



FINGERPRINTBASED ATTENDANCE MANAGEMENT SYSTEM

O. J. Ikani

Computer Science Department
Afe Babalola University
Ado-Ekiti, Nigeria

O. A. Sanya,

Computer Science Department
Afe Babalola University
Ado-Ekiti, Nigeria

M. M. Yahaya

e-Extension Department
National Agricultural Extension and Research Liaison
Services, Ahmadu Bello University
Zaria, Nigeria

L. Durojaiye

e-Extension Department
National Agricultural Extension and Research Liaison
Services, Ahmadu Bello University
Zaria, Nigeria

Abstract: This research was conducted with the broad objective of providing solution to the traditional student attendance system to a fully-computerized and automated system. The system was designed to improve the existing method of attendance taking by introducing a biometric feature i.e., fingerprint capturing. The system was built using C# and SecuGen fingerprint reader. It has successfully been able to capture the fingerprint image of any individual within a time range of 0.2 to 0.5 seconds, differentiating each captured fingerprint from others which has been captured previously, and recording the input data, thereby achieving the objectives of the study. This system has been able to circumvent the problem of drudgery and in efficiency of the conventional method of attendance taking, and it is therefore recommended that this application of biometric system be adopted and used in schools and organizational bodies to reduce impersonation that is common in the old system of verifying candidates.

Keywords: SecuGen, Fingerprint, Attendance, Biometric, Automated.

I. INTRODUCTION

Managing student attendance can be rigorous using the conventional method of paper sheets and old file system. Every academic institution possesses some standards concerning how attendance is to be confirmed for students in lecture halls, laboratory sessions and examination halls. Although the approach of using paper sheets and the old file system to confirm students' attendance has been in use for years, according to [1], some challenges associated with it includes;

- i. Time consumption
- ii. Requires lots of effort when preparing sheets and documents
- iii. Loss or damage to the sheets.
- iv. Sheet could be stolen

Also, in the manual signing processes where the lecturer gives a sheet of paper to students to write their names and append their signatures as a way of confirming their presence for a class session, falsification in student attendance frequently occurs. A student can sign on behalf of his or her colleague as being present in the class when not true. This can be so difficult to prevent especially for large classes where row count will be time consuming, hence the need for an alternative approach which will be the use of biometrics in this case. Biometric qualities can be utilized for verifying an individual's identity. This research focused on developing a biometric based student attendance monitoring system using fingerprint.

The expression "Biometrics" is gotten from the Greek words "bio" (life) and "metrics" (to measure) [2]. Automated

biometric systems have just become useable over the last few decades because of the substantial improvement in image and computer processing. Although, biometric technology is a subject of the twenty first century, biometrics has its root as back as thousands of years ago. The origin of biometrics has been in the public sector; however, biometrics is used for the identification and verification of criminals [3]. Other sectors where biometrics have also thrived are the Banking, Education and Health sectors, e.g., emerging application markets include biometrically enabled transactional payment solutions and biometrically enabled wireless for business use. Some European banks use the 3D facial recognition of employees to grant them access into bank buildings, thereby eliminating the issue of keys which could get lost, stolen or misused [4]. Furthermore, biometric application has been useful in various other sectors like the Government using it for stopping terrorist attacks and fighting crimes. After the 9/11 incident, the Yeager Airport in Charleston introduced the biometrics system, which is used to secure access to its control tower [5]. Also, the biometrics system has been very useful in the Education sector where it has assisted students in the borrowing and returning of books out and into the library respectively. The positive impact of biometrics to the health sector cannot be left out as it has helped in stopping fraud. A palm scanner which reads a patient's unique vein pattern was implemented in Sharp Healthcare in San Diego to stop patient identity theft, the system was known to be very secure and performed efficiently well for its purpose [6].

II. REVIEW OF RELATED WORK

Numbers of related literatures based on electronic device for student attendance record currently exist as reviewed below.

[7] Developed an attendance system using RFID technology for university. Students had to carry RFID tags to mark the attendance for university processes. The system was a prototype and had only a small scale of application. It consisted of a mobile RFID solution in a logical context.

[8] Carried out extensive research on applicability of biometric technology to solve the problem of staff attendance. The study was conducted using a telecommunication company in the South West region of Nigeria, to determine the specific biometric identifier that can be used to enhance their traditional staff attendance system which affects the productivity of the organization. The study was conducted using a quantitative approach by designing a questionnaire as the data collection instrument based on different biometric technologies. The survey involved 37 employees based on stratified random sampling technique. The results however showed that fingerprint biometric identifier was found suitable for the staff attendance management system of the organization. However, no software was developed to take and record attendance.

The authors [9] from the National Institute of Technology, Calicut, developed an attendance system that comprises two sections, one portable hand-held device and a host computer. The fingerprint registering device is a hand-held device which can be carried to the classroom. A Graphical user interface application in the host computer helps the lecturer to manage the student records. It can perform tasks such as students, import and export attendance data etc. After feeding the student list to the device, the lecturer then takes the device to the classroom. The class batch is selected from a menu and the data of the students taking the class is displayed. In the first class, the students register their fingerprint by selecting their roll numbers and placing their finger. From the second class onwards, they can mark their attendance by simply placing their fingers on the scanner. The lecturer can take the device to his office after the class session and it can be connected to the computer. The attendance details can be updated using the Graphic User Interface application.

The study of [10] explained that the performance of a modern automated fingerprint recognition system is heavily influenced by the accuracy of their fingerprint feature extraction algorithm. Their study investigated the possibilities of integrating artificial neural networks into fingerprint recognition process. The study resulted in a fully functional software system for fingerprint recognition that consists of fingerprint sensing module using a high-resolution sensor, image enhancement module responsible for image quality restoration, level-1 and level-2 feature of extraction module based on neural network, and finally, fingerprint matching module using the industry standard BOZORTH3 matching algorithm.

A study by [11] proposed a system of automatic attendance management which integrates fingerprint authentication into the process of attendance management of both staff and students, with an objective of extracting the local

characteristics of a fingerprint which is minutiae points in template based. Templates will be matched during both registration and verification processes. Fingerprint recognition using Minutia score matching method was used for matching the minutia points before attendance is recorded. The system records clock in and clock out time of students and workers effectively using their fingerprint to prevent impersonation and reduce level of absence.

III. METHODOLOGY

Generally, fingerprint identification system is mainly divided into three modules; fingerprint image preprocessing, minutiae extraction and minutiae matching [12]. The input fingerprint image is often processed for skeleton image by the fingerprint image preprocessing stage which is subsequently processed by minutiae extraction stage for extracting minutiae using the crossing number concept. After a successful minutiae extraction stage, if input fingerprint image is processed for enrollment, then, the skeleton image is saved as template fingerprint image in the database, otherwise skeleton image is given to matching stage. In the matching stage, the system compares skeleton image with template fingerprint images from the database and make decision whether input fingerprint match or not.

Fingerprint recognition basically involves taking an image of a person's fingertips and records its characteristics like whorls (ridges form circularly around a central point on the finger), arches (the ridges enter from one side of the finger, rise in the center forming an arc, and then exit the other side of the finger), and loops (the ridges enter from one side of a finger, form a curve, and then exit on that same side).

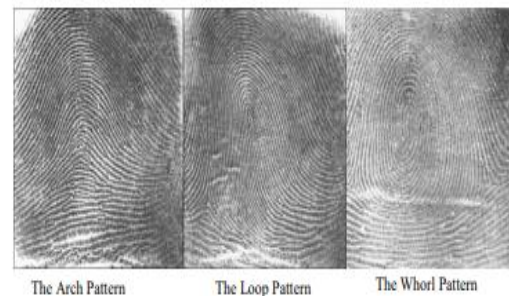


Figure. 1: The three basic fingerprint patterns

Also, with the patterns of ridges, furrows, and minutiae, fingerprint matching can be achieved in three ways:

- i. Minutiae based matching stores minutiae as a set of points in a plane and the points are matched in the template and the input minutiae.
- ii. Correlation based matching superimposes two fingerprint images and correlation between corresponding pixels is computed.
- iii. Ridge feature-based matching is an advanced method that captures ridges, as minutiae capturing are difficult in low quality fingerprint images.

IV. RESULT AND DISCUSSION

The fingerprint-based attendance management system was implemented with C# as programming language, MySQL for database and SecuGen fingerprint reader.

The system has three users, the administrator, lecturer and the student. The figures below depict the screenshot.

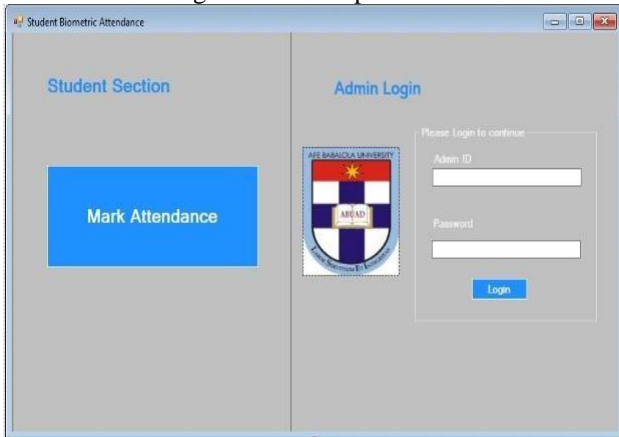


Figure.2: HomePage

As depicted in figure 2, this page contains two modules;

- i. The student’s module
- ii. The admin’s module

The student module contains a “Mark Attendance” button, when clicked on, it takes the student directly to a page where the student attendance will be captured by placing his fingerprint on a biometric scanner.

The admin module has a login page where the admin can login with his username and password before accessing the system in order to manage the student’s attendance.



Figure.3. Main Menu Module

Figure 3 depicts the main menu for admin after a successful login where he can perform various operations ranging from add new class, enroll new student and manage registered students.

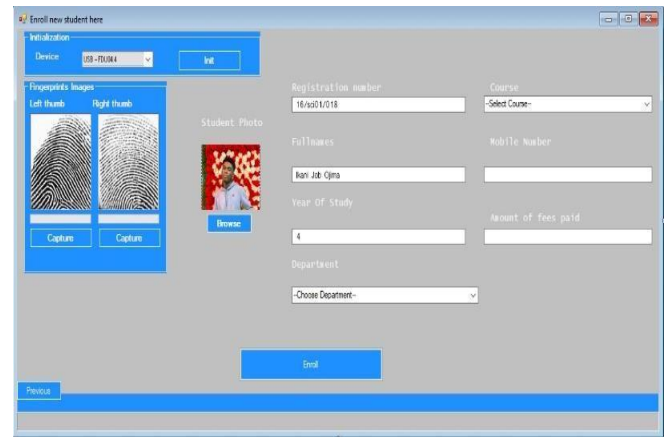


Figure.4. Student Registration Module

Figure 4 depicts student registration module which is a compulsory exercise for every student as no student can take his or her attendance without being profiling, thus, the need for enrolment. This module allow student to register their bio-data ranging from registration number, name, year of study, department, course of study amongst others. The student’s thumbprints, both right and left for proper verification and a passport photograph will be taken as well to complete the registration process phase.

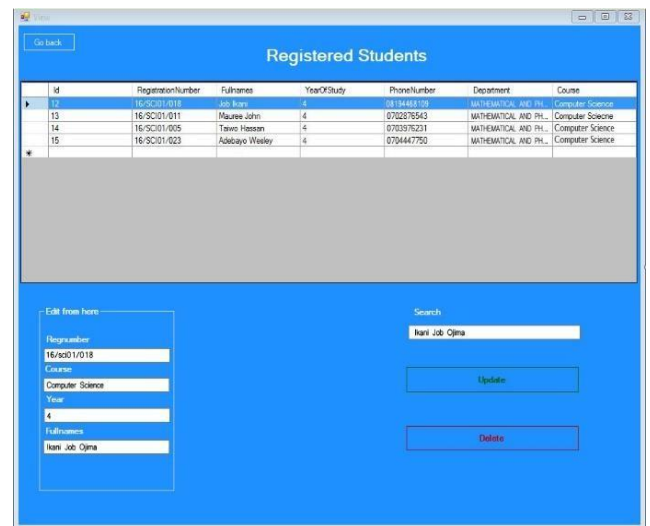


Figure.5. Student Registration Module

Figure 5 depicts registered student where an edit and delete operations can be performed.

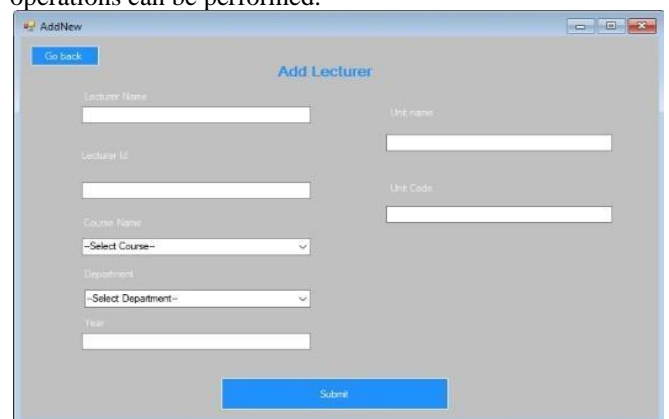


Figure 6: Lecturer and Course Registration Module

Figure 6 shows the lecturer and course registration module where other details can also be registered.

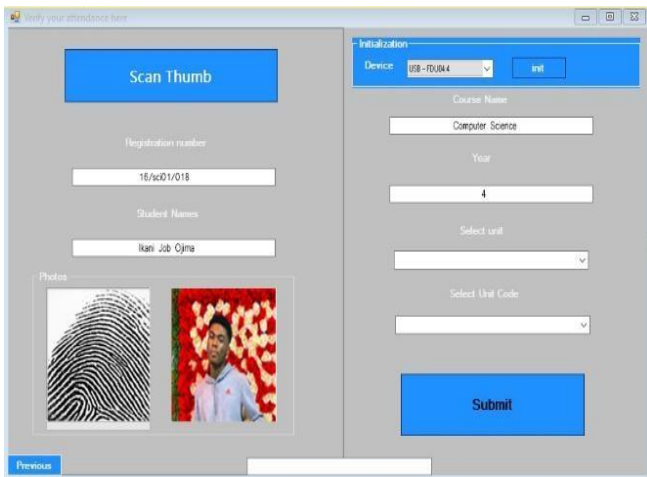


Figure.7. Attendance Module

Figure 7 captured the attendance module where lecturer can take student attendance of an on-going class by launching the application, clicks on mark attendance in the student section on the home page, afterwards initialize the fingerprint device to be used by clicking on the “int” button, and clicks on the “scan thumb” button, then the student places his or her thumb on the scanner. The system validates and verify the thumb, if successful the student’s records will be populated from the database, otherwise the system will throw an error.

IV. CONCLUSION

In this research, an attempt has been made to identify the requirements for a Fingerprint Based Student Attendance Monitoring System, after a successful implementation of the system, this study has come to a conclusion that fingerprint is one of the best biometric technologies that can solve the lingering problem of student attendance in institutions. If it is implemented, the entire draw backs of the manual system will be eliminated or drastically minimized.

VI. REFERENCES

[1] Jacksi, Karwan& Ibrahim, Falah &Zebari, Shahab. (2018). Student Attendance Management System. International Journal of Engineering and Technology. 6. 49-53. 10.21276/sjet.2018.6.2.1.

- [2] Rood, E.P. and Hornak,L.A. (2008, Nov 11th) Are you who you say you are? Retrieved from <http://www.worldandcollege.com/public/2003/august/nspub1.asp>.
- [3] Jiexun L., Wang.A. And Chen H (2011). ‘Identity matching using personal and social identity features’; 13: 101-113.
- [4] Capoor S. (2006). ‘Biometrics as a Convenience Security’, Business story, 48-50.
- [5] Dubin, C. (2011). ‘Biometrics: Hands Down’, ID Management. Security, 52-54. Retrieved from <http://proquest.umi.com/pqdweb?index=0&did=2277161341&SrchMode=1&sid=2&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1304030671&clientId=13314>.
- [6] Kreimer, S. (2010). Matching the Right Patient to the right Record. Hospitals & Health Networks. Retrieved from <http://proquest.umi.com/pqdweb?index=0&did=2212480041&SrchMode=1&sid=1&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQ>.
- [7] A. Kassem (2010) “An RFID Attendance and Monitoring System for University Applications”. IEEE International Conference on Electronics, Circuits, and Systems.
- [8] Oloyede M.O. (2013) “Fingerprint Biometric Authentication for Enhancing Staff Attendance System”. International Journal of Applied Information Systems (IJ AIS). Volume 5- No. 3.
- [9] M. Basheer, C. V. Raghu (2016) “Automated Student Attendance System Using Fingerprint Recognition”. at <https://www.semanticscholar.org/paperAutomated-Student-Attendnce-System-using-Rahman-Rahman/300e20eb9729104dca6fe0e26006b8c575425>
- [10] Marak, P., Alexander, H. (2016) “Fingerprint Recognition system using artificial neural network as feature extractor”, 117–13. DOI: 10.1515/tmmp-2016-00.
- [11] Akinduyite, C.O., Adetunmbi, A.O., Olabode, O.O., Ibidunmoye. E.O. (2013). Fingerprint-Based Attendance Management System. Journal of Computer Sciences and Applications, 1(5), 100-105.
- [12] Manvjeet Kaur, Mukvinder Singh and Parvinder S. Sindhu, “Fingerprint Verification System using Minutiae Extraction Technique”, Proceedings of World Academy of Science, Engineering and Technology, vol. 36, December2008.