DESIGN AND IMPLEMENTATION OF STUDENT IDENTITY USING FINGERPRINT BIOMETRIC MANAGEMENT SYSTEM

*IHAMA, E. I. [1] AND AZIEGBEMHIN, P. E. [2]

[1]Department of Computer Science and Information Technology, School of Applied Sciences, Edo State Polytechnic, Usen, Benin City, Nigeria
[2]Department of Mechanical Engineering, School of Engineering, Edo State Polytechnic, Usen, Benin City, Nigeria
*Corresponding author: eyoski@yahoo.com

ABSTRACT
A biometric identification system is majorly using in fingerprint identity system, this system helps to manage students' class attendance problem. Student Identity management in class attendance is a major problem to most institutions of learning. An efficient and reliable way to curb students' absenteeism from classroom lectures is using a fingerprint biometric attendance system. This paper is aimed at proposing and automating the conventional attendance system and generating report spontaneously at the end of each class or specific duration. This paper also presents a unique means of identity control of students' attendance using a Fingerprint Identity Management System; it records a day to day attendance of students in class by using their fingerprints. In the design approach, a use case was adopted in other to ensure that the system could properly identify, and organized the system requirement. The system was developed using Microsoft visual basic and Microsoft SQL, in developing the database and the graphical user interface, extreme programming (XP) was use. This system is exceptional as it identifies each student and prevents impersonation in class work; it shows the number times a students attended class and allows such students to write examination. The report generated could be sent to parents/guardians in other for them to know how their ward regularly attends classes.

KEYWORDS: Identity management, Fingerprint, Attendance, Biometric, Identification

INTRODUCTION

Most Institutions of learning attach a lot of interest on class attendance, it is important that students meet certain percentage in other for them to be allowed to write examination. According to (Kamal 2015), taking attendance in any classroom activity is an important part in the learning process, this help to also determine students' performance. Although there is no establish relationship that class attendance determine good academic performance, but there is a positive link between them. Usually, students with good or excellent academic performance have high attendance rate.

In the work of (Somasundaram *et al.,* 2016), they discovered that student's academic information can assist in monitoring their performance and progress periodically, but this is a large workload on the part of lecturers, as they have to handle the update and progress of the respective classes. Keeping these issues in mind a system is designed to overcome the problems associated with attendance system.

A fingerprint-based biometric systems offer good performance, and fingerprint sensors have become quite small and affordable because fingerprints have a long history of use in forensic divisions worldwide for criminal investigations. A fingerprint is the pattern of ridges and valleys on the surface of a fingertip. The end points and crossing points of ridges are called minutiae. It is a widely accepted assumption that the minutiae pattern of each finger is unique and does not change during one's life. Attendance Management System is software developed for daily student attendance in schools, colleges and institutes (Rishabh and Prashant, 2011; Saurabh *et al.,* 2017).

An attendance management system is a combination of software and hardware system developed for daily student attendance in schools and institutions. This facilitates access to the attendance of a particular student in a particular class. This system will also help in generating reports and evaluating the attendance eligibility of a student. The students tend to sign for their friends who are not present for that day. Manually computing for the total percentage of attendance a student meet is as tedious as the attendance sheet could be irregular or even misplaced. The verification and authentication of student to determine the student eligibility for exam with the use of identity cards can be inadequate since the plastic identity cards can be forged.

According to (Sogbaike *et al.,* 2018), the use of hand held attendance management device has some drawbacks, such as limited attendance space of 100 students (small size memory), the device has an operation time of maximum fifteen minutes caused by limited power supply (device is battery powered).

In this paper, we design and implemented a classroom attendance system using fingerprint biometric system. The system provides a unique secured means of identity control of students' attendance, to prevent impersonation. It provides a record of day to day attendance of students in class at different session, using their fingerprints biometric.

LITERATURE REVIEW

Shila (2011), said in his work that Fingerprint identification is the most common and well-known biometric identification systems, this system have been unique and consistency over time. Fingerprint has been used for identification for many years, more recently becoming automated due to advancement in computing capabilities. The fingerprint system seems to be the most cost effective and easy to use among all of the biometric system with no health side effects.

According to Caldwell (2015), Biometrics in information technology, helps in identity management. It encompasses methods to analyse

physical and behavioural Identities to extract unique features for identification or monitoring purposes. Various physical features including faces, eyes, fingers, hands, veins, ears and teeth can be used by this technology, and characteristics such as gaits or voice patterns are still being investigated and analysed as part of the wider biometrics field. However, fingerprint biometrics is more accurate, unique, Immutable and acceptable than any other biometrics system.

Jyoti *et al*. (2016), Fingerprint is one of the oldest and easily available trait of biometrics, it offers reliable means of personal identification. The matching accuracy using fingerprint has been shown to be very high as compared to other existing biometric traits. Unlike face and voice patterns, fingerprints are persistent with age and can't be easily distinguished. Therefore, fingerprint is one of the most researched and matured field of biometric authentication.

According to (Chaudhari *et al.,* 2014), they show that there are two different ways to resolve a person's identity: verification and identification. Verification is based on confirming or denying a person's claimed identity and answers question "Am I whom I claim I am?" In the case of identification one has to establish a person's identity answering the question "Who am I?" A biometric system is essentially a pattern recognition system that compare unique physiological or behavioural characteristic possessed by the user with prerecorded data

In the work of Kamal (2015), they handle a project titled development of academic attendance management system using bluetooth technology,

This system developed manages attendance, it consist of Arduino UNO, Adafruit Fingerprint Sensor, HC-05 Bluetooth Module (Master/Slave), and a laptop computer. The aforementioned components are connected together to obtain attendance from the students, this is transmitted through the Bluetooth to the laptop for collation. The major disadvantages of this system is that the operation time for the hand held device is not stated, the attendance size is not stated and the Bluetooth device has a communication distance of 10 meters thus exceeding 10 meters there will be no communication.

According to Somasundaram *et al*. (2016), they presented a paper, titled Mobile based Attendance Management System, and were deployed to manage students' attendance, the system takes attendance by first login on to a webpage to register and then after registration attendance taking process begins. The student on the other hand uses a mobile phone with an android mobile application which enables communication between the lecturer and students via sms. The major setback of this system is that if the server is down, the attendance for the day is not realizable.

In a paper presented by (Neha *et al.,* 2013), titled an efficient automatic attendance system using fingerprint reconstruction technique, they developed an attendance management system using finger print recognition system. The system consists of Fingerprint Scanner, LCD/Display Module, and Computer (4) LAN connection. This attendance system consists of 100 fingerprint scanners, 100 desktop computers and a LAN

infrastructure. Fingerprint scanner will be used to input fingerprint of teachers/students into the computer software. LCD display will Software will be interfacing fingerprint scanner and LCD and will be connected to the network. It will input fingerprint, will process it and extract features for matching. After matching, it will update database attendance records of the students. In the work of (Ikuomola 2015), an Educational Time and Attendance Management System (eduTAMS) was design and developed by them. The system is fingerprint-based comprehensive attendance management system for universities and colleges. The system employs the use of electronic fingerprint scanner interfaced to the digital computer system for verifying student identity. The student Identity is authenticated by the fingerprint-based biometric system which compares the captured fingerprint image with fingerprint templates stored in a database. The student is granted or denied specific lecture attendance based on the result of the comparison by the backend software system running on the PC to which the fingerprint scanner is interfaced. This system could calculate the attendance rate of each student and use this record with specified percentage requirement to perform authentication for access into examination venues. eduTAMS was implemented on a network environment using C# and Microsoft SQL Server 2008. Testing of eduTAMS showed no false acceptance or false rejection but showed true rejection and true acceptance.

According to Akinduyite *et al.* (2013), in their work, developed a

Fingerprint-Based Attendance Management System, the system has 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 system has distinct features, called minutiae points; these were extracted using the Crossing Number (CN) method. They extract the ridge endings and bifurcations from the skeleton image by examining the local neighbourhoods of each ridge pixel using a 3 x 3 window. 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.

Sogbaike *et al.* (2018), designed a system which very consistent and robust than the existing system, in the area of attendance taking. In this system, the admin/lecturer accesses the application on their computer system and can view student data including capturing of their fingerprint. Once this is can be done, the software recognizes the student based on the biometric (fingerprint) data entered.

The use of attendance sheets becomes cumbersome and untidy as the population of students increases, it is time consuming and a waste of human and material resources. The stress associated with manual calculation of student attendance rate has made it impossible to fully implement. Also, high level of impersonation has been known to characterize this method of attendance as students can cheat by asking their friends to write attendance for them. Many educational institutions

and offices are trying to identify accurate, safe, and reliable techniques to protect access rights to their existing services or operation. Since no two people have identical fingerprint in this world, Fingerprint based identity management system is an answer to these concerns, (Ikuomola, 2015).

METHODOLOGY
System Requirement
Computer system is made up of units that are put together to work as one in order to achieve a common goal. The requirements for the implementation of the new system (student attendance management system) are:
a) The Software Requirement:
For the effective implementation of the new system, the following software has to be installed on the computer system.
i. Windows 7 operating system or advanced ii. MySQL iii. Visual basic.NET
b) Hardware requirement:
i. Pentium VI and above ii. 256 MB RAM and above iii. 40GB HD and above iv. CD-ROM drive, the design language is VB.NET and for the database administration system, MySQL database was utilized as a part of dealing with information's inside the system. The system will ensure Security: Student won't have the ability to imprint attendance for their close associate as it requires standby's fingerprint to check attendance.

Data enter into the novel system will be very safe. It will eliminate removal of information and data or misusing of information and data which will prompt harm. Only permitted clients will be allowed to approach the database system.

A use case diagram as shown in figure 2 graphically depicts the interactions between the system, the external system and the user. Use case diagrams play a major role in system design because it acts as a roadmap in constructing the structure of the system Admin/Lecturer Student View Student attendance register, Open Register, Logout, Login, Register student information/View Logout of the system, Verify Fingerprint to take attendance, Student Enter their Mat Number Figure 2: Use case diagram for the system.
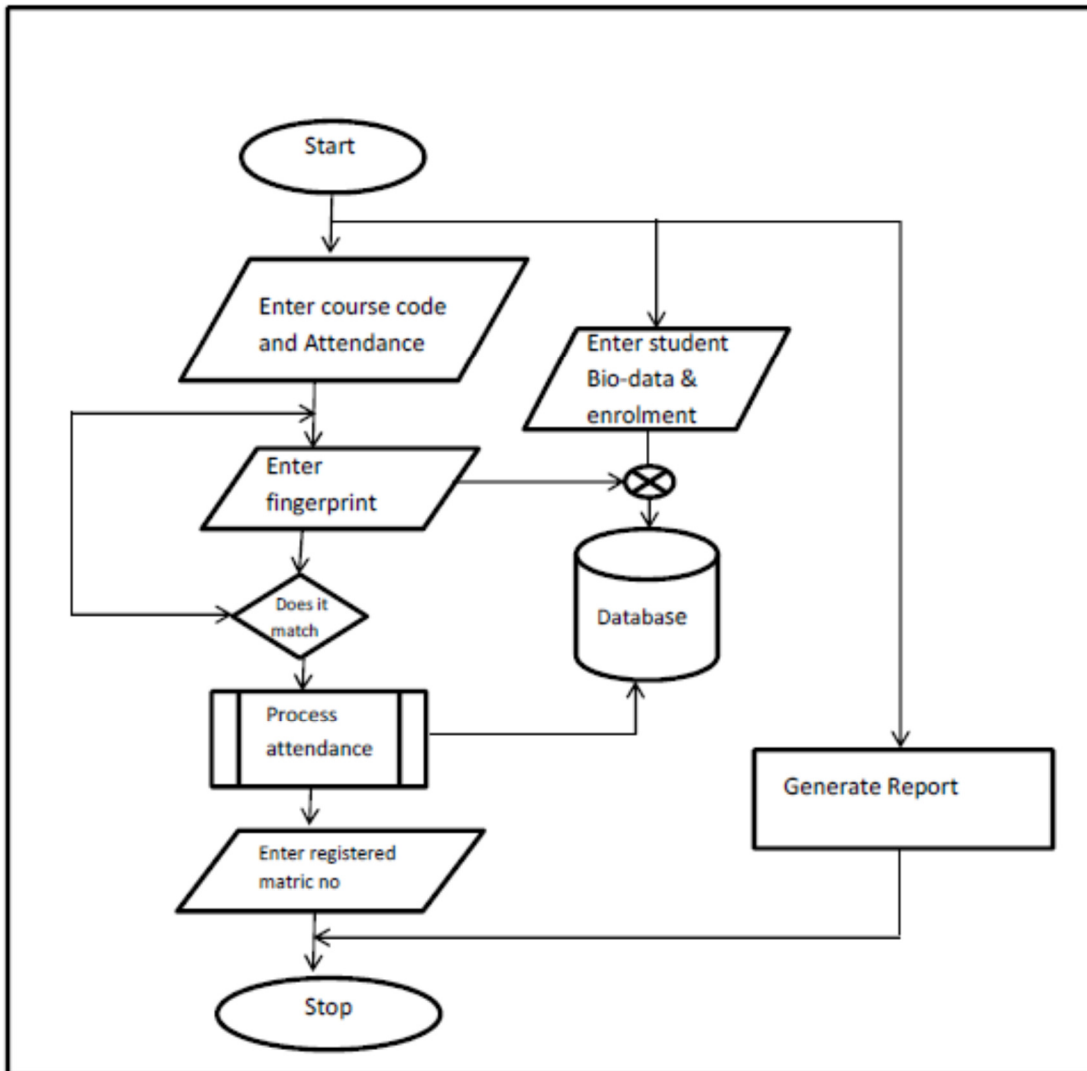
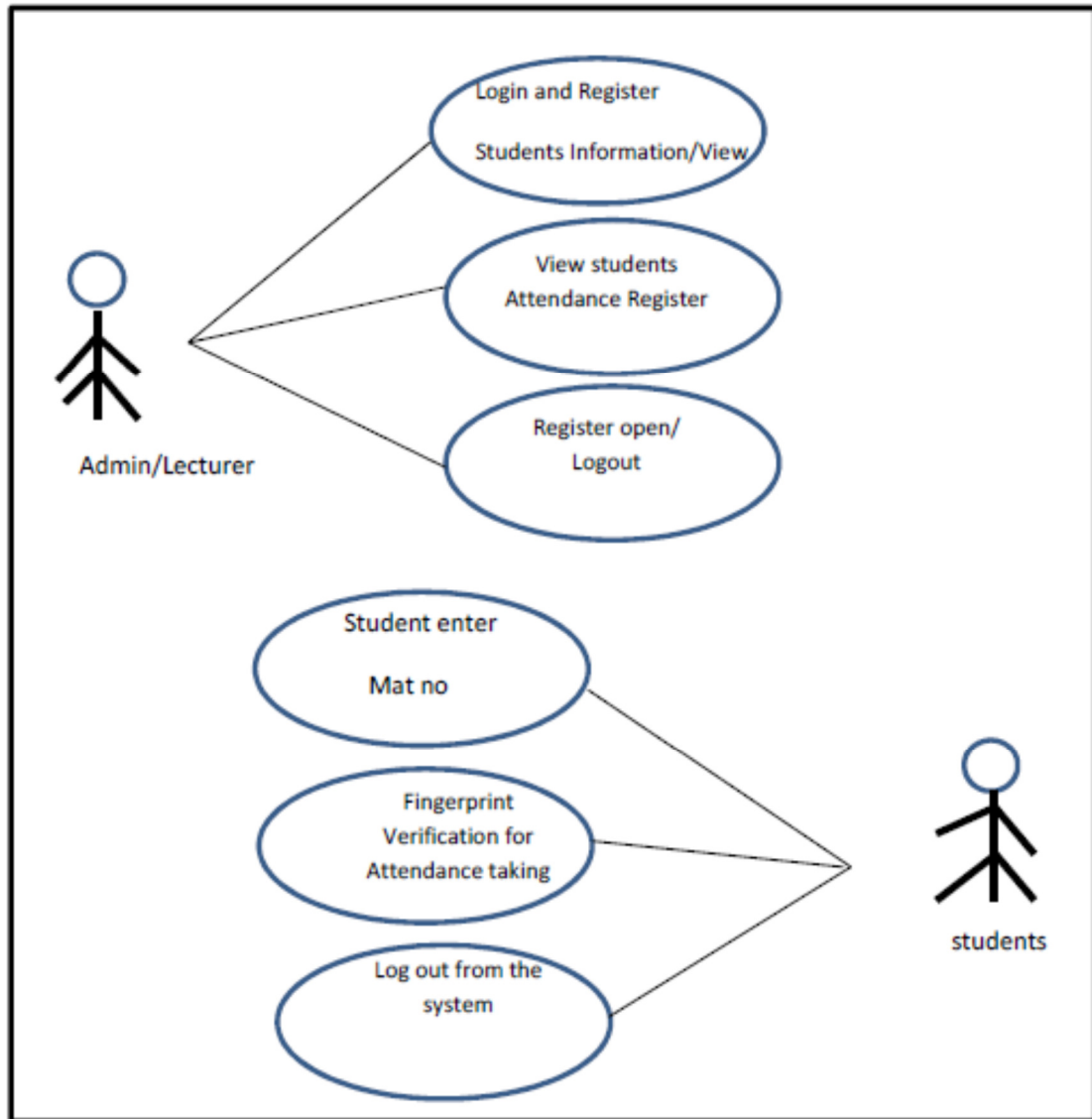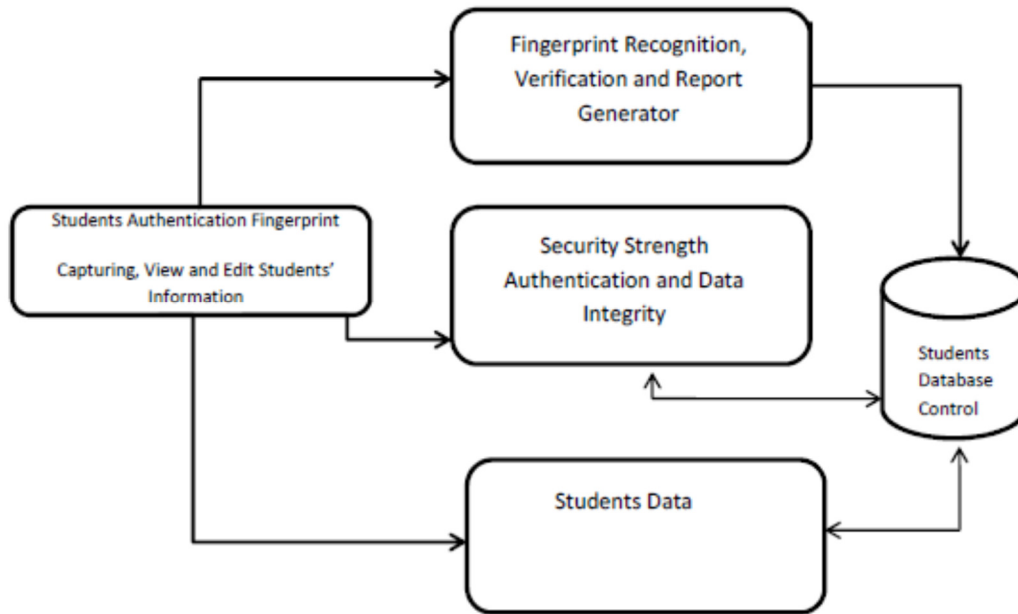Fig. 1: Flowchart of fingerprint biometric system

Fig. 2: Use case Diagram

Fig. 3: The Architecture of the System

It show how students information is captured, authenticated, recognized, verified and stored in the database

SYSTEMS IMPLEMENTATION

The Admin enters username and password, Admin should be able to access the main menu if the correct user name and password is entered properly. Admin then enters the correct username and password and is granted access to the main menu. Admin click on student, the Admin enters a new student. Admin login to the Information to get his or her user details system and view student details Lecturer/admin clicks on take attendance. A form will be displayed to the user, the form enables the students to capture and take attendance. The lecturer/admin then takes students attendance.

CONCLUSION

An automated fingerprint biometric attendance system is a great step in the right direction for school management in ensuring that students attend classes regularly. This system should deploy to all schools in Nigeria as this will help curtailing impersonation during classes and examination. The importance of this system cannot be over emphasized; fingerprint is the best, flexible, exceptional and most appropriate way for identification and data capture media. With the implementation of this system, the fingerprint data can be used in any field/discipline and for a wide variety of purposes. Fingerprint, as the key technology for research, and also in its other application areas, it has been shown that: Fingerprint is efficient for monitoring humans. This system can be used to monitor students' activities both within and outside the school. The system is cost effective; it could be synchronized with many other platforms to create various hybrid

application and implementation. With the successful implementation of this system, it is bedrock for school in Nigeria to adapt to method of classroom attendance as it is far better than the conventional manual attendance taking.

REFERENCES

Akinduyite, C. O., Adetunmbi, A. O., Olabode, O. O. and Ibidunmoye, E. O. (2013). Fingerprint-Based Attendance Management System. *Journal of Computer Sciences and Applications*, 1(5): 100-105.

Caldwell, O. (2015). Market report: "border biometrics", *Biometric Technol. Today*, 2015(5): 5-11.

Chaudhari, A. S. Patnaik, G. K. and Patil, S. S. (2014). Implementation of Minutiae Based Fingerprint Identification System Using Crossing Number Concept. *Inform. Econ.*, 18(1): 17–26.

Ikuomola, A. J. (2015). Fingerprint-Based Authentication System for Time and Attendance, Management British Journal of Mathematics & Computer Science 5(6): pp 735-747.

Jyoti, R. and Gupta, P. C. and Sharmarvind C. (2016). Fingerprint based Identification System-A survey. International journal of Computer Technology and Electronic Engineering, Vol. 1 Issue 3.

Kamal, W. M. (2015). Development of Academic Attendance Management System Using Bluetooth Technology. Faculty of Electrical Engineering, Universiti Teknologi Malaysia pp 1-66

Neha, V., Komal, S. and Megha, R. (2013). An Efficient Automatic Attendance System Using Fingerprint Reconstruction Technique. *International Journal of Advance Research in Science and Engineering* 2(3):

Rishabh, M. and Prashant, T. (2011). Student Attendance System Based on Fingerprint Recognition and One-to-Many Matching, A thesis for Bachelor of Technology National Institute of Technology Rourkela

Saurabh, K. J., Uma, J., Bhupesh, K. S. (2017). Attendance Management System project Rajasthan Technical University, Kota. Pp 1-33

Somasundaram, V., Kannan, M. and Sriram, V. (2016). Mobile based Attendance Management System. *Indian Journal of Science and Technology*, 9(35): 1-4.

Sogbaike, C. O., Sogbaike, A. S., Edafeadhe, G. and Enukpere, V. E. (2018). Design and construction of a hand held attendance management system using fingerprint authentication. international conference on education science, technology and innovations in development in Africa

Shila, S. (2011). A DoG based approach for fingerprint Image enhancement, Ph.D Thesis, Department of Computer Science and Engineering, NIT Rourkela.