DESIGN AND IMPLEMENTATION OF STUDENTS' ATTENDANCE MANAGEMENT SYSTEM

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ABSTRACT

The place of attendance in educational planning and monitoring cannot be over emphasised. Conventionally, attendance is being monitored by role call or passing of a designed sheet for students to either append signature or write any of their means of identity. Apart from the fact that this method is stressful, increase in the students' population compound the problem through possibilities of multiple inputs, unintentional disenfranchising and attendance by proxy amongst others. This research is carried out to provide a smart data capture based attendance management system, whereby students' details and fingerprint are captured and stored in the memory. These are verified by thumb print at every use and store with date and time retrievable when need.

Keyword: *Attendance, Management, Biometric, microcontroller, LCD*

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1. Introduction

Most often than not, human beings tend to require rapt monitoring in their daily activities. Performance evaluation of employees and students depend on punctuality and regularity. Attendance is an integral part of academic activities in schools and this must be handled with rapt care. The conventional way of taking attendance is stressful and time consuming as the instructor will have to spend part of the teaching hours to make a role call before or after the lectures. Academic institution regulatory bodies mandate certain percentage attendance for students before they can be qualified to write semester examination.

The fact that educational system experiences rapid growth throughout the globe, Nigeria inclusive, call for more demands on teacher's knowledge level and management of teaching methodology and processes [1]. The current management system cannot withstand the current requirements for a number of reasons. Most of these management systems are obsolete, hence dose not guarantee effective teaching learning engagement. The System has not been able to provide the corresponding service for the student for a student-centered operation. Expansibility is poor. As the Institution is expanding and number of students keep increasing, the original system may not be able to meet the need of the institution as expected. Hence data security cannot be guaranteed because there is no independent database server.[2]

This project work is considering a flexible technology based attendance management that is more effective and efficient with great convenience to teachers and educational administrators. With a real-time data base, the system can as well be used in employee attendance.

The recent attendance system in institutions has proved to have failed to achieve its major purpose which was to ensure that correct statistics of students that attended the class is captured [8]. Shortcoming of this system as

narrated by [15] amongst other factors is the possibility for a student to sign in for another student. Many educational institutions are trying to identify accurate, safe, and reliable techniques to protect access rights to their existing services or operation [3]. Finger print based attendance system is hereby proposed as an answer to these concerns.

Biometrics, as established in information technology, is one of the methods to analyse physical and behavioural identities and extract unique features for identification and or monitoring purposes. Features in human body such as face, eyes, fingers, hands, veins, ears, teeth amongst others can be used by this technology. Characteristics such as gaits or voice patterns are still being investigated and analysed as part of the wider biometrics field]19]

Biometrics offers secure methods of access to sensitive services and obviates the need to carry a token, card and remember several passwords. Biometric techniques also reduce the risk of lost, forgotten or copied passwords, stolen tokens or over the shoulder attacks. Despite all this obvious advantages, high cost implication and specialised programming requirement make the major reasons it has not been implemented in many organizations [13]. Fingerprint identification is one of the most well-known and common Biometric Identification System, because of their uniqueness and consistency. Over time, finger print has been used for identification. More recently, it is now becoming automated due to advancement in computing capabilities [10]. The fact that standard of education depends largely on the percentage of students' attendance in class as regards punctuality, students' result, quality of teaching and many others. As the number of students increases in class, more time is required for the conventional attendance system. Attendance by proxy and lateness are condoled by the traditional attendance system. Emotional feelings also at times influence the instructor's decision on the conduct of the attendance. For a fair, efficient and time conscious attendance management, there is need for an automated attendance system.

Attendance management system has been in organisations like airports, hospitals and libraries for many years. Of recent, attendance management system was introduced into educational environments as well. A school attendance management system is an essential parameter that provides significant information as regards the quality of a school in terms of students' engagement.

People are prone to make mistakes regardless of being furnished with supporting computational gadgets. An attendance management system guarantees accurate record as it limits the unavoidable mistakes associated with the manual computation.

Regular attendance not only contributes to the educational progress of the students, but also affects their personal and emotional development, thereby making them feel more connected to their peers and communities. The attendance rate has a major impact on curriculum completion and the overall performance of the class. As a result, student non-attendance has a negative effect not only to the educational performance of the individual student but also to the classroom as a whole [12]

The relevance of this application in academic institutions and other organizations cannot be overemphasized. To address the set-backs of the conventional method of monitoring attendance, fingerprint recognition and verification technique has been adopted. A fingerprint detecting device needs to be placed in each classroom or exam hall, for students to swipe their fingers across the sensor so as to indicate their presence in the class or examination hall. The students' records are stored in the database for verification. The moment a student swipes a finger across the scanner, a check would be carried out for the student [5].

A number of attendance management system with related literatures are already in existence as reviewed below. A wireless attendance management system that authenticates using the iris of the users was used by [18]. This was implemented using Off-line iris recognition management system was used for image capturing, extraction of precise details, thereafter the data are stored and matched with the captured image with one stored in the database. This system takes care of wrong entering weather by error or intentionally. However, fear that the Iris scanner might have a side effect that will eventually contribute to the damage of their eye, forms a major challenge of this type of biometric system. [14] designed and implemented an attendance management system that authenticates the user based on passwords. The problem this system has is that it still could not eliminate impersonation since the password can be shared. Passwords many a times are forgotten thereby preventing user's access to the system. Another issue with this system is that the system could be hacked thereby allowing manipulations. [4] proposed computer-based lecture attendance management system. This was an improved system with electronic card reader

serially interfaced to a personal computer. The demerit of such system is that impersonation is still possible if access is gained to someone else's electronic card.

[9], used fingerprint authentication system, and it is cost-effective. It is a simplified means of identification. The fingerprint is distinctive for individuals. The fact that it can work as a standalone system is one of its advantage over other fingerprints identification systems. There are also other solutions such as GSM-GPRS based authentication system and RFID-based authentication system. The GSM-GPRS based systems used in the classroom location for attendance marking can lead to wrong attendance record if there is a change of venue. Also, with RFID based authentication systems, the RFID cards can get lost or stolen, hence, requires the installation of RFID detectors. Its demerit is that, with RFID cards, impersonation cannot be eliminated. [17] carried out techniques like face detection using Haar Feature-based Cascade Classifiers for face detection where each front (face) has a unique histogram. The test image histogram is compared with the train image histogram for similitude. Local Binary pattern (LBP) which is a particular type of the Texture field model propounded in 1990 and eventually charted and modernized is combined with the Histogram of oriented gradients (HOG) descriptor, improves the detection staging noticeably on some datasets. The system consists of a camera that captures the picture of the classroom with the expected students all seated at the inception of the session. Next the processing module image is improved to smooth the progress of the matching process, after this face detection and recognition is performed. At this seam the images are matched and the students who exist in both images are marked present in the database [1].

[2] also worked on attendance marking using face recognition. In this technique attendance is recorded by using a camera that can stream video of students, detect the faces in the image and compare the detected faces with the student database to mark the attendance in a spreadsheet. This gets converted into PDF file mailed to the necessary e-mail addresses. Based on face recognition technique, Attendance Management System was implemented by extracting the common features of each individual student using image integral method [3]. The face image is then matched with the image stored in the database and the attendance is marked for the candidate, base on the facial feature of the captured image that matches with the one already stored in the database.

The problem with this method is that in any case of injury to the face the technique might fail in matching the faces. Another problem with this technique is that faces of identical twins can be wrongly matched. In an attempt to improve on this, minutiae matching and detection was designed by [11] using the Crossing Number (CN) concept which involves the use of the skeleton image where the ridge flow pattern is connected. The minutiae are extracted by scanning the local neighbourhood of each ridge pixel in the image using a 3×3 window.

2. Methodology

The microcontroller (DSPICF4011) is the Central Processing Unit (brain) of the system. It is programmed in C++ while the firmware is programmed in C#. The finger print capturing module is connected to the microcontroller using serial port, while the Liquid Crystal display (LCD) which is also a user interface is connected to the controller to display information about the students' information entered. Data entered and captured are stored in the Electrically Erasable Programmable Read Only Memory (EEPROM) during operation which will later be transferred into the Scan Disk (SD) card memory. A regular PS-2 keyboard connected to the controller via data-clock serial interface shall be used to activate operations on the system as well as inputting of details. The system is powered with a direct current regulated voltage of 5 V and 4.3 V required by the microcontroller and the fingerprint module respectively. Real Time Clock (RTC) module is connected to the controller to capture time and date of every operation. The complete design implemented is as shown below in Figure 1.

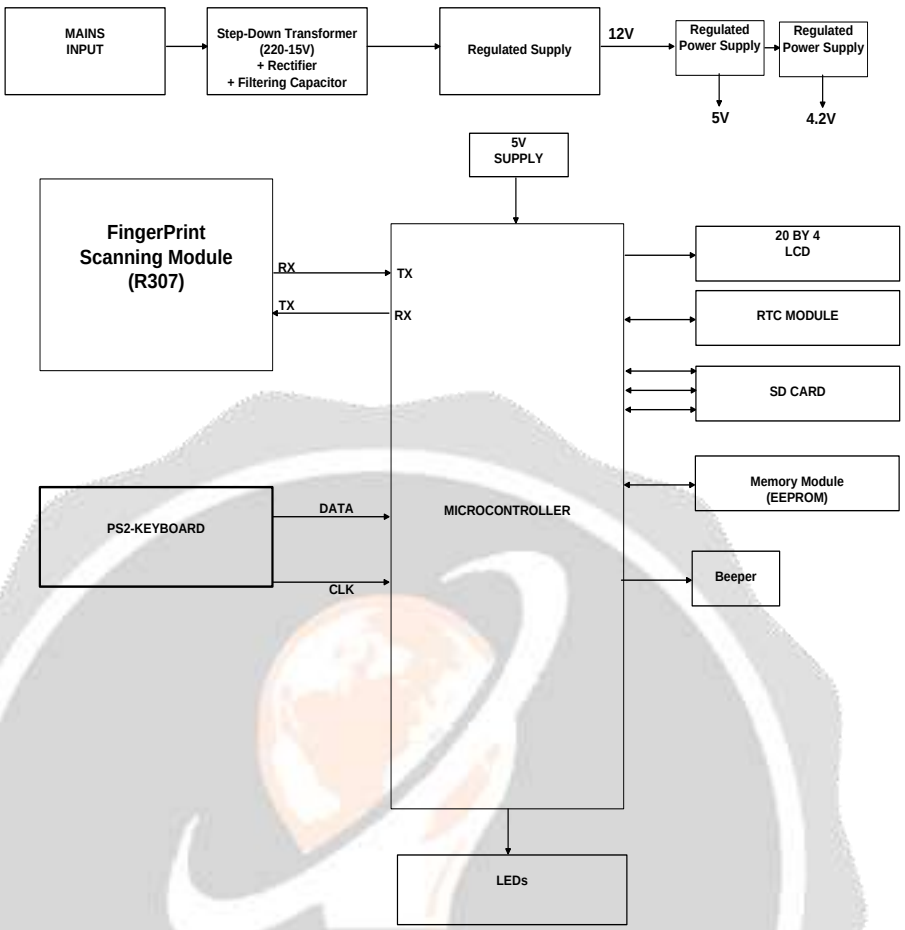
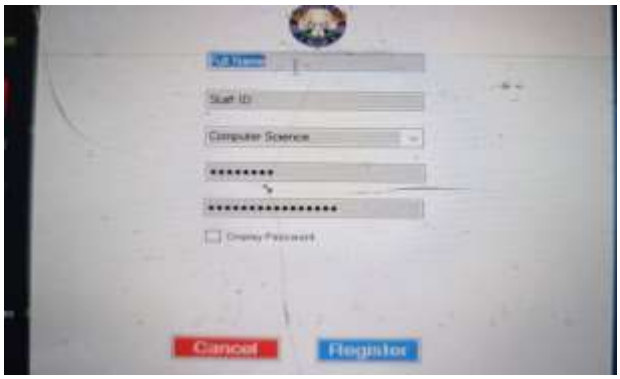


Figure 1: Block Diagram of Students' Attendance Management System

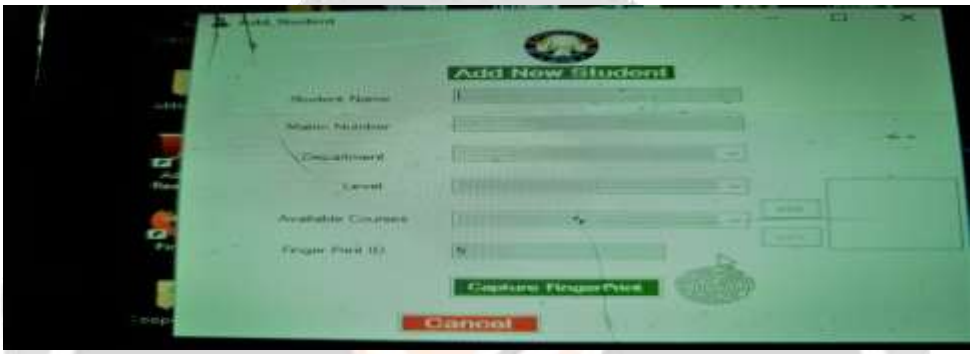
3. Results and Discussions

Accessing the firmware requires login details, that is, user name and password of the admin as displayed in figure 2a. Thereafter lecturers, department, students and courses are managed through the menu as displayed in figures 2b and 2c

(a)



(b)



(c)

Figure 2. PC Application Display

In managing the students' information, fingerprints are captured and saved at the point of registration. Students' fingerprint and all necessary information about the student shall be stored in the System's memory. At the commencement or at the end of the class or both, the department and course shall be selected on the hardware and registered students will place their fingers on the scanner for authentication as duly registered and present. The students' details, indicating the date and present time of the process shall be saved. Flow chart for student verification is presented in figure 3.

The attendance counts shall be updated to pop the page, presented in Figure 4 containing all attendances taken over a period indicating unique attendance index generated for each student, names and matriculation numbers of students, date and time, courses taken and attendance mode as presented This is then exported to CSV file on excel format for easy sorting as preferred. The data on the memory can be updated and can be cleared id need be.

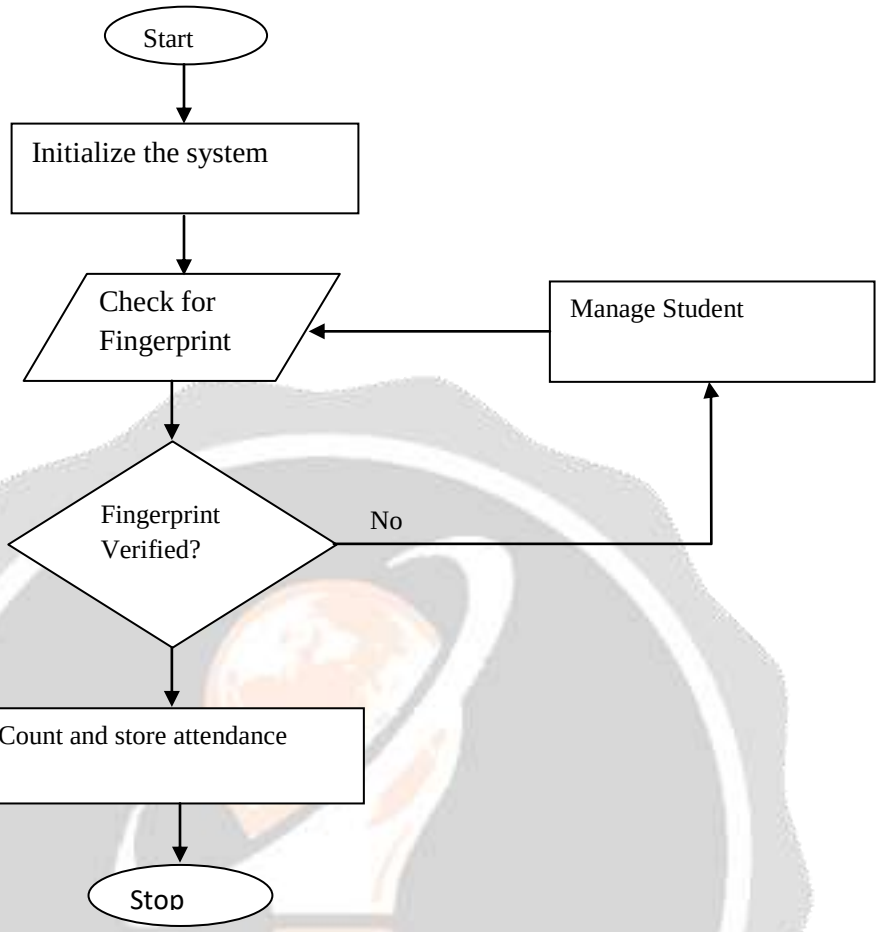
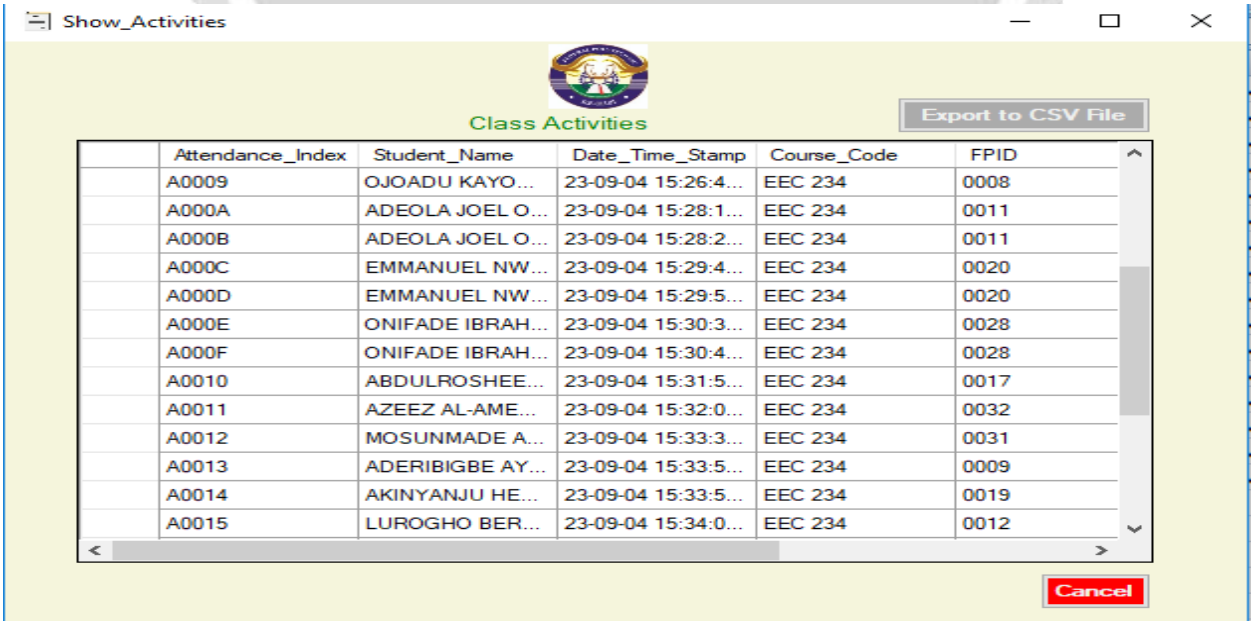


Figure 3. Flow Chart for Student Identity Verification



Attendance_Index	Student_Name	Date_Time_Stamp	Course_Code	FPID
A0009	OJOADU KAYO...	23-09-04 15:26:4...	EEC 234	0008
A000A	ADEOLA JOEL O...	23-09-04 15:28:1...	EEC 234	0011
A000B	ADEOLA JOEL O...	23-09-04 15:28:2...	EEC 234	0011
A000C	EMMANUEL NW...	23-09-04 15:29:4...	EEC 234	0020
A000D	EMMANUEL NW...	23-09-04 15:29:5...	EEC 234	0020
A000E	ONIFADE IBRAH...	23-09-04 15:30:3...	EEC 234	0028
A000F	ONIFADE IBRAH...	23-09-04 15:30:4...	EEC 234	0028
A0010	ABDULROSHEE...	23-09-04 15:31:5...	EEC 234	0017
A0011	AZEEZ AL-AME...	23-09-04 15:32:0...	EEC 234	0032
A0012	MOSUNMADE A...	23-09-04 15:33:3...	EEC 234	0031
A0013	ADERIBIGBE AY...	23-09-04 15:33:5...	EEC 234	0009
A0014	AKINYANJU HE...	23-09-04 15:33:5...	EEC 234	0019
A0015	LUROGHO BER...	23-09-04 15:34:0...	EEC 234	0012

Figure 4. Attendance Activities Report

4. CONCLUSIONS

Electronic attendance management is aimed at in this research work. Though it can be used as general purpose attendance, however, this is domesticated to campus use with Federal Polytechnic, Ile Oluji, Ondo State, Nigeria as the direct beneficiary. The device has been tested using students of Electrical Electronic Engineering of the Polytechnic, and its shows a means of strengthening attendance management.

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