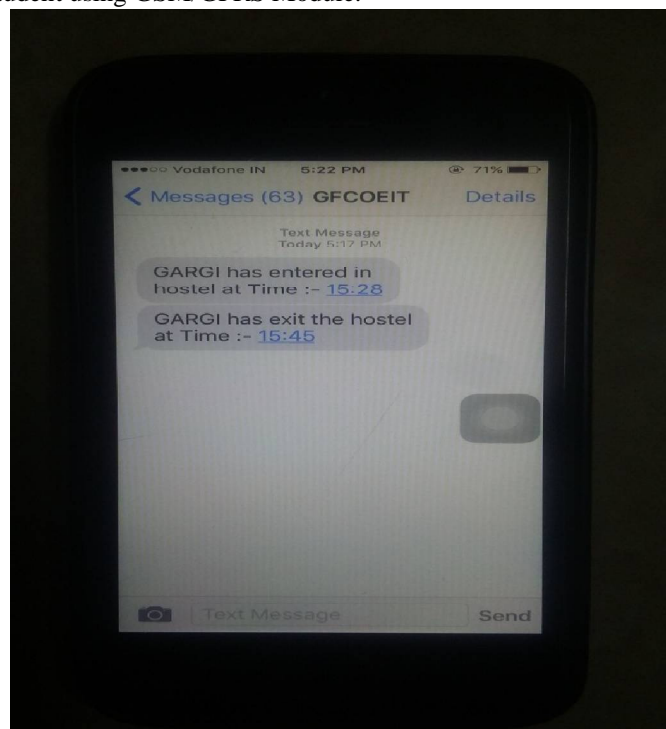


Figure 6:Parent reciving message

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When student Enter/Exit from the hostel, firstly student swap the passive RFID card over the RFID reader. When RFID card ID match with the stored ID in the database then student have to put the thumb on the fingerprint scanner for thumb recognition. Camera take the images of the particular student and compare with the images stored into the database the send SMS to parent of that particular student. This procedure is repeated continuously for all student having database into system.

VI. CONCLUSION

We have implemented an hostel in out management and monitoring using raspberry pi . In proposed method, the system that which sense the RFID reader,photo,finger prints of the students and compare them with the stored data base. They have to impress their RFID card reader, photo and fingers in systems which are placed in hostel main gate. If that system matches the impression then the result will be generated as “MATCHED” then they are allowed to exit if it is “NOT MATCHED” not allowed to exit.And at the same time the SMS is send to the parents using GSM module. If SMS is not delivered the report will be submitted to the hostel PC. And manually the SMS is send to the related guardian’s mobile number. The automatic recording system that which save the time of taking the attendance in the place of more than 500 students present in the hostel. Then the result of enter and exit will be recorded correctly.

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