https://dx.doi.org/10.24001/ijaems.3.3.16 *ISSN: 2454-1311*

Attendance Monitoring System of Students Based on Biometric and GPS Tracking System

J.Chandramohan[1], R.Nagarajan[2], M. Ashok kumar[3], T.Dineshkumar[4], G.Kannan[5], R.Prakash[6]

[1]Asst. Professor, Department of Electrical and Electronics Engineering, Gnanamani College of Technology, Namakkal, India.
[2]Professor, Department of Electrical and Electronics Engineering, Gnanamani College of Technology, Namakkal, India.
[3,4,5,6] U.G. Students, Department of Electrical and Electronics Engineering, Gnanamani College of Technology, Namakkal, India.

Abstract*—This paper is a study of a fingerprint recognition system based on minutiae based fingerprint algorithms used in various techniques. This line of track mainly involves extraction of minutiae points from the model fingerprint images and fingerprint matching based on the number of minutiae pairings among to fingerprints. This paper also provides the design method of fingerprint based student attendance with help of GSM. This system ignores the requirement for stationary materials and personnel for keeping of records. The main objective of this project is to develop an embedded system, which is used for security applications. The biometrics technology is rapidly progressing and offers attractive opportunities. In recent years, biometric authentication has grown in popularity as a means of personal identification in college administration systems. The prominent biometric methods that may be used for authentication include fingerprint, palmprint, and handprint, face recognition, speech recognition, dental and eye biometrics. In this paper, a microcontroller based prototype of attendance system using fingerprint sensor and face recognition module is implemented. The tracking module is used here to identify the location of the missing person.*

Keywords— GSM, GPS, FINGER PRINT, LCD.

I. INTRODUCTION

The fingerprints are one of the main forms in biometric field which used to identify the individual and their uniqueness. Fingerprint authentication is one of popular authentication systems in the world. Due to their consistency and uniqueness it is used widely. There are several sources available for the collection and their established use [1]. In the past, magnetic card attendance system was widely used. But, this system has lot of bugs in it. The card may be lost or damaged. This fingerprint attendance system is highly secure and cannot be forged easily. In recent time, there has been high level of impersonation experienced on a daily basis in both private and public sectors, the ghost worker syndrome which has become a menace across all tiers of government, employers concerns over the levels of employee absence in their workforce and the difficulty in managing student attendance during lecture periods. Fingerprints are a form of biometric identification which is unique and does not change in one's entire lifetime. This paper presents the attendance management system using fingerprint technology in a university environment. It consists of two processes namely; enrolment and authentication.

During enrolment, the fingerprint of the user is captured and its unique features extracted and stored in a database along with the users identity as a template for the subject. The unique features called minutiae points were exacted using the Crossing Number (CN) method which extracts the ridge endings and bifurcations from the skeleton image by examining the local neighborhoods of each ridge pixel using a 3x3 window [2]. During authentication, the fingerprint of the user is captured again and the extracted features compared with the template in the database to determine a match before attendance is made.

Attendance management system is one of the most advanced applications in biometric technology. It cannot be forged easily. With the integration and use of biometric technology getting simpler, many institutions are using down the biometric road to verify the time and attendance of their students and staffs. The system also contains a GMS Modem, which can be used to send the attendance information of the students automatically to their parents. The Embedded system using a small LCD user interface can be interfaced with the computer by using serial communication interface. The previous papers done were only the fingerprint based attendance system and a report generation [3].

The Fingerprint authentication has many advantages such as very high accuracy, the most economical biometric PC user authentication technique [4]. It is one of the safest biometric authentication methods widely used. It is very

https://dx.doi.org/10.24001/ijaems.3.3.16 *ISSN: 2454-1311*

easy to use. Small storage space required for the biometric template, reducing the size of the database memory required and it is standardized. Biometrics technology can solve these problems and proposed fingerprint based attendance system would be ideal for implementation in universities for identification.

II. GENERAL BLOCK DIAGRAM

The fingerprints from the various users are acquitted using the fingerprint module. For example we are taking the samples of three or four fingerprints and they are enhanced using several enhancement techniques. After that we detect the edges along the image using the edge detection function. Here we use the pewit operator for the detecting the edges. We use minutiae matching algorithm for matching the finger print images. Instead of doing all these image processing works, we had used Fingerprint Module (R305) in t his paper [5]. The circuit is made to be switched ON and all the initialization processes are done.

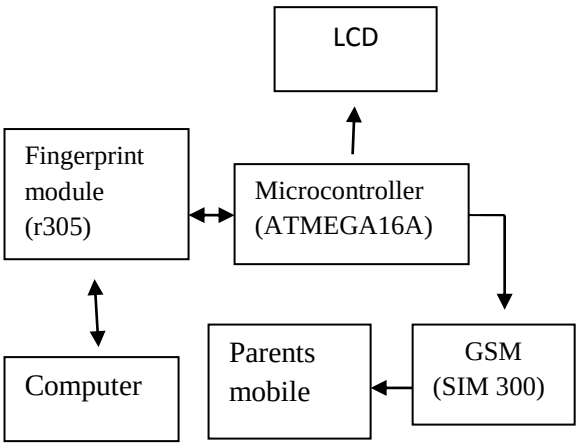

Fig.1 General Block Diagram

The "Initialization done" message has to be displayed in the screen. Up to that user should not keep any fingerprints for scanning. After that "Show the Finger" will be displayed on the screen. The fingerprint that has to be compared is already stored in the memory of fingerprint module. The fingerprint module is capable of storing about 100 images in the inbuilt memory. Now the fingerprints are kept for scanning with in a stipulated time period. Fingerprint module started to compare the results and it gives the hex codes to the microcontroller for further operations. The microcontroller starts to send the control to GSM based on the results from the finger print. But the microcontroller has only one transmitter pin in it. We have to communicate both of the GSM and fingerprint module but not at a time. For that we are using Relay for switching between the GSM and fingerprint module. There are also commands for holding the fingerprints and for comparing it. The person whose fingerprint is matched and there will not be any SMS send to those persons. The persons whose fingerprints were not kept were taken and SMS will be sent only to those numbers. If the fingerprint of an unknown person is kept for scanning then the scanning will not take place. If unknown persons fingerprint is kept then the message "Not Identified" will be displayed. With the help of this the parents can be known about their arrival of the Students to the college or school. The fingerprints are one of the greatest authentication systems where students cannot forge very easily. This can be practically implemented by extending the time period and student's attendance can be managed.

III. FINGERPRINT RECOGNITION

The fingerprint recognition or fingerprint authentication refers to the automated method of verifying a match between two human fingerprints. Fingerprints are one of many forms of biometric used to identify individuals ad verify their identity. If unknown persons fingerprint is kept then the message "Not Identified" will be displayed. With the help of this the parents can be known about their arrival of the Students to the college or school [6].

Fig.2 Fingerprint Module

The fingerprint consist of four process, they are given below
Image Acquisition
Image Enhancement
Edge Detection
Extraction of Miniature Points and Matching

A. Image Acquisition

The Fingerprint images from various users are taken using the module. The finger module itself has an internal memory which can store about 100 images in it. These images are used for the enhancement in next stages [7].

B. Image Enhancement

The image is enhanced using the techniques like Histogram Equalization [8]. It is nothing but the graph

https://dx.doi.org/10.24001/ijaems.3.3.16 *ISSN: 2454-1311*

plot for number of pixels against the gray level. The overall contrast of the image is made uniform and image looks enhanced now the image is suitable for the extraction.

C. Edge Detection

They are many operators used for detecting the edges. The operators are Prewitt, Laplacian, Sobels, and Robertson Operators [9]. The Prewitt operator is one of the best edge detecting operator and we are implementing Prewitt operator in this paper. The edges have to be detected in order to match the input image with already saved image. There are two types of masking used here. They are

i) Horizontal masking
ii) Vertical masking

Edges are calculated by using difference between corresponding pixel intensities of an image. All the masks that are used for edge detection are also known as derivative masks. Because as we have stated many times before in this series of tutorials that image is also a signal so changes in a signal can only be calculated using differentiation.

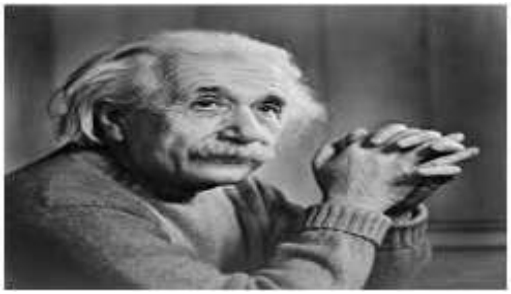

Fig.3 Actual image

Fig.4 Vertical mask

Fig.5 Horizontal mask

D. Extraction of Miniature Points and Matching

After the extraction of edges, the points are marked in it. Those points which are detected after edge detection are known as miniature points. The miniature points that are extracted are compared with already stored image [10]. In order to find the matching process the correlation factor and the Euclidean distance has to be found out. Based on the tolerance value the matching results can be found out. The main purpose of the GSM in projects is to send and receive the messages.

Fingerprints are one of many forms of biometric used to identify individuals ad verify their identity. If unknown persons fingerprint is kept then the message "Not Identified" will be displayed. With the help of this the parents can be known about their arrival of the Students to the college or school.

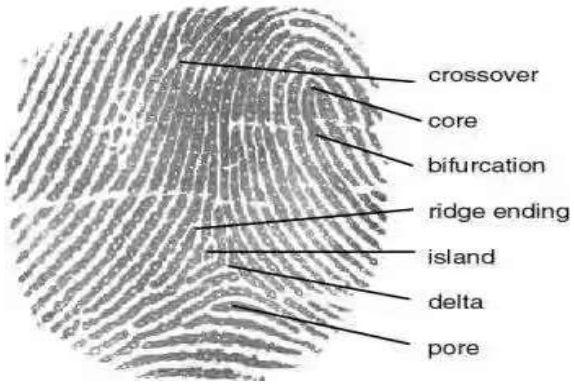

Fig.6 Minutiae before marking

Fig.7 Minutiae after marking

IV. VERIFICATION PROCESS

The second process is the verification process. This is the most repeated process. It is a done each time the user wants to make use of the fingerprint controlled device. When he places his finger on the fingerprint scanner surface, the fingerprint would be processed by the fingerprint scanner. The finger-print pattern that has been obtained would be compared against the stored enrolment template that is already stored in the database or memory location where the enrolment process was executed. When the fingerprint pattern passes the com-parison process, it shows an acknowledgement in its display and grants the user access [11].

https://dx.doi.org/10.24001/ijaems.3.3.16 *ISSN: 2454-1311*

V. GSM MODULE

Global System for Mobile Communications (GSM), is a standard developed by the(European Telecommunications Standards Institute) ETSI in order to represent the protocols for 2G cellular networks used by mobile phones. We have majorly two types of SIM modules. They are SIM 300 and SIM 900. Here the SIM 300 is enough for our purpose. SIM 900 is used for some advanced purposes and it has many additional features [12]. But not only that we can make a call and can we also browse using the GSM. The GSM has the operating voltage of 12v. It has mainly of three pins namely transmitter, ground and the receiver pin.

To perform these tasks, a GSM modem must support an "Extended AT command set" for sending / receiving SMS messages. GSM is one of the most useful inventions in the modern world. It has many advantages than other technology standards. The Advantages of GSM are,

- Worldwide roaming
- Security
- Reasonable devices and facilities
- Extensive spectrums obtainable

After some time interval the details of the students who were not present were taken. Those persons details were taken and message of "NOT PRESENT "is sent to their respective parent's mobile numbers. So, the parents may know about the student's presence immediately. The Students cannot forget this system easily.

Fig.8 GSM Module

VI. GLOBAL POSITIONING SYSTEM (GPS)

GPS, which stands for Global Positioning System, is a radio navigation system that allows land, sea, and airborne users to determine their exact location, velocity, and time 24 hours a day, in all weather conditions, anywhere in the world. The satellites transmit the exacta me the signals are sent. By subtracting the time t he signal w as transmitted from the time it was received, the GPS can tell how for it is from each satellite [13]. The camera used here is a PC web camera that captures the images of students for both database creation and test images [14]. The face recognition is the most important part of this system. It is an automatic method of identifying or verifying a person from a digital image or a video frame. It is done by comparing the extracted features from the captured image with the images that are previously stored in the predefined database [15]-[17].

VII. PROPESED SYSTEM

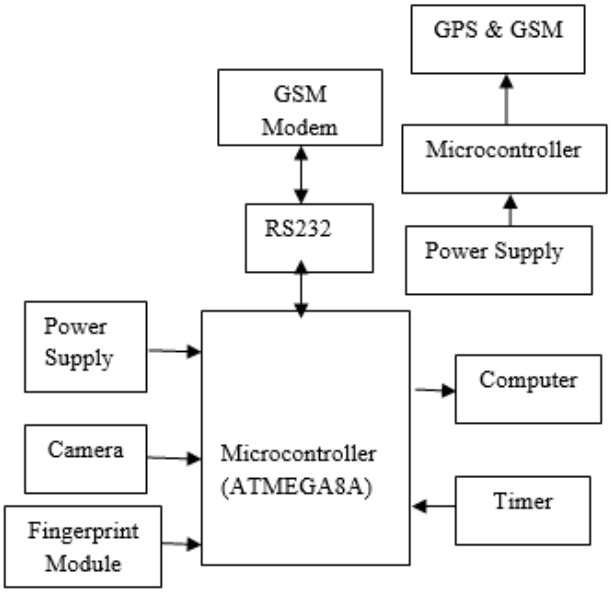

Fig.9 Proposed system

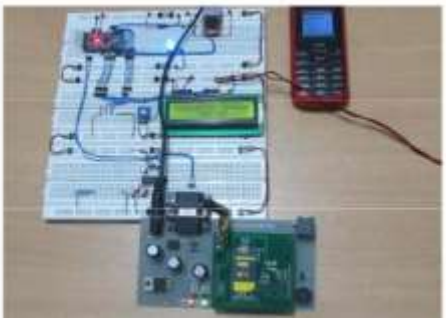

Fig.10: Interface of GSM Module

The system consists of fingerprint acquisition module and a GSM modem. Fingerprint acquisition module is used for capturing the fingerprint and pre- treatment [18]-[21]. GSM modem is used to send the attendance of the students to their parents in the form of SMS. The system hardware includes: fingerprint acquisition module, GSM modem, microcontroller, Camera (Face recognition), MAX-232, and LCD.

https://dx.doi.org/10.24001/ijaems.3.3.16 *ISSN: 2454-1311*

VIII. CONCLUSION

The fingerprint based attendance management system was implemented with Microsoft's C# on the .NET framework and Microsoft's Structured Query Language (SQL) Server 2005 as the backend. The future work may consist of creating the database of students which contains the academic details of the students. We can send the academic details of the students periodically to the parent's mobile along with the attendance report. So in near future we can use finger vein recognition in this attendance system which very unique compared to the fingerprint authentication. The authentication can also be made as more secure by using human odor for the Security purpose.

REFERENCES

[1] Murizah Kassim, Hasbullah Mazlan, Norliza Zaini, Muhammad KhidhirSalleh "Web-Based Student Attendance System using RFID Technology" IEEE International Conference on Vol. 4 Issue. 5, 2012.

[2] B.Rasagna, prof.C.Rajendra "SSCM: A Smart System for College Maintenance" International Journal of Advanced Research in Computer Engineering & Technology,Vol. 1,Issue. 3, pp. 139-143 May 2012.

[3] Li Jian-po, ZHU Xu-ning, LI Xue, ZHANG Zhi-ming "Wireless Fingerprint Attendance System Based on ZigBee Technology" Biomedical Science Instrumentation on Vol. 37, no. 2001, pp. 373-378, 2010.

[4] O.sheoewu, o.a.idowu, "Development of attendance management system using biometrics" The Pacific Journal of science and technology, Vol. 3, Issue. 1, May 2012.

[5] Zatin Singhal, Rajneesh Kumar Gujrl, "Anytime Anywhere-Remote Monitoring of Attendance System Based on RFID using GSM Network", International Journal of Research in Engineering and Technology, Vol. 4, Issue. 2, pp.187-198, February 2015.

[6] Kamaraju M. & Kumar P.A, "Wireless Fingerprint Attendance Management System", IEEE International Conference on Electrical Computer and Communication Technologies (ICECCT), Vol. 3, Issue. 3, pp. 5-7March, 2015.

[7] Farooq U., Amar M.,Ibrahim H.R., Khalid N., Nazir S. &Asad M.U. "Cost Effective Wireless Attendence and Access Control System", IEEE 3rd International Conference on Computer Science and Information Technology (ICCSIT), Vol. 2, Issue. 10, pp.128-131, July 20103.

[8] Lixiu M,, Jinfeng P., Lijun C. &Jin S. "The Design of Wireless Students Management System based on Fingerprint Sensor", IEEE International Conference on E-Business and E-Government (ICEE),Vol. 3, Issue. 3, pp.7-9, May, 2010.

[9] Verma P. & Gupta N., "Fingerprint Based Student Attendance System Using GSM", International Journal of Science and Research (IJSR), Vol. 2, Issue 10, pp. 128-131, 2013.

[10] Talaviya G., Ramteke R. &Shete A.K. "Wireless Fingerprint Based College Attendance System Using Zigbee Technology", International Journal of Engineering and Advanced Technology (IJEAT), Vol. 2, Issue 3, pp. 201-203, 2013.

[11] Gutiérrez P.D., Lastra M., Herrera F. &Benítez J.M., "A High Performance Fingerprint Matching System for Large Databases Based on GPU", IEEE Transactions On Information Forensics And Security, Vol. 9, No. 1, pp. 62-71, 2014.

[12] Zainal N.I., Sidek K.A., Gunawan T.S. &Martini H.M.M, "Design and development of portable classroom attendance system based on Arduino and fingerprint Biometric", IEEE International conference on information and communication Technology for the Muslim world, Nov. 17-18, 2014.

[13] Benyo B., Sodor B., Doctor T. &Fordos G., "Student attendance monitoring at the university using NFC", IEEE Wireless Telecommunications Symposium (WTS), Vol. 3, Issue. 3, pp.187-198, April 18-20, 2012.

[14] Ansari A.N., Navada A., Agarwal S., Patel S. & Sonkamble B. "Automation of Attendance system using RFID Biometrics GSM modem with .Net framework", IEEE International conference on multimedia technology, pp. 2976-2979, July 26-28, 2011.

[15] R.Nagarajan and M,Saravanan. "Performance Analysis of a Novel Reduced Switch Cascaded Multilevel Inverter," Journal of Power Electronics, Vol.14, No.1, pp. 48-60. 2014.

[16] S. Chandrasekar and Gian Carlo Montanari, "Analysis of Partial Discharge Characteristics of Natural Esters as Dielectric Fluid for Electric Power Apparatus Applications," IEEE Transactions on Dielectrics and Electrical Insulation Vol. 21, No. 3, pp.1251-1259 June 2014.

[17] R.Nagarajan and M,Saravanan "Staircase Multicarrier SPWM Technique for Nine Level Cascaded Inverter," Proceedings of the International Conference on Power, Energy and Control, IEEE Press, pp-668-675. 2013.

[18] Li T. Wu H. & Wu T., "The study of Biometrics Technology Applied in Attendance Management System", IEEE 3rd International Conference on

https://dx.doi.org/10.24001/ijaems.3.3.16 *ISSN: 2454-1311*

Digital Manufacturing and Automation, Vol. 69, pp. 944-947, July, 2012.

[19] Srinidhi M.B. & Roy R., "A Web Enabled Secured System for Attendance Monitoring and Real Time Location Tracking Using Biometric and Radio Frequency Identification (RFID) Technology", IEEE International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, Jan. 08- 10, 2015.

[20] J.Chandramohan, R.Nagarajan, K.Satheeshkumar, N.Ajithkumar, P.A.Gopinath, and S.Ranjithkumar, "Intelligent Smart Home Automation and Security System Using Arduino and Wi-fi", International Journal of Engineering and Computer Science (IJECS), Volume 6, Issue 3, pp. 20694-20698, March 2017.

[21] R.Nagarajan, S.Sathishkumar, S.Deepika, G.Keerthana, J.K.Kiruthika and R.Nandhini, "Implementation of Chopper Fed Speed Control of Separately Excited DC Motor Using PI Controller" International Journal Of Engineering And Computer Science (IJECS), Volume 6 Issue 3, pp.20629-20633, March 2017.

J.Chandramohan received his B.E. in Electrical and Electronics Engineering from Bharathiyar University Coimbatore, India, in 2003. He received his M.E. in Power Electronics and Drives from Anna University, Coimbatore, India, in 2010. He is currently working toward his Ph.D. in Power System at Anna University Chennai, India. He is currently working as a Assistant Professor of Electrical and Electronics Engineering at Gnanamani College of Technology, Namakkal, Tamilnadu, India. His current research interest includes Power System and High Voltage Engineering.

R. Nagarajan received his B.E. in Electrical and Electronics Engineering from Madurai Kamarajar University, Madurai, India, in 1997. He received his M.E. in Power Electronics and Drives from Anna University, Chennai, India, in 2008. He received his Ph.D in Electrical Engineering from Anna University, Chennai, India, in 2014. He has worked in the industry as an Electrical Engineer. He is currently working as Professor of Electrical and Electronics Engineering at Gnanamani College of Technology, Namakkal, Tamilnadu, India. His current research interest includes Power Electronics, Power System, Soft Computing Techniques and Renewable Energy Sources.