Smart Phone Attendance Management System For Universities Using Embedded Qr Id Card.

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Abstract
Globally, electronics cards, including smart and magnetic cards, are utilized for a variety of purposes but not limited to security, personnel identification, electronic payment, and electronic voting. This study, which is at the University of Cross River State, offers an electronic card-based solution to the issue of lecture attendance in higher education. Our approach is based on an embedded Quick Response [QR] Code identification card that if scanned during lectures can authenticate the availability of a student using cloud services. This system could expedite the procedure for recording students' lecture attendance and provide a faster and more error-free method of verifying that students have attended lectures as required in order to be eligible for exams in a university environment. All the lecturer has to do is to use the special attendance monitoring mobile application to scan QR code image displayed on the student Identity card during lecturers. After that, the server received the code for the attendance procedure. Next.js, PHP, and MYSQL was used for the frontend, backend and database respectively. While the Authentication and QR code generation uses JSON Web Tokens (JWT) and JavaScript QR code libraries. The model can compile students' attendance and deliver an accurate but brief information about the they participation in class in less time. The framework is effective for taking students attendance with high user satisfaction rate and having reasonably low computing requirement.
Keywords: *Attendance management system, QR Code, ID Card, Smart phone, Marking Attendance.*

I.   Introduction

Attendance in schools is a modality that has been developed to help monitor the performance and engagement of the student in academic schedules and activities. Attendance is a vital aspect of academic progress monitoring and report. Student attendance administration is a critical content of the Administration of School/College/University. (Zhang, 2013). Over the year's active participation of students in academic schedules and activities is seriously declining, as students rarely attend classes and participate in-class activities. The usual practice is that students are given sheets of paper to write down their names, matriculation number and signature. This manual method of taking attendance is obviously not effective as it is attributed to the following challenges: The sheets of paper become cumbersome and untidy as the population of student increases; time consuming and a waste of human and material resources; high level of impersonation as absentee can be on the list through their friends that attended the class due to the lower lecturer/student ratio and large class size. Consequently, it is very difficult to manage the attendance and determine whether each student actually made seventy-five percent (75%) of lecture attendance as required by the University authority.

The use of manual attendance signing in tertiary institutions proved effective for a while, as the increasing number of students in tertiary institutions has defeated the effective application of manual attendance signing. According to (Taxila, 2009) It becomes difficult for the administration at the universities to regularly update the attendance record and manually calculate the percentage of classes absented and attended for the purpose of subsequent results processing and examinations. In recent time observation has shown that the majority of students link up with their colleagues who write and sign attendance registers on their behalf in their absence.

This research is targeted at the design and implementation of mobile attendance management system using embedded QR ID Card to address the problem of poor lecture attendance for the Universities, (University of Cross River as a case study) by building a system that will help curb this act. The project is focused on using trending technology to automate the process flow of attendance signing, by using innovative technological approach to make sure that students are uniquely identified digitally on real time while they are physically present within the class location to sign attendance.

The need for the introduction of an embedded QR code ID card security techniques for attendance management is to further transform the existing manual approach with a modern sophisticated identification tag for the identification and tracking students' attendance during lectures. The embedded QR code ID card technology would save both the time of the lecturer and students. QR codes are easily collected and processed by a camera than even biometrics with associated with difficulties and delay. Moreover, QR codes are widely used in telecommunication due to the increased popularity of smartphones, which typically contain software that can read QR-code images (Zupanovic and Tijan, 2012). QR codes make it possible for large volume of information to be arranged in small spaces due to its capability to hold a lot of information (Umoh and Ofut, 2022).

This work seeks to shift paradigm from the manual methods to a full electronic approach by formulating and implementing a simplified and cost-effective model of embedded computer-based solution to the classical and/or manual method of managing student lecture attendance problem in higher institutions in developing countries like Nigeria.

II.   Related Works

Several authors have proposed different techniques and methods in carrying out automatic attendance systems in literature and in practice. Attendance without proper attention to their performance rating. A few related works focus on installing applications on the lecturer device, be it smart phone or laptops.

Shehu (2010), is an example of a proposal that uses real time face detection algorithms integrated on an existing Learning Management System (LMS). It automatically detects and registers students attending on a lecture. The system represents a supplemental tool for instructors, combining algorithms used in machine learning with adaptive methods used to track facial changes during a longer period of time.

In Arulogun et al., (2008), an automatic attendance system using fingerprint verification technique was proposed. The finger-print technique verification was achieved using extraction of abnormal point on the ridge of user's finger-print or minutiae technique.

Mahyidin (2008), the authors proposed student tracking using Radio frequency identification system (RFID). It involves the use of the student card to get student attendance. The author tried to solve the problem of manual computation of attendance but his work does not eliminate the risk of impersonation. Similar solution to attendance monitoring problem can be found in barcode readers as does in (Kizildag, 2007).

Elbehiery (2019) makes use of two applications. One application is a Desktop application that is used for storing the attendance of the students and the other application is a mobile application. This paper also makes use of GPS (Global Positioning System) to avoid false registrations by the students.

We noticed that most methods do involve applications being used by the lecturers during classes. Hence, the attendance system requires much time to capture and verify students. On the other hand, our proposal does require the lecturer to easily scan the QR image on each students ID card at the entrance of the classroom to capture and verify the student details. Hence, students may register their presence at any time they arrive the classroom, while having in mind that arrival times are recorded.
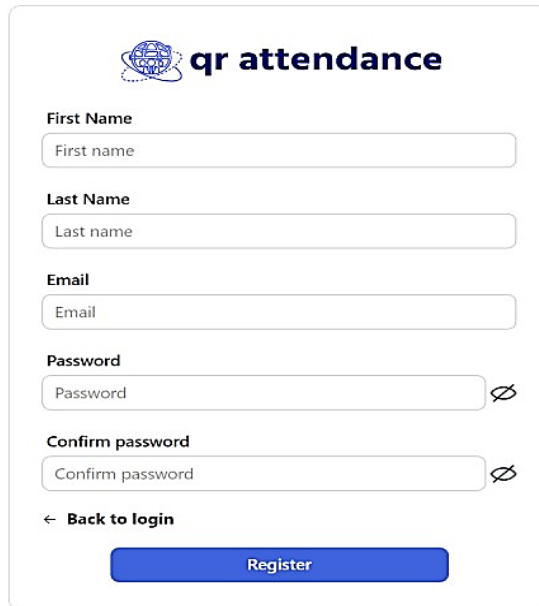
III.   Overview Of The Proposed System

The proposed approach combines a mobile application for QR code-based on-the-go attendance tracking with an online application for administrative activities. The process of registering includes taking a student's image, which is then saved in the database along with all relevant personal information. To calculate attendance, the student's image is taken and data is retrieved from the database. The database's daily attendance is updated by the administrator. After the particular student's photo has been taken, the data is obtained from the database. A database can be used to update student attendance, and the database can also provide an excel file with the attendance information.
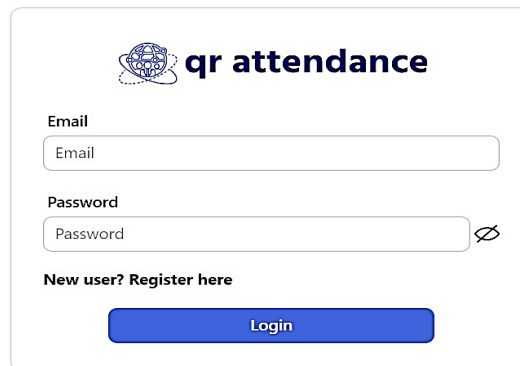
How the system work.
Step 1: Registration and Login

The Admin who is the course Lecturer will have to visit the web-application to relatively register and then login to the system. This step is important to keep the system completely secured and not prone to external access.

Figure 1.1: Registration Screen as an Admin or Lecturer
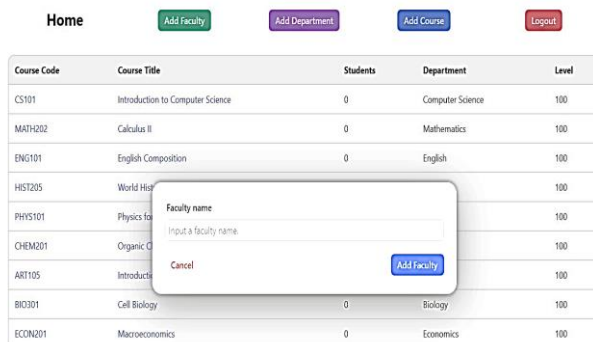
Figure 1.2: Login Web-app Screen as an Admin or Lecturer

Step 2: Setting up Attendance

After a successful login and authentication process the lecturer setup up an attendance sheet for his class by adding faculty of the students taking the course, as well as department, and the specific course.

Once this step is completed as shown in figure 2.1 below, it will then be reflected on the mobile app of moderators, which will be used for marking the actual attendance in the physical class.

Figure 2.1: Mobile App Setup Screen

Step 3: Adding new classes and generating report

The admin/Lecturer can proceed to creating / adding new classes (lecture periods) for previously created courses. To do this, he/she clicks on the course code or course title to navigate to the screen shown below in figure 2.1, and then click on the button with arrow directions to create a new class as shown in figure 3.1 below;

Meanwhile the screen in figure 3.1, also holds the display in table, the total report of attendees for a class associated with a specific course, this means that the admin can access and view all the total number of students that have attended his/her classes as well as view a summary of attendees as shown in figure 3.2.
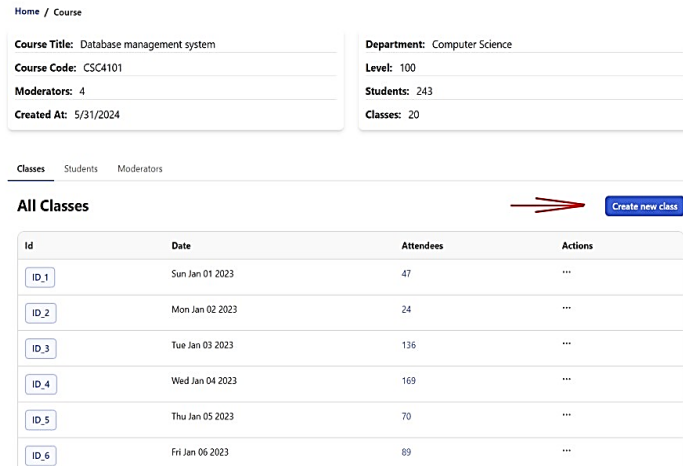

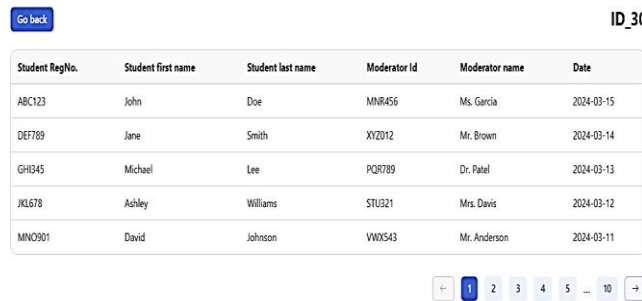**Figure 3.1:** Creation of Class Screen + Report of attendee's screen

Figure 3.2: Class Attendee View report screen

Step 4: Adding Moderator

As an admin, the lecturer can add moderators to manage the application in order to fastrack the process of taking the attendance in class while lectures are ongoing. Note that, these moderators can be student lecturers, Class captain, or even graduate Assistant who will take the attendance and also monitor the transparency of unique student ID display on the mobile Application. This is shown is figure 4.1 below. Also, as an admin or Lecturer, can also get a list of all the students who have registered for the course, as shown in Figure 4.2 below.
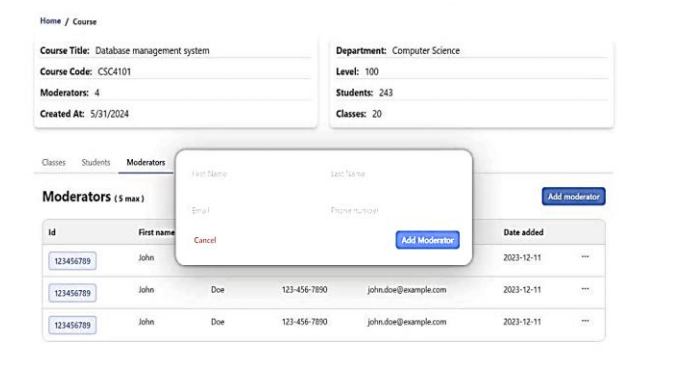

Figure 4.1: Adding a Moderator to control attendance marking

First Name	Last Name	Reg No.	Email	Clasees Attended	Date Added
John	Doe	123456	john.doe@example.com	10	2023-12-11
Jane	Smith	789012	jane.smith@example.com	15	2023-12-11
John	Doe	123456	john.doe@example.com	10	2023-12-11
Jane	Smith	789012	jane.smith@example.com	15	2023-12-11

Figure 4.2: List Display of eligible students to take course and report of attendance recorded in class.

Tracking Attendance in the Classroom with a Mobile Application
Step 5: Making Attendance
      The moderator shall launch the mobile app on an android phone, with the login details forwarded to him/her email from the moderator creation screen previously shown in figure 4.1, to enable him sign in to the system. figure 5.2 shows the login screen on a mobile device. It is important to note that a moderator can only sign into a particular class assigned to him to moderate and has no access the entire system.
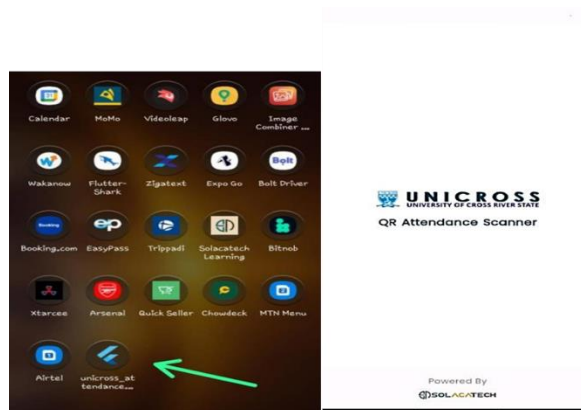

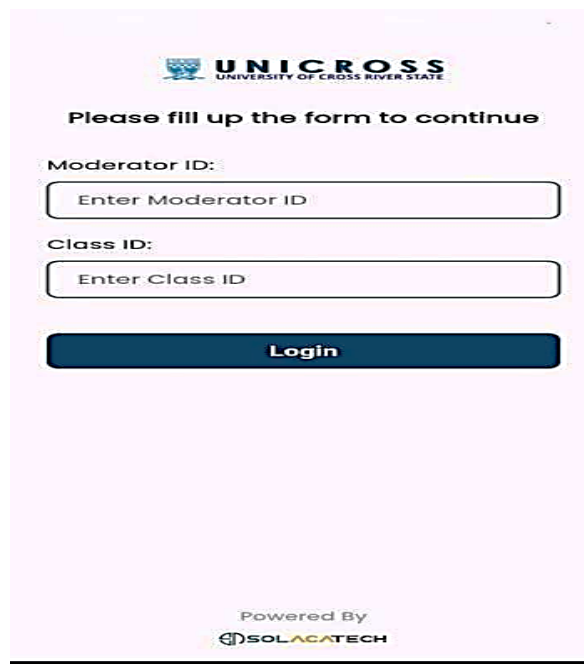**Figure 5.1:** Launching of the mobile app by moderator

Figure 5.2: Login screen for moderator

Benefits of the New System

i. **Time-saving**: QR code scanning significantly reduces the time required for marking attendance compared to manual roll calls.

ii. **Error Reduction**: Automated QR code scanning eliminates the human errors commonly associated with manual attendance writing, ensuring precise records.

iii. **Ease of Use**: The user-friendly interfaces of both the web and mobile applications streamline the attendance process for administrators, lecturers, and students.

iv. **Identity Verification**: QR codes provide a secure method for confirming student identities, preventing fraudulent attendance, and ensuring that only registered students are marked present.

v. **Instant Updates**: Attendance data is automatically synchronised between the mobile and web applications, providing real-time updates and immediate access to attendance records, which is not possible with traditional methods.

IV. Conclusion

The aforementioned attendance system has undergone extensive development and testing. To ascertain if a student is eligible for an exam, the system will analyze each student's attendance by calculating their attendance percentage. In order to track their attendance, students can scan a QR code that the teacher generates, according to the study paper's proposed student attendance system. Compared to conventional attendance systems, the method has a number of benefits, such as improved accuracy, less paperwork, and more effective attendance tracking. Instant update is obtainable as the attendance data is automatically synchronized between the mobile and web applications, providing real-time updates and immediate access to attendance records, which is not possible with traditional methods. The technology eliminates the possibility of students signing up for those who might not be there and offers greater security than the conventional approaches that rely on the sign-in sheet or roll calling student names. Furthermore, it offers a more expedient and straightforward method of recording attendance, which lecturers at UNICROSS may readily implement to streamline the process of recording, organizing, and maintaining student records.

V. Acknowledgement

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