Ilaro Journal of Women in Technical Education and Employment (Ilaro J Wom Tec Edu Emp)
The Federal Polytechnic, Ilaro. Ogun State, Nigeria.
ISSN: 2734-3227. Volume 1 – Issue 2. December 2020
https://fpiwitedjournal.federalpolyilaro.edu.ng

Students' Class Attendance Monitoring System Using Fingerprint

Oloruntoba S.A*, & Akinode J.L#
Department of Computer Science, The Federal Polytechnic, Ilaro
*samson.oloruntoba@federalpolyilaro.edu.ng, & #john.akinode@federalpolyilaro.edu.ng

ARTICLE HISTORY

Received: May 27, 2020
Revised: June 2, 2020
Accepted: August 31, 2020

Abstract

Students' class attendance monitoring has always been known as a typical problem that is time-consuming, energy-sapping and waste of time. Therefore, the need to adopt an electronic system as opposed to the manual process cannot be over-emphasized. This paper designed a students' attendance monitoring system which could efficiently monitor student attendance in their various classes in the Department of Computer Science, Federal Polytechnic, Ilaro, Ogun State. Student attendance is marked after a student's biometric identification has been stored in the database. This study developed an electronic class attendance monitoring system using a feature extraction algorithm for matching a fingerprint template. The use of fingerprint will help to reduce the skipping of classes by the student and which will improve their academic performance. A questionnaire was also prepared and administered to sample the opinion of lecturers and students involved. The difference in the mean response of both manual and electronic was tested using descriptive analysis. The result from the analysis corroborates the fact that the electronic method is better.

Keywords: Database, Finger Print, Matching, Monitoring, Biometrics.

Citation
Oloruntoba, S.A. & Akinode, J.L. (2020). Students' Class Attendance Monitoring System Using Fingerprint, *Journal of Women in Technical Education and Employment*, 1(2), 29-37.

1. Introduction

Most universities and polytechnics in Nigeria are still using the manual way of monitoring student attendance which requires the student to sign on a piece of paper every time they attend a class throughout the whole semester. Using the manual attendance system, there are problems such that there is no backup for the attendance records once the lecturer or Head of Class (HOC) mistakenly lost the attendance sheet, coursemate also helps their friends to sign or mark attendance. It is also hard to analyse and track student performances based on attendance factor, poor attendance in class also affect some student knowledge and skills. The possible solution is to replace the manual entries with biometric-based automatic attendance systems.

The attendance monitoring system is put to use by implementing the use of fingerprint will trigger the student to attend classes and the student would not be able to sign for their course mate or friends anymore since the system require their fingerprint to prove their attendance in the class (Liew, 2015). Also, it will be easier to analyse the student performance based on their attendance since the system will record the attendance more accurately and efficiently with minimum possible error. Also using an electronic-based system is far better than using a paper-based system to gather, store, and produce the attendance results.

In many institutions and academic organizations, class monitoring is a very important criterion that is used for different purposes which include record-keeping, assessment of students, and promotion (Karwan *et al*., 2018))

To confirm whether the student attends class or not the student has to put his/her hand on the fingerprint scanner to verify his/her data. If student record exists, then the student is marked presence otherwise it gives the message

that record does not exist. By developing this system there are various advantages like saving time, less efforts are required by the lecturer, accuracy of the result is more in comparison to the manual records and no one can represent the presence of another student because we have used unique identification as the fingerprint of the student confirm the authenticity. One of the disadvantages of this system is that every student requires a fingerprint reader to access the system.

Biometrics are related to technologies that examine and measure physical human body features, such as DNA, fingerprints, eye retinas and irises, voice patterns, facial patterns and hand measurements, for validation or authentication purposes (Tabassam *et al.*, 2009) The process of biometric validation is a way by which some spotting or traits can be identified in individual comprises retina, earlobe geometry, iris patterns, fingerprints, hand geometry, voice waves, earlobe geometry DNA, and signatures. The identification and verification process is the same irrespective of the biometric methodology employed. An individual distinct feature is captured, processed by a software application and stored as a template into a database and when there is need for verification a new physical feature is captured and compared with the one stored in the database.

Salil, *et al*., (2003) mentioned that fingerprint is the prototype of ridges and valleys on the surface of a fingertip. The endpoints and crossing points of ridges are called minutiae. It is a widely accepted theory that the minutiae pattern of each finger is unique and does not change in one's lifetime. In figure 1, Ridge endings are the points where the ridge curve terminates, and bifurcations are where a ridge splits from a single path to two paths at a Y-junction.

(a) Ridge ending (b) Bifurcation

Figure 1. Example of ridges ending and bifurcation. Saill *et al.* (2003)

When human fingerprint experts determine if two fingerprints are from the same finger, the matching degree between two minutiae pattern is one of the most important factors. Fingerprints are considered to be the best and fastest method for biometric identification. They are secure to use, unique for every person and do not change in one's lifetime. Implementation of the fingerprint recognition system is cheap, easy and accurate. Fingerprint recognition has been widely used in both forensic and civilian applications. Compared with other biometrics features, fingerprint-based biometrics is the most proven technique and has the largest market shares.

Kumar & Ummal (2013) developed a Matching algorithm used to compare stored templates of fingerprints of the candidate against the new candidate fingerprints for authentication purposes. Two majorly used algorithms are Pattern-based (or image-based) algorithms and Minutia Feature extraction-based algorithms. Pattern-based algorithms compare the basic fingerprint patterns (arch, whorl, and loop) between a previously stored template and a candidate fingerprint. The major Minutia features are ridge ending, bifurcation, and short ridge (or dot) Kawan *et al.* (2018). The ridge ending is the point at which a ridge terminates. Bifurcations are points at which a single ridge splits into two ridges. Short ridges (or dots) are ridges which are extensively shorter than the

average ridge length on the fingerprint. Minutiae and patterns are very important in the analysis of fingerprints since there is only one fingerprint each person with their fingerprint. The Minutia Feature extraction-based algorithm has been used for matching the fingerprint templates in this project work. The algorithmic step of the Minutia Feature extraction-based algorithm is shown in figure 2

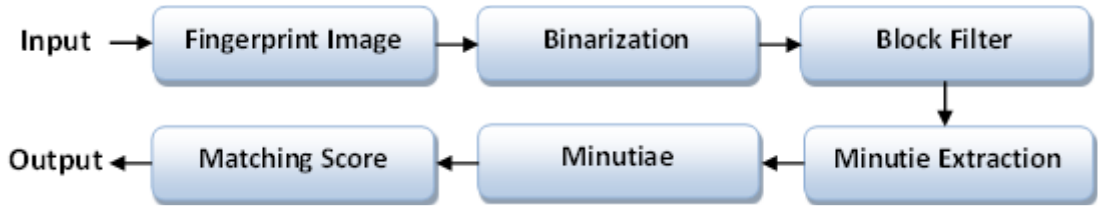

Figure 2: Flow diagram of feature extraction. Kumar& Ummal (2013)

Tabassam *et al.* (2009) developed an academic monitoring system using a fingerprint identification system. The system was developed using Digital Personal Software Development Kits Microsoft Visual Studio 2008 and SQL Server 2005, interface with a fingerprint scanner for biometric identification. When the system was tested, it produces a 98% success rate, but the system fails to incorporate a feedback mechanism in case of impersonation.

Neha et, al (20013). In a paper title efficient automatic attendance system using fingerprint reconstruction technique, developed an attendance management system using fingerprint recognition system. It consists of a finger scanner LCD/Display module LAN connection. The fingerprint scanner was used to input the fingerprint of teachers/students into the computer to extract features for matching. After matching then it updates the attendance of students.

Kamal (2015). Presented a paper titled academic attendance management system using Bluetooth technology developed a system that manages the attendance of students. The system consists of Adriano, UNO, Adafruit finger sensor, HC-05 Bluetooth Module (Master/Slave) and a laptop computer. The system is connected to get attendance from the student. The problem of this system is that no time is stated for the operation, the attendance size was not stated, and the Bluetooth device communication distance is 10 meters anything outside, there is no communication.

Ikuomola (2015) designed an Educational Time and Attendance Management System. This system was developed for Universities and colleges. It uses fingerprint scanner interfaced with a digital computer system to verify student identity. The student identifies is authenticated by the finger-based biometric which compares the capture fingerprint image with the fingerprint templates store in the database. The student is granted or denied specific lecture attendance based on the result.

This study designed a students' attendance monitoring system which could efficiently monitor student attendance in their various classes in the Department of Computer Science, Federal Polytechnic, Ilaro, and Ogun State which is the case study. Student attendances are marked after a student's biometric identification has been stored in the database. The use of fingerprint will help to reduce the skipping of classes by the student since there is no way to manipulate it thus improving their academic performance.

Ilaro Journal of Women in Technical Education and Employment (Ilaro J Wom Tec Edu Emp)
The Federal Polytechnic, Ilaro. Ogun State, Nigeria.
ISSN: 2734-3227. Volume 1 – Issue 2. December 2020
https://fpiwitedjournal.federalpolyilaro.edu.ng

3. Methodology

The proposed model was built after analysing the manual process of class attendance system. The system gets attendance of individual students with the help of a fingerprint sensor and the records of the students save inside the computer server. Fingerprint sensors and LCD screens are placed at the entrance of the classroom. In order to mark the attendance, students have to place his or her left thumb or right thumb impression on the fingerprint sensor. Immediately after identification, student's attendance record is updated in the database and he or she is notified. The proposed system is easy to operate and very reliable.

Java programming language was used to develop the front end and Microsoft SQL Server was deployed to develop the back end. Window 7 operating system was used to run the application. We designed the logic and the implementation of different processes and then putting the modules together to form the software. The application developed was then tested and validated for efficiency and performance. This system monitors individual student attendance with the help of a fingerprint sensor and all the records are saved on a computer server. Fingerprint sensors and monitor are placed at the entrance of each room. In order to mark the attendance, the student has to place his/her left thumb or right thumb on the fingerprint sensor. On identification student's attendance record is updated in the database and he/she is notified through the monitor.

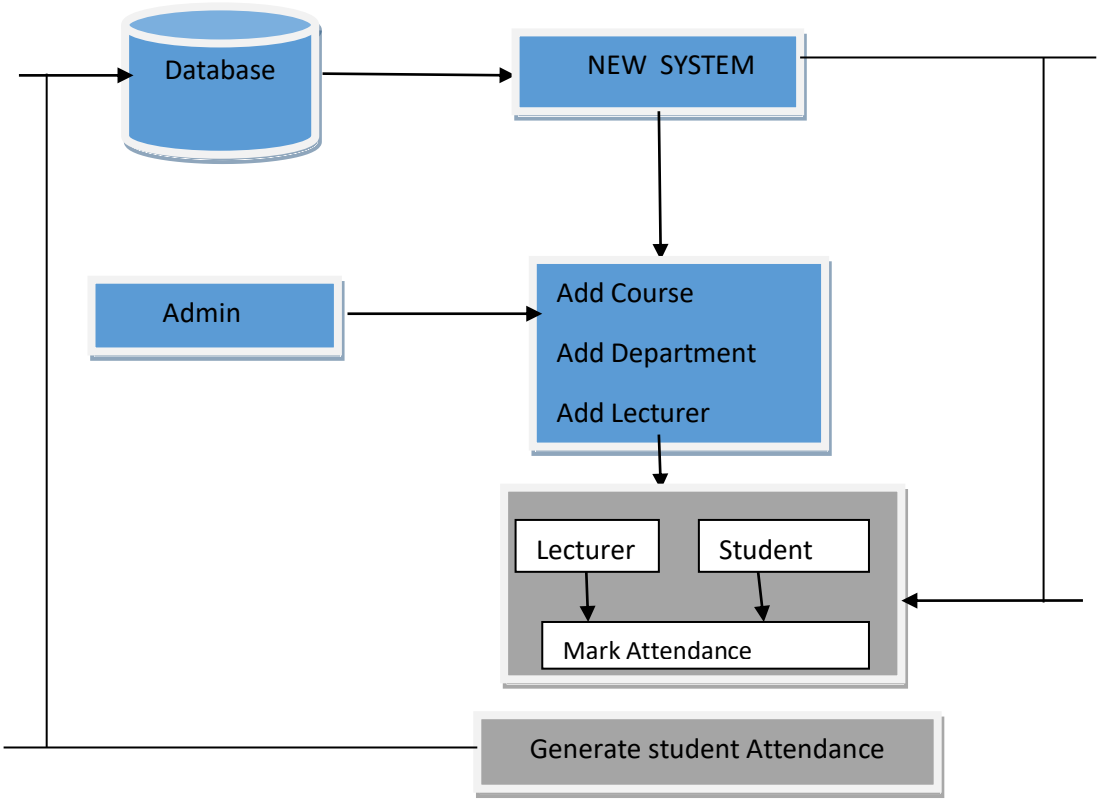

Figure 3 Proposed systems Architecture

Figure 3 shows the architectural design of the student's attendance monitoring system using fingerprint.

Ilaro Journal of Women in Technical Education and Employment (Ilaro J Wom Tec Edu Emp)
The Federal Polytechnic, Ilaro. Ogun State, Nigeria.
ISSN: 2734-3227. Volume 1 – Issue 2. December 2020
https://fpiwitedjournal.federalpolyilaro.edu.ng

4. System Implementation and Statistical Analysis

4.1 Software Implementation

During the implementation of the software, several conditions were taken into consideration among which are; No student can fingerprint more than once, No student can be registered on a proxy. The system has a login page where the admin and lecturer can log in and do other necessary activities such as adding departments, courses, and also, the lecturer login, to check the student attendance. The admin will have access to the software and will be able to add lecturer, courses, and department. Likewise, the lecturer can add student, check the attendance list and allow the student to mark attendance. Also, the student will register and mark attendance if the fingerprint matches with the one in the database. The status "student has been marked" is displayed after a successful operation.

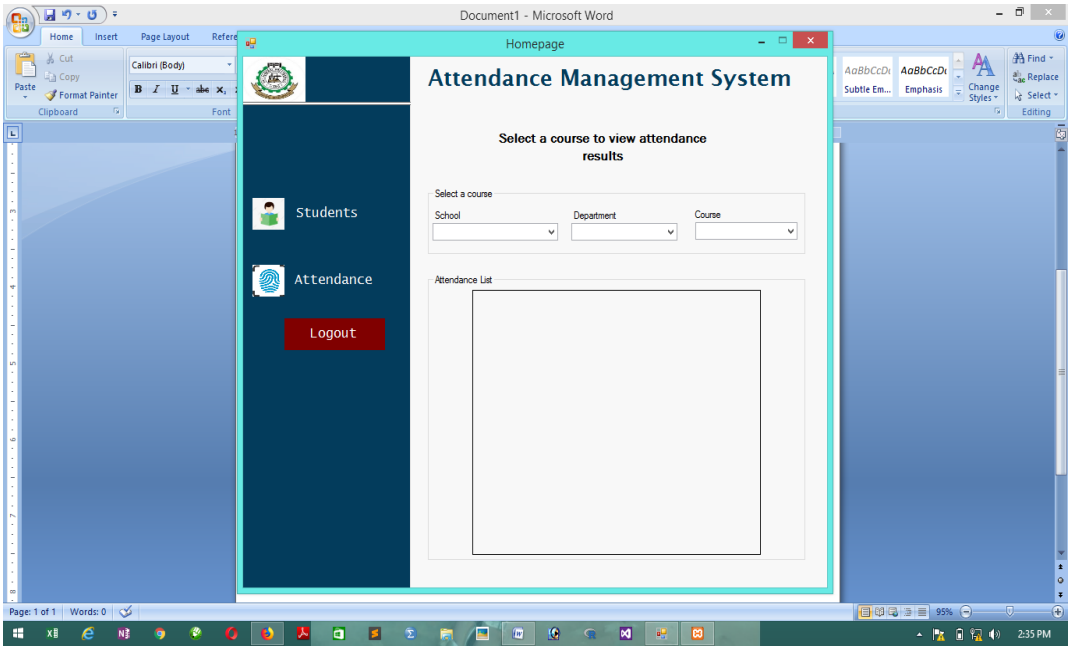

Figure 4. Registration Page

Figure 4 is the module where student register for a course and their fingerprints are captured and stored in the database with the aid of a scanner attached to the computer.

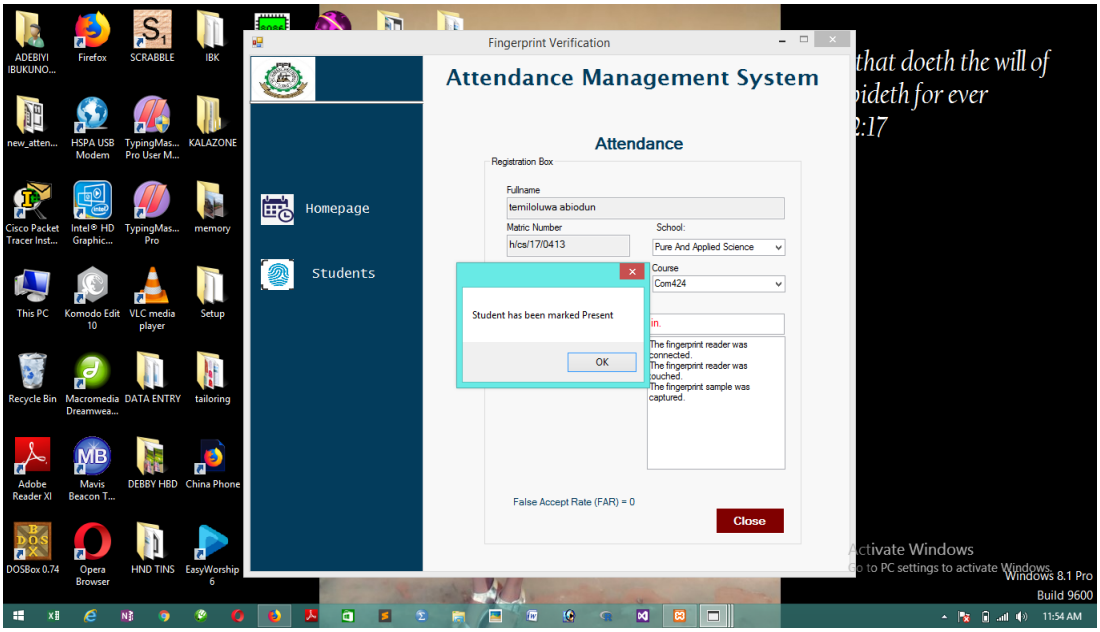

Figure 5. Student marked attendance module

Figure 5 is the module where the student fingerprints are checked against the one in the database. If there is no match, the student is not a member of the class. This is done with the aid of the fingerprint scanner attached to the computer

4.2 Statistical Analysis of Students Attendance Software Adoption

In order to test the usefulness of the developed software, 100 respondents were purposively selected among the students of the Department of Computer Science to respond to the questions contained in the structured questionnaire with responses ranging from Strongly agreed (4) to Strongly disagreed (1). The result of their responses was analysed using descriptive statistics and correlation analysis as presented in the tables below.

Descriptive Analysis

Table 1: Responses of the Respondents on the efficiency of the software

S/N	Item	SA	A	D	SD	Mean
1.	The software is interactive	74 (74%)	22 (22%)	4 (4%)	-	3.7
2.	The software is easy to use	80 (80%)	20 (20%)	-	-	3.8
3.	Power failure affects the functionality of the software	-	-	19(19%)	81(81%)	1.2

4.	There are obstacles in the usage of the software	1(1%)	-	15(15%)	84(84%)	1.2

The responses of the respondents as it is presented in Table 1 shows that 74% of the respondents strongly agreed that the developed software is interactive and 80% of them strongly agreed that it is easy to use. In addition, 81% and 84% of the respondents respectively strongly disagreed with the statement that power failure affects the functionality of the software and that there are obstacles in the usage of the software. In general, the average responses affirmed that the software is friendly and interactive.

Table 2: Responses of the Respondents on regular class attendance

S/N	ITEM	SA	A	D	SD	Mean
1.	The software will aid students regular class attendance	79(79%)	18(18%)	3(3%)	-	3.6
2.	It will help in monitoring the class activities of the students and staff	85(85%)	15(15%)	-	-	3.9
3.	It will help in monitoring students attitudes to lectures	92(92%)	8(8%)	-	-	3.9

From table 2, 79% of the respondents strongly agreed that the software will aid students regular class attendance, 85% strongly agreed that the software will help in monitoring class activities of the students and staff. Lastly, 92% of the respondents strongly agreed that the software will help in monitoring students' attitudes to lectures. Besides, the average responses of the items show that majority of the respondents believe that the software will aid in regular class attendance for staff and students.

Table 3: Responses of the Respondents on students' performance

S/N	ITEM	SA	A	D	SD	Mean
1.	The software will aid students' performance	79(79%)	21(21%)	-	-	3.8
2.	The usage of the software will help the students to have more understanding of the course(s)	87(87%)	13(13%)	-	-	3.9
3.	This is a means of enhancing students' seal for knowledge acquisition	90(90%)	10(10%)	-	-	3.9

The result in Table 3 shows the effect of the implementation of the software on the students' performance; 79% of the respondents strongly agreed that the software will aid students' performance, 87% of the respondents strongly agreed that the usage of the software will help the students to have more understanding of the courses and lastly 90% of the respondents strongly agreed with the statement that the software will enhance the students' seal for knowledge acquisition. The average response shows that majority of the respondents affirmed that the software would aid students' performance.

Table 4: Relationship between perceived students' performance, regular class attendance and efficiency of the system.

Item	Perceived Students' Performance	Regular Class Attendance	The efficiency of the System
Perceived Students' Performance	1	0.76*	0.87*
Regular class attendance		1	0.88*
The efficiency of the system			1

**p-value is significant at 5% level.

The result in Table 4 shows the strong relationship (r = 0.76) between perceived students' performance and regular class attendance which suggests that most of the respondents believe that constant attendance in the lecture hall will aid students' performance. Moreover, the result further shows a strong positive relationship between the efficiency of the system and the perceived students' performance (r = 0.87). This result shows that the respondents believed that the efficiency of the software will not discourage them from attending the lecture hall because the duration and the time of usage are very minimal. Lastly, there is a strong positive relationship between regular class attendance and the efficiency of the system.

5. Conclusion

In conclusion, an electronic student's class attendance monitoring system using fingerprint was developed to overcome the shortcoming of a manual system. This electronic system will simplify the old method and better management of resources of both students and lecturers in term of class attendance and academic performance of students. The software with little modification can be adapted to be used in tertiary institutions of learning. Also based on the statistical analysis of this study, the software will be useful to replace the manual method. It is therefore recommending the full implementation of this software to ease the burden of the manual recording of class attendance within the higher institution in Nigeria.

References

Ikuomola. A. J. (2015) Fingerprint based authentication system for time and attendance m Management. British. *Journal of Mathematics and Computer Science* 5(6), 735-747.

Jain A. K., Prabhakar S., Hong L. & Pankanti S., (2000). Filterbank-based fingerprint matching IEEE Trans Image. *International Journal of Computer Science Issues* 85(9), 1365– 1388.

Kamal WAN M. (2015). Development of academic attendance management system using Bluetooth Technology. Thesis Faculty of Electrical Engineering university of Teknologi Malaysia 1-66

Karwan Jacksi et al. (2018). Student Attendance Management System Sch. *International Journal of Scientific & Engineering Research* 49-53, 2321-435X.

Kumar D. A. & Ummal S. B, (2013). A Comparative Study on Fingerprint Matching Algorithms. *EVM Journal of Computer Sciences and Applications*, 55-60.

Liew Ken. (2015). Fingerprint Recognition Student Attendance Management System: *Faculty of Information and Communication Technology*, 1683–1686.

Neha, V., Koma, S. & Megha, R. (2013). An Efficient Automatic Attendance System Using Fingerprint Reconstruction Techniques. *International Journal of advanced Research in Science and Engineering* 2(3).

Rahman, S., Rahman, M. & Rahman, M. M. (2018). Automated Student Attendance System using Fingerprint Recognition, *Edelweiss Applied Science Tech*, 2(1): 90-94.

Salil Prabhakar, Sharath Pankanti & Anil K Jain (2003). Editors, *Biometric Recognition*: *Security and Privacy Concerns IEEE Security and Privacy Magazine.* Grenoble, France.

Tabassam. N et. al. (2009). Development of Academic Attendance Monitoring System Using Fingerprints Identification (IJCSNS). *International Journal of Computer Science and Network Security*, 9(5), 164-168.

Vinay Suryawanshi et al, (2017). Attendance System Using Fingerprint Identification with GUI. *Journal of the Acoustical Society of America* 5(2), 2321-9939.