Comprehensive Survey on Automatic Embedded Attendance System by Using Wireless Technology

Mr.Umesh G. Waghmare[1], Prof. P.D.Bhirange[2], Prof.B.J.Chilke[3]

[1,2,3](E&TC Department, SDCOE Selukate ,Wardha, India)

Abstract: Attendance plays a vital role in evaluating a student. The traditional method of taking attendance manually is very time consuming and often leads to human error this paper presents the Real time remote monitoring and attendance record monitoring is necessary in today's life as there are many more offices and branches under one person. He is generally responsible for availability of his staff members in office. Such persons may be remotely available. So to handle such cases, automatic attendance system with alerting facility to remote person is proposed in this work. Its general requirement is to identify the RfiD card with personal face monitoring. RFID technology facilitates automatic wireless identification using electronic passive and active tags with suitable readers. For cross check, the face image and his identity has to send to authorized person through WhatsApp. Automatic Embedded attendance system is compulsory in many government offices as well as in Jilha Parishad in Maharashtra, the system represents, user has to take his photo at the time of entry in office with office background and has to send to his officer, Instead of that one has to stand in front of this proposed system, he has to show RFID card to system, it will take his photo and will send the photo to officer. This paper describes the various research work recently proposed related with the above specified issues.
Keywords: RFID, Biometrics, Student's attendance, Fingerprint recognize, Biometric

I. Introduction

Automatic attendance and authenticating system is used at many places like school, colleges and in various offices. some of them comprise of understudies up to thousands or more. To handle an extensive number of understudies, it might be an issue particularly to get the participation of the understudies. The manual procedure is that whenever a teacher comes to class, he accompanied register and physically takes Participation by calling roll numbers. This manual procedure has a few imperfections on the grounds that on the off chance that where understudies can cheat by saying participation of their companions. Another issue is that the instructor needed to deal with the register and enter the participation into the log (or) information base. This would be a major issue in the schools and Universities. The appropriate answer for this issue is by outlining a framework that will record participation naturally. RFID frameworks were utilized to record the quantities of understudy's participation naturally. The ID cards of the understudies is inserted with RFID label which is perused by a peruser. This RFID framework was interfaced to a database through a PC or some electronic circuits. This strategy is more compelling to anticipate issue experienced while getting participation physically segments that the RFID innovation comprises are RFID Reader and RFID Tag. RFID is an incipient innovation, profoundly established by its initial advancements in utilizing radar 1 as a harbinger of foe planes amid World War II. A plenty of commercial ventures have utilized the advantages of RFID innovation for upgrades in segments like military, games, security, carrier, creature ranches, human services and different regions.

II. Literature Survey

Attendance systems are designed base on various biometric techniques. It also includes use of RFID techniques. The various techniques proposed by many researchers are discussed in this section.

2.1. Automatic Attendance System Using Fingureprint Techniques

The work presented by Josphineleela R and Dr. M Ramakrishna during 2009 [10] proposed framework, in which participation is being taken utilizing unique finger impression. This framework was utilized for students and staff. In it, the unique mark is considered for participation administration and it includes Pre-preparing, Extraction of features, re-organization, recognition and Reporting processes. Novel unique finger impression recreation calculation is utilized in this work.

In [11], creator attempted to actualize a framework which conquers the constraints of the current methodology getting participation using staff cell-phone. Overall system architecture doing likewise takes a shot at cellular telephone spares our assets as well as empowers the client to get

simple and intuitive access to the participation records of understudies.

BIS [12] presented a framework using RFID for administration of participation in institutions called business framework. The framework sends messages to parents/watchmen. The understudy has to enroll near the door by swapping RFID tag over RFID reader and can send his information to server available in the school. The server will prepare the participation information and send a SMS to the parents of the non-attendant understudy using a specific server. Framework likewise has software for time management for dealing with participation and for handling functionalities of human resource. The problem in this is not possibilities of checking but internal participation can be verified.

2.2. Automatic Attendance Systm Using Combined Biometrics Techniques

Jain et. al. proposed an application [1], in which roll list of the students of a particular class appears when the teacher starts the application program. Student's attendance can be taken by the use of click-box in-front of the name of the students. A Register Catch button has to be pressed then to register their presence. Be that as it may, in this additionally, human association for participation following is required. For solving this problem, another concept was proposed, in which the understudy needs to enlist exclusively by using a program of customer server attachment available in proposed gadget.

These days, in the mechanized check process, numerous biometric strategies are there in the business [2] sector.
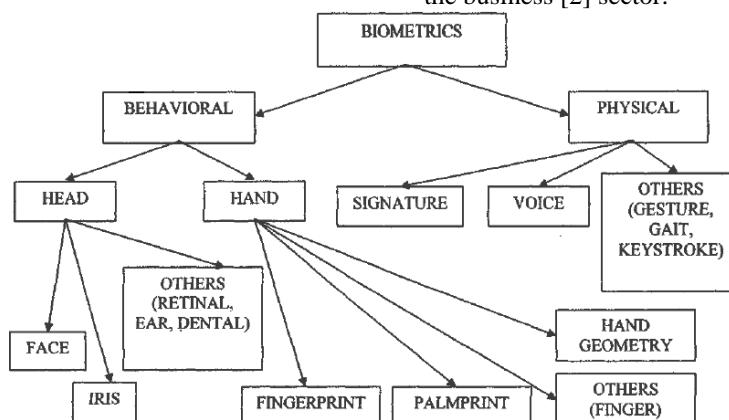
Fig. 1. Biometrics Techniques

Fig. 1 shows the biometrics techniques, in which biometric innovations empower programmed individual acknowledgment in view of physiological or behavioral qualities.

The advancement of a participation administration framework utilizing biometrics is proposed by Mazzer R. Label [3] considering understudy's participation among specific small period which has become a difficult test. The capacity to measure the participation rate turns into a considerable errand as manual calculation produces serious mistake, and spent a considerable amount of time. For solving this, a useful participation administration framework using biometrics is designed. With the use of a unique mark gadget, this system gets participation and stores the data in to the database.

In 2004, Vishal Bhalla et al. [4] have proposed the participation framework which is taking participation utilizing Bluetooth communication. Here, participation is utilizing

teacher's cell telephone application programming is introduced in teacher's cellular phone empowers it to question understudy's cellular phone by means of Bluetooth association and through exchange of understudy's cell phone Media Access Control (MAC) locations to the educator's cellular phone, nearness of the understudy can be affirmed. The issue of this proposed framework is understudy's telephone is required for participation. If there should arise an occurrence of understudies' truant if his portable is given to his companion then likewise present is stamped. So nearness of understudy is a bit much just telephone ought to be in scope range.

In [5], Anugerah Ayuet. et. al. proposed framework in which an electronic participation framework using NFC innovation is created called a System of Touching. In this framework, two modes are utilized called Peruse/Writer modes.

In the participation framework [6], all the rooms have NFC RFID readers which are

associated with educator's system that is associated with the college's system. Be that as it may, again for this situation, understudy must have NFC empowered telephone to stamp nearness in the classroom.

Seema Rao et. al. in 2006 [7] proposed a novel system for worker's participation using unique finger impression. Here, unique finger print identification is performed and the framework performs all the steps of making participation. For worker unique mark checking, it checks one finger impression layout with all formats available in a specific database.
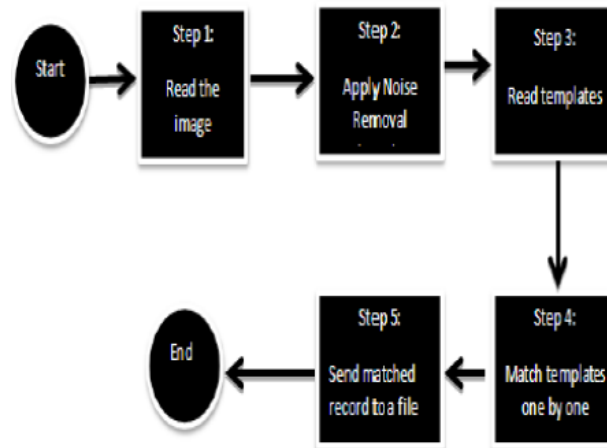

Fig. 2. Fingerprint Recognition and Authentication

Fig. 2 represents the fingerprint recognition and authentication. New system, unique thumb effect confirmation is shown.

Seifedine Kadry and Mohammad Ismail [8] have proposed one framework. In this paper, a remote iris acknowledgment participation administration framework is planned and actualized utilizing Daugman's calculation time. To get the participation record, remote verification client is designed. To access this, html document is also designed by this framework. Primary issue in this framework is that perceived face needs to contrast and all passages need to store iris information into the information-base for iris recognition verification process.

This biometrics based framework and its remote procedure takes care of the various problems of spurious participation and of inconvenience of doing a comparing system. It makes clients' attendance most effortlessly and successfully. But the basic problem of framework is that it is so expensive and all the students have to wait for long time for iris scan.
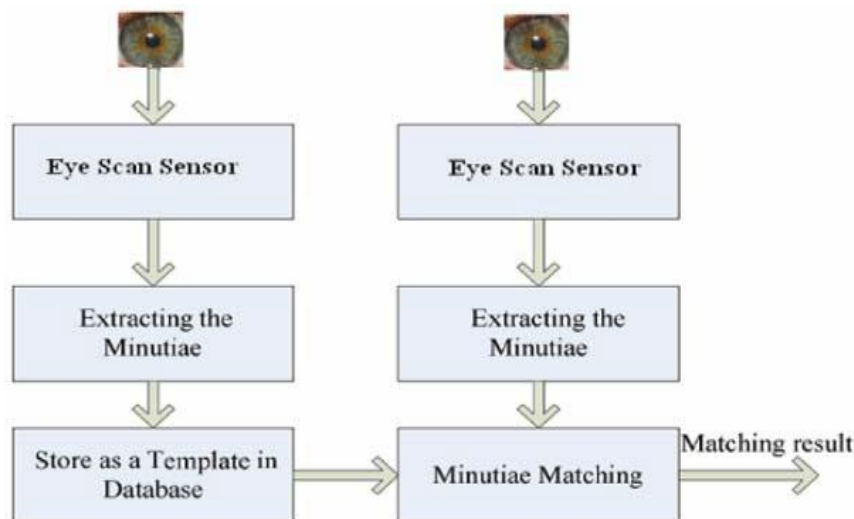

Fig. 3. Iris Recognition Verifying Process

Fig. 3 shows the iris recognition verification process. This framework is based biometrics and remote procedure takes care of the matter of false participation also of powerful inconvenience like ordinary the comparing system. Charm vessel organizes the clients' presences total the more effortlessly along with successfully. But the important issue of this framework is that it is excessively costly and it is short separation and also for each class understudies needs to remain in long line of iris scanner for checking prance.

In [9], Student attendance is taken using a bio-metric recognition technique called Face Recognition. As iris and fingerprints recognition requires short view capture of iris and fingerprints. This application is designed to have medium distance recognition by camera set up at the distance of focal-point from the chalk-board in the classroom to covers the most of the classroom. It is designed with the use of ongoing Opens library. So the system (Fig. 4) was proposed to utilize Viola Jones Calculation for counting persons.
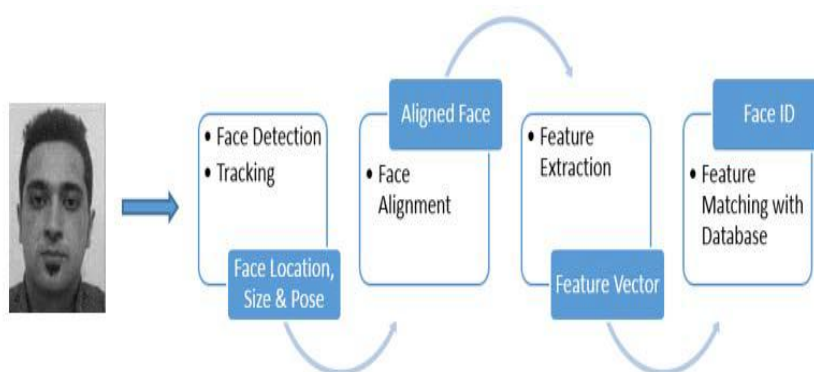
Fig. 4. Overall Process of Face Reorganization

Then the face image is detected and processed through resizing, contract correcting and feature extracting using PCA/LDA. After final recognition, attendance is recorded in database with proper information.

Table 1: Attendance System Using Biometrics Techniques and Their Problem

Sr. No.	BIOMETRICS TECHNIQUES		
	Specific Techniques	*No. of references*	*Problems*
1	Combined Biometrics Techniques	[1],[2],[3]	Upfront installation expensive, ongoing monthly service fee.
2	Face Recognization	[1],[2],[3],[9]	2D reorganization is affect by changing in lighting, the person hair's, and if the person wear glassless.
3	Iris Technology	[8],[2]	More memory for the data to be stored.
4	Fingerprint Recognition	[7],[2]	For some people it is very intrusive, because is still related to criminal identification, It can make mistakes with the dryness or dirty of the finger's skin, as well as with the age.

Table 1 shows the different technology in automatic attendance system i.e biometrics technology; face reorganization, iris technology and fingerprint reorganization with their problems.

2.3. Automatic Attendance System Using Face Recognition

Radio recurrence distinguishing proof called RFID is one of the programmed ID advances more in vogue these days. There is a wide innovative work around there attempting to take most extreme preferred standpoint of this innovation, and in coming years numerous new applications and examination zones will keep on appearing. This sudden enthusiasm for RFID likewise realizes a few concerns, principally the security and protection of the individuals who work with or use labels in their regular life. RFID has, for quite a while, been utilized to get to control in a wide range of regions, from resource following to constraining [13] access to confined territories. In this work, author proposed a design and system of a framework that utilizations dispersed RFID over Ethernet and we show how to robotize a whole understudies' participation enlistment framework by utilizing RFID as a part of an instructive foundation environment. As we know that use of RFID frameworks ii not instructive establishments,

it is expected to use it for taking care of every day issues in colleges.

In another work [14] the author has been suggest that nowadays, educators in colleges and schools take the participation physically either by getting out individual's name or by going around a participation sheet for understudy's mark to affirm his/her nearness. Utilizing these strategies is both bulky and tedious. Accordingly a technique for taking participation utilizing educator's cell phone has been introduced in this paper which is paperless, speedy, and precise. An application programming introduced in the teacher's cell phone empowers it to question understudies' cellular phone by means of Bluetooth association and, through exchange of understudies' cellular phones' Media Access Control (MAC) locations to the educator's cell phone; nearness of the understudy can be affirmed. Besides, itemized record of a student's attendance can likewise be created for printing and documenting, if necessary.

The primary aim of the recent work [15] is to build up an exact, speedy and proficient framework for participation using unique mark checking methods. Author proposed a framework in which identity checking is possible by extracting the detailed strategy and the framework which mechanizes the whole participation process. Manual process is a relentless and difficult work and required lot of time.

For this reason, authors utilized unique mark checking framework The result demonstrated that the proposed framework is exceedingly productive in confirmation of client unique mark.

Biometric time and participation framework [16] is a standout amongst the best uses of biometric innovation. Primary favorable state of a biometric, time and participation framework is that it maintains a strategic distance from "mate punching". Amigo punching was a noteworthy escape clause which will abuse in the customary time participation frameworks. Unique mark acknowledgment is mostly used technique today, while fingerprints are a time consuming process. But most unique finger impression based biometric frameworks records the details layout of a client in server. It is expected that the particulars layout of a client cover all the data of the first unique mark. This conviction was appeared to be false and a few calculations were recommended that remakes unique mark pictures from details layouts.

The author of a similar work [17] exhibits the configuration approach of a basic and high continuous Zigbee biometric system for simple and efficient participation administration utilizing the fingerprints of the representatives at any association alongside the worker approaching and active log upkeep. Firstly representative's fingerprints are checked by programming and a personality number is assigned as their enlistment. Amid the attendance time when workers awe their fingerprints, against the scanner, the framework thinks about the new unique mark designs and the association between different focuses in the unique mark with the enlistment database. A match is recorded as a thump practicing securing, handling, transmission, coordinating. Through this programmed framework, time and labor is decreased to the immense degree.

Another work [18] portrays that the face is nothing but the unique character of a man. The participation is taken in each schools, universities and library. Customary methodology for participation is educator calls understudy name and record attendance. The framework depicted in this paper intends to go amiss from such conventional frameworks and present another methodology for taking a participation utilizing picture Processing. The working of an Automatic Attendance System in a classroom situation is simple. At first video clip of a classroom is taken and is put away in the database, and these video is changed over to edges/pictures.

Author [19] tackled the difficulties of manual strategy for recording the participation in institutes of Nigeria. A computerized participation framework was embraced. The difficulties incorporate trouble while recording the participation list with in the specified duration are pointless wastage of time amid composing or marking, disgraceful documentations, negligence of understudies to compose or sign the participation paper, negligence of instructors overlooking the participation list in the classroom, understudies composing and marking unlawfully for a non-attendant. Radio recurrence recognizable proof (RFID) programmed participation framework is implemented at Nigeria's instructive organizations that gives the proper functionalities of enrolling.

The exact acknowledgment of a man is possible using face acknowledgment framework and this ID is utilized for further handling. Customary face acknowledgment frameworks can utilize strategies to distinguish a face from the given information but the outcomes are not generally exact and exact as fancied. So, the new framework depicted [20] intends to go amiss from such conventional frameworks and acquaint another methodology with distinguish an

understudy utilizing a face acknowledgment framework called 3D Facial Model.

In 2011 the Mohammed et. at. [21] presented another understudy participation framework taking into account biometric verification convention. This framework is fundamentally utilizing the face identification and the acknowledgment conventions to encourage checking understudies' participation in the classroom. In this work, the classroom's camera is used for capturing the student's photographs, specifically face identification and acknowledgment procedures were actualized to create the teacher participation record. Really, it is effective than the other understudy participation techniques as the discovery and acknowledgment are thought are the best and speediest strategy for biometric participation framework. Concerning the understudies and educator sides, the framework is working with no arrangement and without any exertion.

Augusta et. al. [22] exhibits the outline and development of programmed participation stamping and parent cautioning framework, with a specific end goal to make a perfect domain for instructing in classes. In this model, each understudy and instructor might have an extraordinary RFID card. As an understudy draws close to the class entryway, it opens just if his RFID matches with the database and once he entered the class. This procedure proceeds until the teacher enters the class, once he enters the class the entryway is bolted and the rundown of missing understudies is made. SMS should be sent to the particular guardians of the non-attendant understudies through the GSM module present in the model. Amid this handle however the RFID of the understudy is coordinated he is not permitted to enter the class as he is late or some other understudy inside the class is permitted to leave the class. The class entryway opens just when the teacher brings his RFID tag close to the class entryway showing the culmination of class and the same technique proceeds for each class.

Jyothi Kameswari [23] suggests that most instructive establishments' chairmen are worried about understudy sporadic participation. Truancies can influence understudy general scholarly execution. The ordinary technique for taking participation by calling names or marking on paper is extremely tedious and unreliable, subsequently wasteful. Thusly, PC based understudy participation administration framework is required to help the personnel and the instructor for this time give much helpful technique to take participation,

however a few requirements must be done before begin utilizing.

2.4. Automatic Attendance System Using RFID

Nirmala et. at. [24] suggested that the application of attendance system validation is a huge issue in framework by controlling through PC based correspondence. Face acknowledgment is an essential branch of biometric confirmation and has been generally utilized as a part of numerous applications, for example, video screen framework, human-PC connection, and entryway control framework and system security. This work portrays a strategy for attendance which is incorporated with the face acknowledgment innovation utilizing Personal Component Analysis (PCA) calculation. The framework will record the participation of the understudies in classroom environment naturally and it will give the offices to the workforce to get to the data of the understudies effortlessly by keeping up a log for check in and checkout time. Table 2 shows the automatic attendance system using specific technology and with their problems.

Pragyan Mishra [25] said that the system unique mark coordinating has been effectively utilized by law authorization for over a century. The innovation is presently discovering part of different applications, for example, personality administration and access control. In this setting, robotized unique mark acknowledgment framework and recognizable proof of key difficulties are portrayed alongside the exploration open doors. The depiction resembles an item outline in this report actualizing RTOS (Real time working framework) under the area of installed framework. Unique mark Recognition is a broadly mainstream yet an intricate example acknowledgment issue. It is exceptionally hard to plan precise calculations fit for separating remarkable elements and coordinating them in a vigorous way. In this work, author have accompanied a novel way to deal with streamline the current issues with a legitimate Installed System Design.

Anay U. Khairatkar [26] proposed this day and age, a paper based methodology which is taken after for checking participation, where the understudies sign on the participation. This information is then physically gone into the framework. Dealing with the participation of the understudies amid addresses is a troublesome errand and it turns out to be more troublesome amid the report stage. This is on the grounds that the way toward stamping participation and keeping up the information is not completely computerized

and manual calculation produces blunders and squanders a part of time. Hence, the advancement of Attendance Monitoring System (AMS) is performed.

Table2: Automatic Attendance System Using RFID Techniques and Their Problem

Sr. No.	RFID TECHNIQUES		
	Specific techniques	*No. of References*	*Problems*
1	RFID	[12], [13], [14], [15], [16], [24]	If only RFID based attendance is there, suppose student 1 is absent and he gives his card to student 2.so student 2 can easily access two cards..So that is a flaw in this system, Damage on the smart card, Lack of awareness the student in the system
2	NFC	[13], [17], [18], [19], [20], [22], [23]	Hacking is possible

In 2014 [27] the author said that, participation Management System (AMS) is the least demanding approach to monitor attendance for combined associations, for example, school clubs, scouting units, church bunches, business associations and volunteer gatherings. Among the individual recognizable proof techniques, face acknowledgment is known not the most normal ones, since the face methodology is the methodology that utilizes to distinguish individuals in regular lives. Albeit different techniques, for example, unique finger impression distinguishing proof can give better execution, those are not fitting for common savvy cooperation's because of their intrusive nature. This face location separates faces from non-confronts and is along these lines crucial for exact participation.

Jomon Joseph proposed [28] a system which is gone for executing a digitized framework for participation recording. Current participation stamping techniques are dreary and tedious. This work is proposed to handle every one of the various issues. Being a standout amongst the best utilizations of the picture handling, face acknowledgment has an imperative part in specialized field particularly in the field of security reason. Human face acknowledgment is a critical field for checking reason particularly on account of understudy's participation.

In Feb 2015, Deepali Kokare et. al. [29] suggested that being a standout amongst the best utilizations of the picture handling, face acknowledgment has a fundamental part in specialized field particularly in the field of security reason.

Generally understudies' participation is recorded by calling their names however a novel methodology [30] expends parcels of time for investigation and to produce reports with a specific end goal to spare time while recording understudies participation numerous advancements, for example, RFID, Biometric, Bluetooth and Wi-Fi systems.

Embedded systems include various processors like ARM-7 [31, 32], ARM-9 [33], ARM-11 [34] processors. Raspberry pi system board [35, 36] and Arduino system board [37] are mostly used embedded boards by many researchers. It has open source platform for interfacing various compatible modules like RFID detector [38, 39], GSM module [40], GPS module [41], fingerprint module [37] and face tracking camera module [42] which are used for the design of attendance systems.

III.   Conclusion

Automatic embedded attendance system by using wireless technology is a system where one can take the attendance with the help of RFID, Biometrics like Face and Fingerprint Recognition and send it to the remote location by using wireless technology . This paper presents discussion about the various technologies which are recently proposed for taking the attendance of students/workers. Older methods are unable to send the real time attendance at remote place. RFID and WhatsApp based systems can take automatic participation for all the students entering. Face Recognition can be also utilized to verify the students which can avoid the proxy attendance. The paper suggests that the use of RFID, finger print recognition and face recognition techniques are mostly preferable as per the discussion by many researchers.

References

[1].   Marr, Liz & Lancaster, Guy, "Attendance System", Learning and Teaching in Action, 4 (1), pp. 21-26, 2002

[2].   Jainet "A Large-Scale Investigation into the Relationship between Attendance and Attainment: A Study Using an Innovative, Electronic Attendance Monitoring System", Studies in Higher Education, 33(6), pp. 699-717, 2001

[3].   Marr, Liz & Lancaster, Guy, "Attendance System", Learning and Teaching in Action, 4 (1), pp. 21-26, 2002

[4].   Mazza, R. & Dimitrova, V., "Visualising student tracking data to support instructors in web-based

distance education", Proceedings of 13th International World Wide Web Conference on Alternate Track Papers & Posters Press, pp.154-161, New York: USA, 2003

[5]. Vishal Bhalla, Sayedali Mousavi, "An Automated Attendance Monitoring and Registration System for EMU's SPIKE Seminar Series," Proceedings in Academia Edu, 2004.

[6]. Anugerah Ayu ; Huei Chen, K, "E-Visitor Information management System(E-VIMS) using MyKad," Applications of Digital Information and Web Technologies First International Conference on the, 4-6 Aug. 2013, Pages 44-49.

[7]. Satari, B.S. ; Abd Rahman, N.A. ; Zainal Abidin, Z.M., "Face recognition for security efficiency in managing and monitoring visitors of an organization," Biometrics and Security Technologies (ISBAST),sept 2013 International Symposium on, 26-27 sept . 2006, 95 – 101.

[8]. Seema Rao and Prof.K.J "RFID technology-based museum ticketing and visitor management systems," Information Management, Innovation Management and Industrial Engineering (ICIII), 2013 6th International Conference on (Volume: 3), 23-24, Nov. 2007, 304 – 306.

[9]. Anwar, N. ; Masrek, M.N. ; Rambli, Y.R., "Visitor Management system by applying the model of UTAUT," Business, Engineering and Industrial Applications, 23-26, dec. 2008, 223 – 228.

[10]. https://www.raspberrypi.org/documentation/usage/python

[11]. Jain, S.; Vaibhav, A. ; Goyal, L., "Raspberry Pi based interactive home automation system through E-mail", International Conference on Optimization, Reliabilty, and Information Technology, June 2008.

[12]. Piranha ; Antony, A.J.P. ; Meena, M.J. ; Pandian, S.R., "Smart cloud robot using raspberry Pi", Recent Trends in Information Technology (ICRTIT), dec 2010 International Conference on, 10-12 , 1-5.

[13]. BISAM-BIS attendance Management System by BIS Softwar Development Services PV Limited. [Online].Available http://www.softwarehouse.co/school-attendance-brochure.pdf

[14]. F. Silva V. Filipe and A. Pereira, "Automatic Control of Students' Attendance in Classrooms Using RFID," International Conference On Systems and Networks Communications pp. 384-389.

[15]. Tariq Jamil "Automatic attendance recording system using mobile telephone," Telecommunications Forum (TELFOR), 2011.

[16]. Chitresh Saraswat and Amit Kumar, "An Efficient Automatic Attendance System using Fingerprint Verification Technique", International Journal on Computer Science and Engineering Vol. 02, No. 02, 2010, 264-269.

[17]. R. Josphineleela, M. Ramakrishnan, "An Efficient Automatic Attendance System Using Fingerprint Reconstruction Technique," International Journal of Computer Science and Information Security, vol 10, no 3, 2012.

[18]. L.Rajasekar, S.Vivek, "Wireless Fingerprint Attendance System using ZigBee Technology," International Journal of Power Control Signal and Computation (IJPCSC) Vol3. No1. Jan-Mar 2012.

[19]. Dr Suvarna Nandyal, "An Automatic Attendance System Using Image processing" The International Journal of Engineering and Science (IJES) Volume 4 Issue 11, 2015.

[20]. A.A. Olanipekun and O.K. Boyinbode, "A RFID Based Automatic Attendance System in Educational Institutions of Nigeria" International Journal of Smart Home Vol. 9, No. 12, (2015), pp. 65-74 Nov 2010.

[21]. Abhishek Jha, "Class Room Attendance System Using Facial Recognition System," International Journal of Mathematics, Science, Technology and Management, Vol. 2, Issue 3, 2006.

[22]. Mohammad A. Alia, Abdel fatah Aref Tamimi and Omaima N. A. AL-Allaf, "Integrated system for monitoring and recognizing students during class session" The International Journal of Multimedia & Its Applications (IJMA) Vol.5, No.6, December 2013.

[23]. NAMIT SATIJA, "BLUETOOTH ATTENDENCE SYSTEM," International Journal of Innovative Research in Science & Engineering, Nov 2012.

[24]. Abdul Aziz Mohammed , Jyothi Kameswari U, "Web - Server based Student Attendance System using RFID Technology," International Journal of Engineering Trends and Technology (IJETT). V4(5):1559-1563 May 2013.

[25]. Nirmalya Kar, Mrinal Kanti Debbarma, Ashim Saha, and Dwijen Rudra Pal, "Study of Implementing Automated Attendance System Using Face Recognition Technique,"International Journal of Computer and Communication Engineering, Vol. 1, No. 2, July 2012.

[26]. Devendra Kumar Yadav, Sumit Singh, Prof. Shashank Pujari, Pragyan Mishra," Fingerprint Based Attendance System Using Microcontroller and LabView" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 4, Issue 6, June 2015.

[27]. Akshay A. Kumbhar, Kunal S. Wanjara , Darshit H. Trivedi , Anay U. Khairatkar and Deepak Sharma, Automated Attendance Monitoring System using Android Platform," International Journal of Current Engineering and Technology E-ISSN 2277 4106, PISSN- 2347 – 5161, April 2013.

[28]. G. Lakshmi Priya , M. Pandimadevi, G. Ramu Priya, P. Ramya, "Implementation of Attendance Management System using SMART-FR," International Journal of Advanced Research in Computer and Communication Engineering, Vol. 3, Issue 11, 2014.

[29]. Jomon Joseph, "Automatic Attendance Management System Using Face Recognition," International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 June 2014

[30]. Deepali Lokare, "Attendance System Using NFC Technology with Embedded Camera on Mobile Device," International Journal of Advanced Research in Computer and Communication Engineering, Vol. 4, Issue 2, February 2015"

[31]. Mohmad Umair Bagali, "Classic Electronics Student Attendance Register," International Journal of Applied Engineering Research ISSN 0973-4562 Volume 11, Number 1, pp 606-610, 2016.

[32]. RP Patil, VD Chaudhari, KP Rane, "ARM based 3-axis seismic data acquisition system using Accelerometer sensor and Graphical User Interface," International Journal of Engineering Research and General Science, vol. 3 no. 2, 2015.

[33]. Shital M Dharrao, Vijay D Choudhary, Kantilal P Rane, "Intelligent Bus stand Monitoring and Control," Proceedings of the ACM Symposium on Women in Research, pp. 15-19, 2016.

[34]. D.Narendar Singh, Chaitanya kumar Munukoti, "Attendance Monitoring System Using ARM9 with QR Code," International Journal of Latest Trends in

Engineering and Technology (IJLTET), Vol. 2, Issue 1, January 2013.

[35]. Umar Farooq, Mahmood ul Hasan, Muhammad Amar, Athar Hanif, and Muhammad Usman Asad, "RFID Based Security and Access Control System," IACSIT International Journal of Engineering and Technology, Vol. 6, No. 4, August 2014.

[36]. Miss. Pradnya R. Nehete, Dr. K P Rane, "OTP Based Door Lock Security System," International Journal Of Emerging Trends In Engineering And Management Research, vol. 2, No. 2, 2016.

[37]. Miss. Madhuri Prakash Patil, Mr. K P Rane, Cloud Based Weather Monitoring System, International Journal on Recent and Innovation Trends in Computing and Communication, Vol. 4, No.5, pp 446-450, 2016.

[38]. Shraddha Pramod Nikumbh, Vijay D. Chaudhari, Dr. K. P. Rane, "Fingerprint Recognition with Monitoring on Remote Whats App," International Journal on Recent and Innovation Trends in Computing and Communication, Volume 4, Issue 5, Pages 442 – 445, 2016.

[39]. Miss. Ashwini C. Ingle, Mr. Ishwar S. Jadhav, Dr. K. P. Rane, "WhatsApp based Automatic Embedded Attendance System,", International Journal on Recent and Innovation Trends in Computing and Communication, Volume 4, Issue 5, Pages 438 – 441, 2016.

[40]. Mr LR Patil, Mr HT Ingale, KP Rane, Mrs SK Chaudhari, "RF-ID Based Touch Screen Museum Guide System," The International Journal of Engineering And Science, Volume 3, Issue 6, Pages 27-31, 2014.

[41]. Sanjib Kalita, JN Borole, KP Rane, "Wireless Earthquake Alarm System using ATmega328p, ADXL335 and XBee S2,"International Journal of Engineering Trends and Technology, Volume 12, Issue 3, Pages 144-148, 2014.

[42]. Sachin U Chavhan, Rahul D Chavhan, Kantilal P Rane, "Real Time Industrial Operator allotment System," International Journal of Application or Innovation in Engineering & Management, Volume 2, Issue 6, Pages 253-258, 2013.

[43]. Priyanka Kulkarni, Vijay D Chaudhari, Kantilal P Rane, "Face Tracking and Robot Shoot using Adaboost Method," International Journal of Application or Innovation in Engineering & Management, Volume 3, Issue 7, Pages 135-141, 2014.