

Attendance Authentication And Assessment System Using Fingerprint Technology

KPELA PRINCE GIOBARI¹ AND CONSTANCE IZUCHUKWU AMANNAH²

¹kpelaprince@yahoo.com, ²aftermymisc@yahoo.com²

^{1&2} DEPARTMENT OF COMPUTER SCIENCE, IGNATIUS AJURU UNIVERSITY OF EDUCATION, RIVERS STATE, NIGERIA

Abstract—Accurate and effective Students' attendance has become of more concern to the educational institution occasioned by the call to check the absenteeism of their learners. Student attendance is marked manually on paper sheet or notebook containing the names of students, falsification of signature do occur and students sign attendance for colleagues that are not present. The purpose of the study was to develop students' attendance authentication system using fingerprint technology. However, the objective of the study were to; ascertain the constraints of the existing class attendance system, design a proposed student authentication platform for class attendance with the aid of used digital personal fingerprint matching technique, identify and verify student's fingerprint, implement the proposed student authentication platform for class attendance, and test and deploy the proposed student authentication platform for class attendance. The method adopted was waterfall model. The waterfall model analyses the flow of the software paradigm. The proposed system was implemented using JAVA, MYSQL and Software Development Kit (SDK) was also used to integrate the fingerprint module. The developed system was tested and deployed. The system authentication and validity was measured by capturing few students' fingerprints data to march the attendance. The system is recommended for use by users with basic skills in computer operation and doing so with recommended data categories as indicated in the documentation, alongside with the standard recommended in software and hardware specifications.

Keywords—Attendance, Authentication, Fingerprint Technology, Signature, minutiae technique

I INTRODUCTION

Students' attendance management in institutions is conventional and traditional. Paper and pen are still the instruments of this sensitive routine. The conventional attendance system is associated with difficulty in modifying students' information and in computing other statistical decisions. As an alternative to the conventional way of the clocking process, fingerprint technology can be adopted for authenticating students' attendance. This study was designed to develop students' attendance authentication system using fingerprint technology. In the traditional process, lecturer give notebook or a printed list of students' names to sign attendance.

Researchers regard biometric as a method that can be used to detect the true user's identity. Fingerprint authentication

refers to any automatically assessable robust and unique physical attribute or personal traits adopt to identify a person or verify the claim of an individual. Biometric science uses the measurements of an individual behavioural character such as; mouth movement, upright strokes or biological uniqueness such as; fingerprint, nose, jaw, voice pattern, eye, and so on. It is the facial appearance captures that are used in transform digitally into a template. The detection software analyses the facial appearance features and discovers the individual involve in the crime. Fingerprint recognition is regarded as the most unique biometric method used in identification of an individual [1].

Biometric is an endeavour that utilizes automated technique in identifying and verifying individual based on behavioural and physiological traits. Biometric paradigm makes it so essential in recognizing some part of the human body in which lost of identity is not possible. The uniqueness of fingerprint pattern valid differently that no two individual can possess the same types of fingerprint. Also it is difficult for a criminal to guess a fingerprint but password can be easily predicted using different categories such as date of birth, or last four digit of individual phone number, [2, 9].

A. Statement of the Problem

Tracking and authentication of students' attendance can be wearisome, more of time wasted and errors. The paper-based attendance is not reliable and secured. Students' signature can be guessed and used. The study proposes a computerized system that evaluates students' mark attendance electronically using fingerprint technology. The students' data and fingerprint will be captured, verified and authenticated for security purposes. The system will track, monitor update, and store the class attendance records and decisions purposes. Falsification of signature and misplacement of attendance will be eliminated.

B. Specific objectives

The study intended to;

- i. review the conventional class attendance system.
- ii. design a fingerprint authentication platform
- iii. implement the proposed fingerprint authentication platform.
- iv. test and deploy the proposed fingerprint authentication platform

C. Significance of the Study

The introduction of students' authentication platform using fingerprint technology will eradicate the paper-based attendance along with its associated bottlenecks; falsification of data, inaccuracy, inconvenience approach, editing and updating constraints and so on. The proposed system supports mechanism for verification of attendance data.

D. Scope of the Study

The study is limited to students' attendance authentication for lecture activities. The system is restricted to a window-based platform.

II RELATED LITERATURE

A. Automated employee time clocking system

Furnem [3] holds that automated process has been a relevant tool for businesses and collection of employee attendance data when the worker schedule shift is still involved in manual process. Many businesses have migrated from conventional method to automated or computerized processes; such as attendance system, inventory, purchasing, payroll processing and monitoring of employees' duty time and off duty time.

B. Biometric Attendance System

In [4] biological features can be measurable in the field of biometric study. In the field of computer security, the physical feature of biometric authentication can be measurable and automatically checked using various techniques. He further expressed that there are numerous types of biometric identification schemes which include; fingerprint, hand geometry, vine voice and face recognition.

C. Hand Geometry Theory of Biometry

David Sidlauskas propounded Hand geometry as a biometric that recognises individual nature of their hands, [5]. Practical hand geometry procedures have been manufacture in the 1980s, hand geometry was considered as the first biometric in searching for widespread computerized use. Widely accepted ordinary applications of hand geometry include access monitoring in time attendance operations. Given that hand geometry has not been considered as exclusive as fingerprint, palm veins and irises are always preferred technology for high-security. Hand geometry is efficient and accurate when it is combined together with other related identification. When the population increase, hand geometry application is not secure enough, as individuals are identified with other recognition biometry together with hand geometry. This study explores the principles in the theory of David Sidlauskas.

D. Pattern Recognition Theory

The theory of pattern recognition states that pattern recognition is a process of recognizing patterns by using machine learning algorithm, [6]. This involves matching and trait detection. The methods and model enshrined in the theory of Gbbert are instrumental in this study. It provides for pattern recognition and classification making for effective comparison of features of the fingerprint.

E. Students' Examination Records Database

In the work of Fenibo [7] he focused on the need for tertiary institutions to replace their paper database with efficient database systems for handling students' data. His aim was to create a database management system for handling student data. His objectives were to; design student database management system, and implement secured and efficient database management systems. The methodology used was V- model. The result of Fenibo's study showed the need for institution to take advantage of the advancements in Relational Database Management System (RDMS). In Fenibos' study he did not actually developed the student platform for monitoring and authentication, which is the gap this proposed study is poised to bridge.

F. Design of a Database System for Effective Capturing and Efficient Updating of Student Record

In the work of Nbazuigwe, [8] she focused on database security of students' form with a view to reducing unauthorized personal and misplacement of students' relevant data. Her aim was to design a database system for effective capturing and updating of students' records. Her objectives were to; create an effective database management system, enable the use of technology to ascertain information about students with minimal manpower, make information accessible for decision making, and automate data entry and reduce data lose due to natural and accidental fire outbreak. The methodology used was waterfall model. She examines some related futures that can enhance the capturing and updating of students' record. The result of Mbazuigwe's study showed that electronic database is better option as compared to the traditional method. The platform developed by the study cannot actually verify imposters, which is the gap this proposed study is poised to bridge.

III SYSTEMS ANALYSIS AND DESIGN

A. Analysis of the Existing System

The existing system permits the students to sign their class attendance manually on a printing paper. Lecturers give attendance sheet of paper or notebook containing names of the students to the course reps to give out to the student to sign-in their signature or the lecturer directly give to the student to sign as a way of ascertaining student who were present in class. The converse is considered to be absenteeism. In the existing system, students falsify signature to sign attendance for their colleagues that are not present in the lecture hall. Figure1 highlights the architectural components of the system.

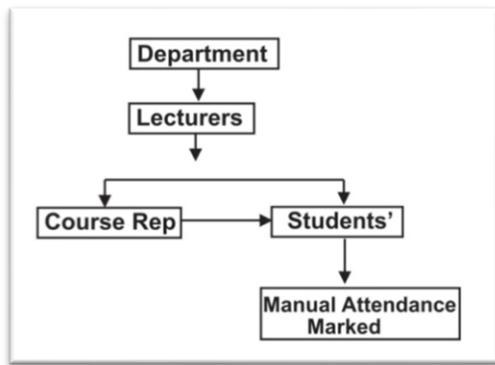


Figure 1: Architecture of the Existing System Source: [1]

B. Analysis of the Proposed System

The proposed system is development of student's attendance authentication system using fingerprint technology. In the proposed system, the administrator will register and capture the students fingerprint, process the fingerprint and to mark attendance as a way to confirm his/her present in the lecture classes. In the capture process, raw fingerprint is captured by the sensing device extort the unique characteristics from the raw fingerprint section and convert into a procedure identifier record. In the enrolment process results are saved in the system database for future comparison and authentication.

In the proposed system, the administrator create an account for each lecturer and capture his/her fingerprint to activate their attendance dashboard, the lecturers have a privilege to view his/her course attendance report either weekly, monthly or semester- based to take relevant decision concerning students' absenteeism. The students' have the privilege to thumbprint, by thumbprint the device capture the student fingerprint and send to the system server, the server process minutiae, verify and record the student as present in the class.

C. Architecture of the Proposed System

The architecture of the proposed system consists of three major segments (system administrator, students' and lecturer's segment). The login page is the first page from where every other action in the system starts. In the login page, only users with the right login credentials are granted access to the main system. The administrative dashboard or page gives its users the privilege to utilize the following functionalities of the system; adding new courses, new students and new lecturers. Whereas the lecturers' segment or page grants its users the following privileges; authenticate his attendance, view students' daily lecture attendance report and end of semester lecture attendance report. Students' dashboard gives the student privilege to mark their daily present attendance. Figure 2 describes an elaborated structure of the system.

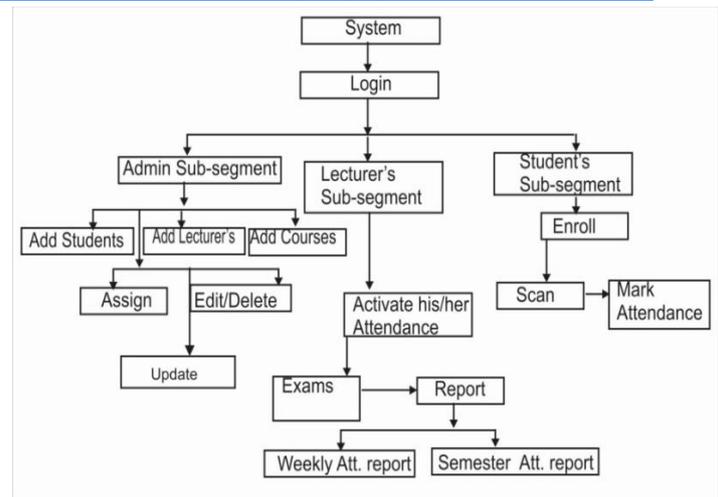


Figure 2: Architecture of the proposed system

D. Method Adopted For the Study

The method adopted in the development of the system is the Waterfall model. The waterfall model was used in this study to emphasize the logical progression and physical planning in testing each stage of the system requirement. The waterfall method was also used in the study to analyse the sequential flow of the software development life cycle. The requirement phase which enable the gathering of all possible requirements of the system to be developed. The system design enables the specification of hardware and system requirement in defining the overall system architecture. The implementation phase enables unit testing which integrate into the next phase. The testing phase enables the method to test all the units developed in the implementation phase. The deployment phase enables the study to integrate the function and non-function testing before deployment to the user.

E. Design of the Proposed System

The system design highlights the basic features of the proposed system. They include;

Login page: verify the admin fingerprint either access denied or access granted.

Students' Enrolment Form: in the student enrolment form each student accurate information will be keyed into the system.

Lecturer's enrolment form: in the lecturer enrolment form each lecturer accurate information is keyed into the system.

Course Assign Form: in the course assign form the students register each lecturer's courses.

Thumbprint: this is the unique fingerprint image of each student.

Authentication: is the method of validate and authorizing the student to mark attendance.

Report: this gives the basic information about the student performance.

F. Input Design of the Proposed System

The system input include three forms where the administrator keys in information to the system. The forms include as shown in figures 3, 4, and 5;

- i. Students' Enrolment Form.
- ii. Lecturer's Enrolment Form
- iii. Course Assign Form

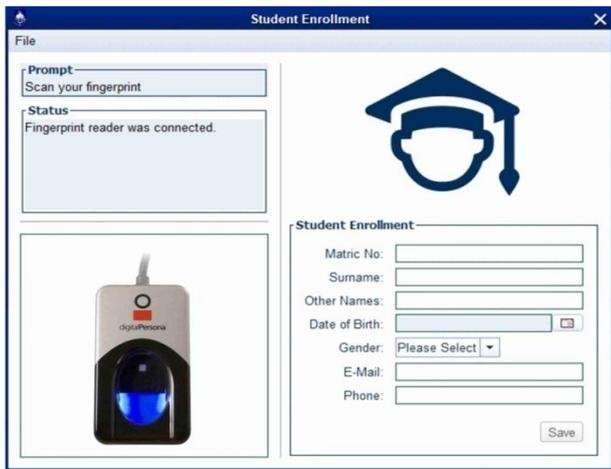


Figure 3: Student Enrolment form



Figure 4: Lecturers Enrolment Form

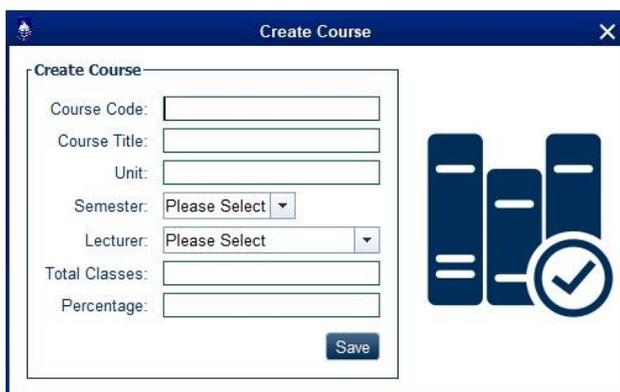


Figure 5: Courses Assign Form

G. Process design of the proposed system

The processing functionalities of the proposed system are carried out by the software server. The system

administrator login into the system on the software server, submits the registration form of the students, lecturers and course form details of every students' to the server and the server processes the data and saves it in the database. Thereafter the lecturers will activate the attendance and give students' access to thumbprint authenticates and authorize to confirm his/her presence in the class. Lecturers can view attendance reports or print it if necessary. The process design is shown in figure 6.

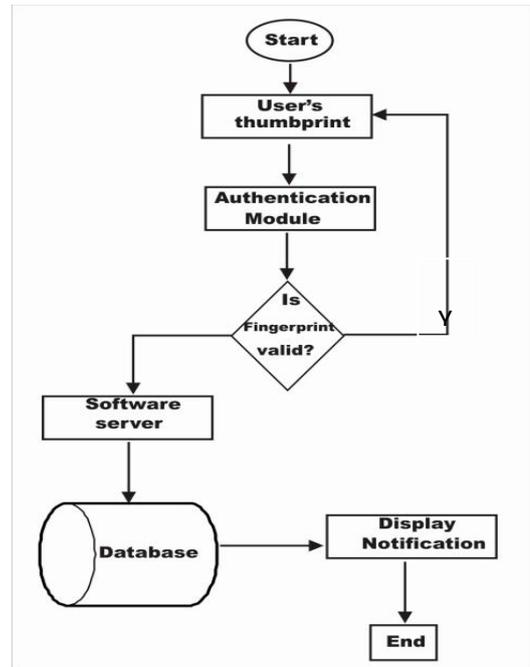


Figure 6: Process Flow design of the proposed System

H. Flowchart of the Proposed System

The flowchart of the proposed system shows all the system communication flows, exchange of data between the system components and the direction of the dataflow. It also shows various decisions and iteration points in the system.

I. Output Design of the Proposed System

At the output end, the students' attendance report is made either weekly, monthly or per semester and on request is displayed on the monitor for viewing and/or printing. The output end also displays the student's personal information, total attendance marked and the details of each particular courses. Samples of the attendance form, the flow of operation and the report form are described in figures 7, 8, 9, and 10.

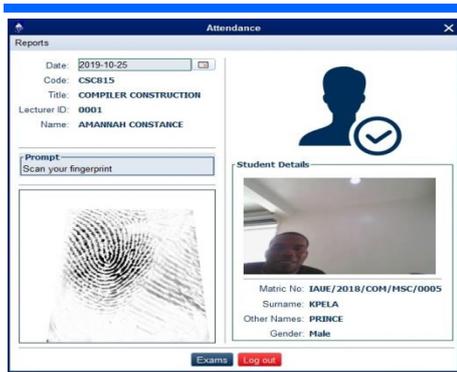


Figure 7: Attendance Page

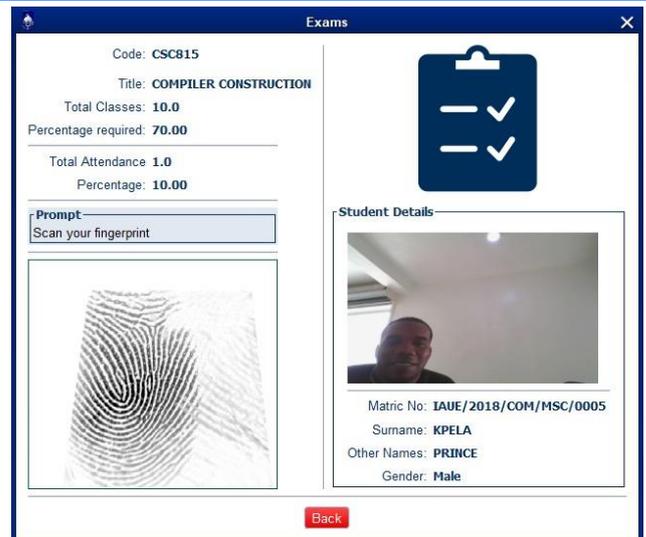


Figure 9: Total Classes Attended and Percentage Verify Page

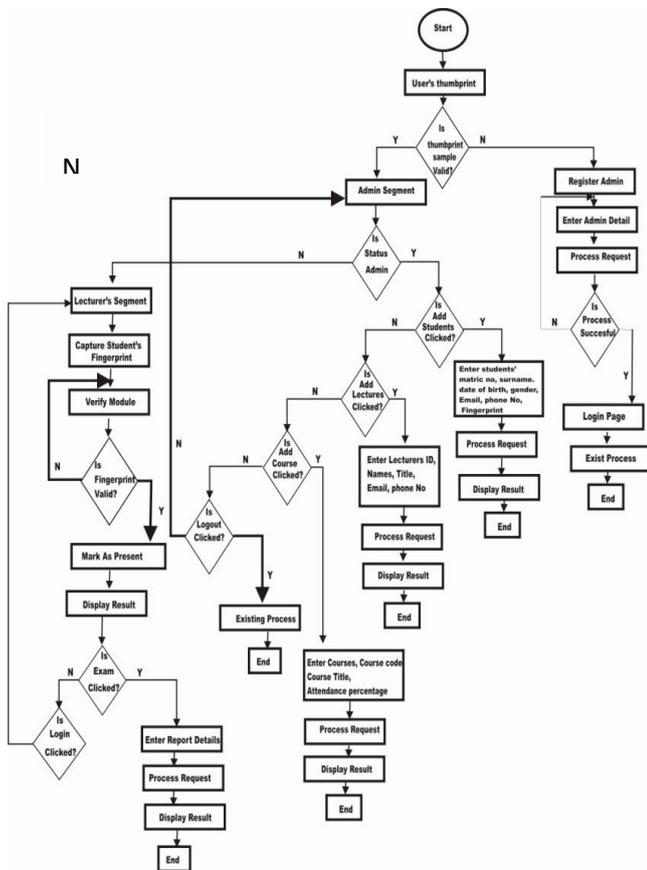


Figure 8: Flowchart of the Proposed System

S/No	Matric No	Student Name	Attendance Status
1	IAUE/2018/COM/0001	OCHINUGOR DONPAUL	Absent
2	IAUE/2018/COM/MSC/0002	DIAMOND PHILIP	Absent
3	IAUE/2018/COM/MSC/0003	ORLUMA JOY	Present
4	IAUE/2018/COM/MSC/0004	AMADI PETER	Absent
5	IAUE/2018/COM/MSC/0005	KPELA PRINCE	Present

Figure 10: Students' course Attendance Report

IV Database Design of the Proposed System

The database design of the proposed system highlights how data will be structured in the database. The database consists of three tables; Students table, Lecturers table and course assign table. Figure 11 highlights the database activity of the system.

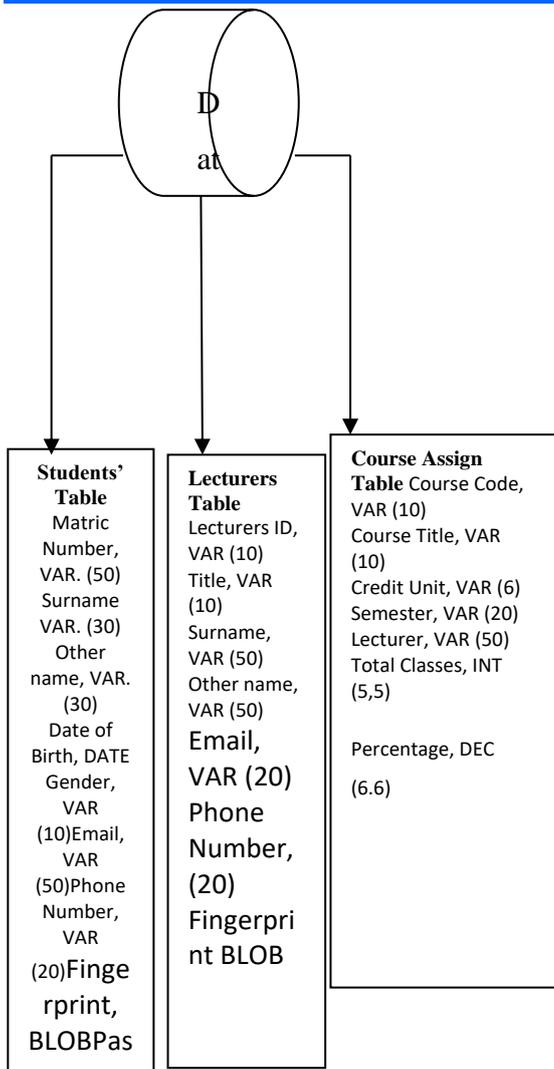


Figure 11: Database design of the proposed system

V IMPLEMENTATION ARCHITECTURE

The implementation architecture consists of six modules namely;

The user's module: supplies the necessary input data to the system to examine its proficiency.

The local server module: takes the input data supplied by the users and organizes the data in order to check its functionality.

The process module: performs a series of operations on the input data organized by the local server to check the processing speed.

The Database module: collects the organized data from the process module and saves it for future use.

The Output module: displays the required information.

The Student Report module: provides details of the output module.

This system adopts both the top-down and bottom-up implementation architecture. Figure 12 illustrates the implementation structure of the study design.

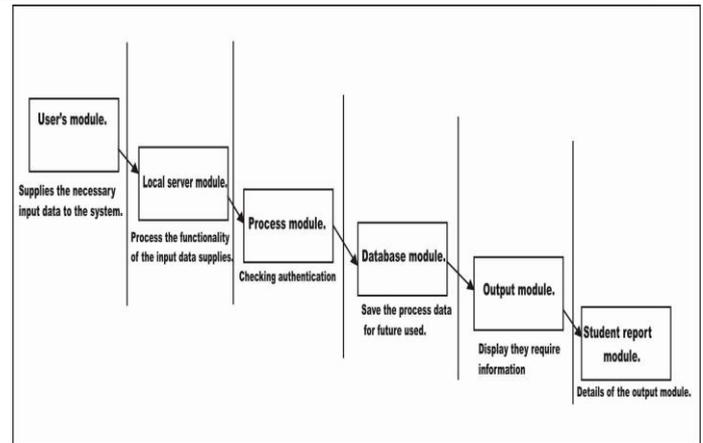


Figure 12: Implementation architecture

VI Documentations

The system is a computer-based attendance platform that permits students to mark attendance using fingerprint technology. The implementation is made up of six modules namely;

- The user's module
- The local server module
- The process module
- The database module
- The output module
- The student report module.

VII System Testing

The system was tested using the top-down technique. The login page was the first to be tested, the administration page was next tested, the student dashboard was tested after the administrative page, the lecturer page was tested, the student dashboard and the course assign page were last to be tested.

VIII System Requirements

The system requirements consist of hardware and software requirements.

A. Hardware Requirements

The following are the hardware requirements of the proposed system;

- Core 2 Duo or Athlon X2 at 2.4 GHz and above.
- 2GB RAM and higher
- 400GB, and higher.
- Hp 2016 or Other Printers, and higher
- Direct x 9.0c compatible video card, and higher
- Direct x 9.0c compatible soundcard and higher.
- Standard keyboard
- Hp or Lenovo mouse
- Digital personal fingerprint device
- Uninterrupted power supply (UPS)

B. Software Requirements

The following are the requirements for the proposed system;

- Windows Vista SP2, Windows 7 and Windows 8 and higher
- Microsoft MySQL Server
- Java Runtime Environment (version 8 or above)
- Microsoft Office 2007 and higher.

- v. Neuro-technology Fingerprint software Development Kit (SDK).
- vi. NetBean

IX SUMMARY AND CONCLUSION

A. Summary

The study was designed to develop students' attendance and authentication system using fingerprint technology. Its target was to update the conventional system. The existing system involved paper sheets and old file system, where the lecturer or instructor will give notebook or printed list of students' names to sign-in attendance or calls the names of those sitting in the class to voice-indicate their presence. The existing system is time consuming, inadequate, inefficient, allows falsification of students' signature, and lacks effective attendance management along with its tediousness. The proposed system as it objectives reviewed the conventional class attendance system, designed a fingerprint authentication platform, implemented the proposed fingerprint authentication platform, tested and deployed the proposed fingerprint authentication platform.

The proposed system supports accurate data management which makes it easy for lecturers to effectively track store students' attendance and their class activities. It provides high level of security which reduces fraud and impersonation, lowers over dependent on paper, and eliminates repetition of attendance and increases consistency of data. The administrator creates an account for each lecturer and captures their fingerprint to activate their attendance dashboard, the lecturers have a privilege to view their course attendance report weekly, monthly or semester-based to take relevant decision concerning students' absenteeism. The students' have the privilege to thumbprint. The device captures the student's fingerprint and sends it to the system server, the server processes minutiae, verifies and records the student as being present in the class. The method adopted the waterfall model and the choice of programming language is the JavaBeans. MYSQL was used for the database and software integration Kits was used to integrate the fingerprint device with platform.

B. Conclusion

The study achieved its aim, it developed a fingerprint-based attendance platform for capturing, storing and retrieving attendance information. The fingerprint-based system is of the following features; login page, students' enrolment form, lecturer's enrolment form, course assign form, thumbprint, authentication, and students' report page. The authentication platform captures the parameter and the requisite data for computerized attendance operation. The system will save time, reduce the amount of workload on the lecturers and management. The responsible authority can easily track and monitor students' attendance. The system is highly secure. Only authorized personnel namely, lecturer can access the student attendance report and take relevant decision. The system can be operated by skilled end-user vested with basic computer skill. The system was tested by capturing

few students' fingerprints and the results were consistent and valid enough.

X RECOMMENDATIONS

In order to sustain the reliability and accuracy and the desired precision of the system the following operational directions are recommended;

- i. The hardware and software requirements should be of precise standards
- ii. The system users should have the basic skill in computer operation
- iii. The preferred data specified for the system should be used at all time

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