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QR Code-based Real-Time Intelligent Attendance Covering System

Bhavya Singh Chauhan [1], Km Divya [2], Dr. Nikhat Akhtar [3], Vipin Rawat [4], Jitendra [5]

[1] Scholar (B.Tech Final Year) Computer Science & Engineering, Ambalika Institute of Management & Technology, Lucknow,
[2] Assistant Professor, Department of Computer Science & Engineering, Ambalika Institute of Management & Technology,
[3] Associate Professor, Department of Computer Science & Engineering, Ambalika Institute of Management and Technology,
[4],[5] Assistant Professor, Department of Computer Science & Engineering, Ambalika Institute of Management & Technology,
Lucknow-India

ABSTRACT
The existing approach has a lot of uncertainty, which makes attendance taking incorrect and wasteful. Whenever the authority is unable to enforce the previous system's regulations, a slew of issues occur. The difficulty with this strategy is that it takes time, and the manual procedure has the potential to produce mistakes in the majority of situations. To address this issue, a QR code was used to track student attendance during lecture hour. The website will mark and check attendance without the need for human interaction by scanning individual QR codes supplied to students with a Smartphone. The scanned QR code will take you to a page where you can fill out the student's details and save it to a database. The database is available for attendance verification and mobile viewing. Faculty members can use their smartphones to view the attendance list. It is possible to view the attendance sheet that is kept in the database. The major goal of this study is to implement a QR code-based attendance system at the Department of Computer Science and Engineering at Ambalika Institute of Management and Technology (AIMT) in Lucknow, Uttar Pradesh, India, with the goal of improving performance and accuracy.

Keywords: Intelligent Attendance System, QR Code, Verification, Student Attendance, Authentication, Rapid Application Development (RAD).

I. INTRODUCTION

Attendance is one of the most significant aspects of business and education, and its significance has risen to the point that it now influences a wide range of activities. Meanwhile, organisations are rapidly [1] shifting away from conventional attendance tracking methods. This is because conventional means have a reputation for being time consuming and prone to deception, cheating, and manipulation issues [2]. This is a contemporary issue impacting the college, educational institution, where records of student attendance are recorded on a sheet of paper or in a notebook. This is risky since the paper or note book is not safeguarded and may easily be misplaced. The development of the QR Code technology [3] has helped to overcome some of these issues. A QR code is a sort of barcode that encodes information as a sequence of pixels in a square-shaped grid and can be read conveniently by a digital device.

First and foremost, the creation of this novel attendance system offers new inventive ideas that will aid in the reduction of expenses and security issues [4] connected with traditional attendance systems. The study is significant for colleges and educational institutions because it will aid in the development of a class and exam system that saves time and is more effective in ensuring that students do not deceive the attendance system by faking their attendance, which

jeopardizes the college's integrity and revenue-earning capacity, as well as making sure that all students have paid the college's fee. This technique is also beneficial to students since it helps to reduce disruptions during tests, which can lead students to lose focus and ultimately impact their exam results [5].

The average lifespan of Smartphone users is 26 years old, according to 46% of them. As a result of the increased use of smartphones among university students, this study examines the issue of lecture time waste and presents a solution that may cut it by nearly 90%. Students can scan a QR code [6] using a smartphone application as part of the suggested solution. The code, as well as the student identification captured by the app, will be used to verify the students' attendance. The approach would save not just time, but also the work that instructors were meant to put in during each session. It will expedite the process of taking attendance while also allowing plenty of time for the lesson to be effectively delivered. The suggested system additionally uses [8] multi-factor authentication to prevent unlawful [7] attendance registration. That is, "Something you know", "Something you have", and "Something you are", are all used to verify the student's identification. Conventional manual methods of validating whether a student has legitimate proof to sit for a test, on the other hand, have been heavily criticized, with many claiming that they cause disruption to students because most security

officials would come to check for proof of payment during examinations [9]. As a result, there is a requirement to create and a QR Code-based attendance recognition system may be used to verify whether or not a student has legitimate documentation to sit for a class or an exam.

II. RELATED WORK

The earlier work on the attendance system is described in this section. In order to conclude and verify students and workers of an organization, attendance records are required. Using an RFID-based system, the authors provided an autonomous, digital, intelligent, and scientific integrated information management system in [10]. Through a systemized method of equipment management and maintenance, it provides a useful service to the equipment departments by ensuring safe and high-quality management. An attendance management system was created in [11] to authenticate the user using passwords; however, this sort of system permits impersonation since passwords may be exchanged, tampered with, or even forgotten, preventing the user from gaining access to the system. There were also some alternative device-based attendance solutions, such as RFID [12] (Radio Frequency Identification)-based student attendance systems and GSM-GPRS-based student systems. GSM-GPRS [13] based systems use the class's location for attendance marking, which is not dynamic, and if the schedule or location of the courses changes, incorrect attendance may be recorded. Lim et al. [14] described a low-cost RFID-based Attendance System prototype that offers various advantages over the traditional technique of taking class attendance. The prototype created for this project is small and light. It may also be powered by a power adaptor or a battery. Another approach for attendance management was presented in [15], in which each user enters into the system and must manually indicate his or her attendance. The user chooses a certain date and the courses they attended on that day, which are then added to the database automatically. Zhang Yongqiang et al. [16] created a wireless fingerprint-based attendance system to record and collect attendance data utilizing biometrics (fingerprints). An attendance system that uses Bluetooth [17] to take attendance was proposed in 2013. The instructor's cell phone is used to collect attendance here [18]. The instructor's mobile phone has application software that allows it to query the student's phone through Bluetooth connection, and the presence of the student may be confirmed by transferring the student's phone's Media Access Control (MAC) addresses to the instructor's phone. Man et al. [19] created a time management and access monitoring system that uses a microprocessor card to track students' or employees' movements and save information in a database for administrators' reference in a campus, office, or specific location. Teachers, the headmaster, and parents would have access to all of the data collected by this system. Another researcher [20] employed a wireless attendance management system that authenticates individuals by scanning their iris. The system was an off-line iris recognition management system that could complete all processes such as recording the iris picture, extracting minutiae, sorting, and matching. Mohd Helmy et al. [21] show how to integrate a mobile device with software to record examination attendance. In a test, it was discovered that it saves time, personnel, money (printing and paper), and simplifies testing procedures. Finally, in [22], a fingerprint biometric attendance management system was presented. The standalone system, which consists of an enrollment and identification phase, was created in response to the need to transition from the old manual method of marking attendance to an automated method.

III. EXISTING PROBLEM

The traditional method of signing an attendance sheet on paper is no longer thought to be a reliable way to keep track of attendance because it is simple to fake attendance and destroy papers, leaving lecturers without any proof of absences, especially when the attendance list includes attendance for the entire semester. Test disruption caused by exam verification processes, which are employed by the majority of educational institutions, is the main issue that has been noticed. This is because the student must go through a lengthy process only to get an examination slip that will allow him or her to show that they are qualified to take a test. As a result, these antiquated technologies might be viewed as time-consuming. The existing advanced attendance system uses equipment that is exclusively developed for the system, therefore implementing a robust [23] system of attendance may not be a cost-effective strategy. It would take a long time to gather all the information needed to create the individual student reports at the end of the year. Bypassing all of that bother and compiling all records automatically using an automated attendance tracker. The time that is so saved can be used for more crucial managerial tasks.

4. Objective

The major goal of this research is to create a fingerprint-based automated attendance system that can be applied in exam rooms to determine if a student has valid identification to show up for a test. The following goals [24] are also objectives of the study. To develop a more efficient, cost-effective, and better attendance system that may be utilised to determine whether or not students have legitimately attended the exam and if they are eligible to do so. To provide a system that can be used to record data on both attendance and performance, making it simple to analyse the data and come up with fresh approaches to improve student performance and attendance. To create and deploy a database-accessible, automatic attendance-checking QR code attendance system on an internet platform. To lower the amount of pupils caught making up other people's absences. To lessen the need for paper records while monitoring attendance. To lessen problems with proxy attendance.

5. Needs

Attending classes helps students learn in many different ways. Reading assignments are supplemented by lectures. Information is presented differently in classroom presentations than it is in the book. Topical discussion and elaboration [25] provide up-to-date material that might not be included in the textbook. We inquiries may be answered by hearing the remarks and inquiries of others. Critical thinking abilities may be improved in class by the instructor via conversation. They can ask questions that force students to link ideas and apply what they are learning to actual situations. Students' recall of information will improve as they analyse and scrutinise more of it. As you can see, regularly attending class earns you much more than simply attendance credit [26]. The majority of students who fail a course rarely show up to class. Discipline and time management abilities are needed for consistent attendance in class. Regardless of the employment route you select, these abilities are useful. A student's engagement with various faculty members rises when they show up to class. Finding mentors and role models who can aid in guiding their academic, professional, and personal growth is therefore more likely to occur.

IV.   PREREQUISITE

Denso Wave, a Toyota subsidiary based in Japan, created the first QR code technology in 1994. During the production process, they required a more precise technique to track cars and parts. They created a specific kind of barcode that could encode kanji, kana, and alphanumeric characters to do this [27]. Standard barcodes can only be read from top to bottom in one way. As a result, they can only hold a limited amount of data, often in an alphanumeric format. But a QR code is read in two directions top to bottom and right to left. This allows it to house significantly more data. The QR Code system has become popular outside the automotive industry due to its fast readability and greater storage capacity compared to standard UPC barcodes. The QR code consists of black modules (square dots) arranged in a square grid on a white background. Our website uses this QR code system to mark the attendance of the students instead of using pen and paper for the same. Most smartphones have built-in QR scanners, which are sometimes built in the camera [28]. A QR scanner is simply a way to scan QR codes. It comprises of two phases, one is for the Faculty and the other is for the student. The Faculty will log in using their password into the website and generate QR for their particular subject. The students will scan the same from their smartphones to get their attendance marked.

4.1 HTML (Hypertext Markup Language)

HTML, which stands for Hypertext Markup Language, is the most widely used language for creating documents that would be shown in a web browser. Technologies like Cascading Style Sheets and programming languages like JavaScript can help. The structure of a web page is described in HTML. HTML is an abbreviation for Hypertext Markup Language. The link between web pages is defined by hypertext [29]. This language is used to annotate (make notes for the computer) text so that a machine can understand it and manipulate text accordingly. Most of markup (e.g. HTML) languages are human readable. Language uses tags to define what manipulation has to be done on the text. Transitional, is the most common type of HTML. It provides a flexible syntax, or grammar and spelling component. With the passing years meant to return rules into HTML and make it more reliable. For example, the strict type requires closing all tags for all opened tags. This style of HTML is important on phones, where the processing power may be limited. A clean and error-free code helps to load pages faster. Finally, a frameset allows web developers to create a mosaic of HTML documents where multiple documents can be connected into a single screen. This technique is often used to create a menu system.

4.2 CSS (Cascading Style Sheet)

CSS is a style sheet language that is used to describe the appearance of a document written in a mark-up language such as HTML. CSS is intended to facilitate the separation of layout and content, including colour and fonts. This separation can increase content accessibility, give greater flexibility and control in defining presentation features, let numerous web pages to share formatting by describing the required CSS [30] in a separate.css file, and decrease complexity and redundancy in structural content. The separation of formatting and content also allows the same mark-up page to be presented in multiple styles for different rendering techniques, such as on-screen, in print, via voice (through speech-based browser or screen reader), and on Braille-based interactive applications. CSS also has rules for alternate formatting if the content is accessed on a mobile device [31]. The name cascading comes from the specified priority scheme to determine which style rule applies if more than one rule matches a particular element. This cascading priority scheme is predictable.

4.3 MYSQL

Before understanding MySQL, it is critical to grasp the database. A database is a programme that holds a structured collection of records. It is extremely simple for the user to access and administer. It enables us to rapidly access important information by organizing data into tables, rows, columns, and indexes [32]. Each database has its own API for conducting database tasks including generating, maintaining, accessing, and finding the data stored in it. There are several databases accessible today, including MySQL, Sybase, Oracle, MongoDB, PostgreSQL, SQL Server, and more. MySQL is the most widely used database management system software for handling relational databases. It is an open-source database programme that is maintained by Oracle. In compared to

Microsoft SQL Server and Oracle Database, it is a faster, scalable, and user-friendly database management system. It is commonly used in conjunction with PHP scripts for creating powerful and dynamic server-side or web-based enterprise applications.

4.4 PHPMYAdmin

PHPMyAdmin is a popular free and open source administration tool for managing MySQL and MariaDB. It is released under the GNU GPLv2 licence. It has a web based interface and can be used on any platform easily. It is available in 79 languages. It is PHP-based and is offered by practically all Web hosting companies that support the WAMP/LAMP development stack [33]. Using its web-based user interface, phpMyAdmin may be used to do important activities such as managing databases, tables, relations, indexes, user permissions, and so on. It also has a query interface where the user can write SQL instructions and run them. phpMyAdmin is well-documented, and there is a wealth of learning material accessible in the form of books, blogs, and articles. LTR and RTL languages are supported by phpMyAdmin.

V. PROPOSED SYSTEM

The method employs a QR Code-based student attendance system. Students would take attendance individually using a QR Code in the suggested approach [34]. Students are registered in the system on their first day of classes, or possibly after a week of orientation. Figures 1 and 2 demonstrate how each student's QR Code will be scanned and recorded. All other student information will also be logged, and when a student enters the lecture hall, he or she will be scanned to be counted present. A complete history of all students, professors, departments, and absences would be accessible to be reported on at all times [35].The suggested system would offer information on each student's attendance, absence, lateness, and outstanding balances. The suggested solution would be cost effective in the sense that the expense of procuring paper would be fully eliminated. The technology will also save time because the computations are now automated. As the data will be required, the reports generated at the conclusion of each semester would be error-free and very accurate [36].
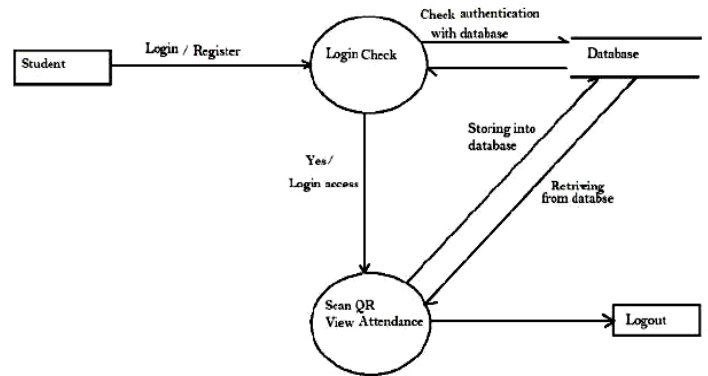

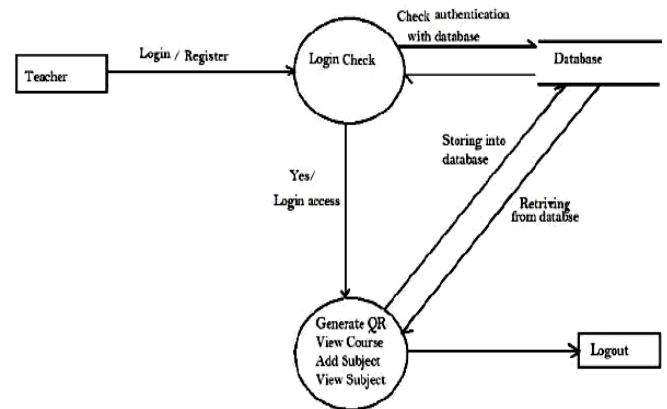**Figure 1 The Student Data Flow Diagram**

Figure 2 The Faculty Data Flow Diagram

5.1 Functional Prerequisite

The following are the major system functions that users should expect first, keeping (saving) data in the database, second, retrieving data from the database, third, avoiding duplication of student attendance records in the database; fourth, being able to register courses that should be done in the department; fifth, registering students in the database, and sixth, assisting students in updating their information.
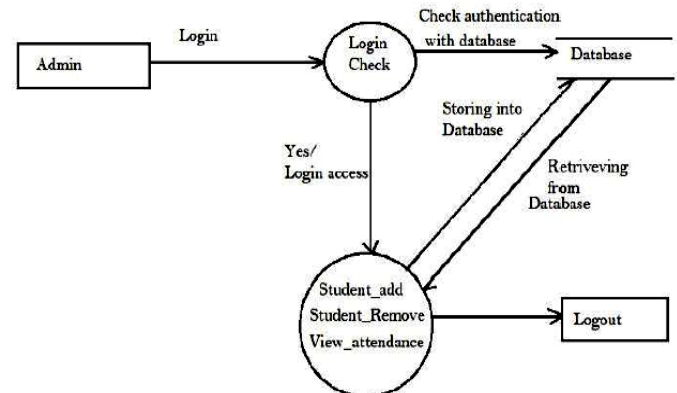

Figure 3 The Admin Data Flow Diagram

5.2 System Framework

Figure 4 depicts the system overview, which will serve as the system's fundamental framework for future development and feature implementation. The major technique utilised in this project is Rapid Application Development (RAD) [37] methodology with incremental prototyping approach. RAD emphasises prototype over planning, enabling for speedier application development and enhancement. Because the system uses an incremental prototyping technique, the project is separated into three primary component prototypes: a QR code reader, an Android application, and an offline and online database.
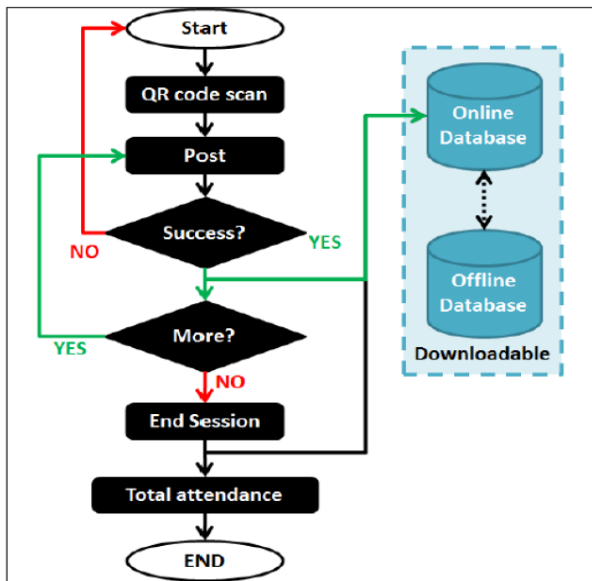

Figure 4 The System Architecture

Each component is created one at a time and tested individually to ensure that it meets the criteria. All prototypes will be merged, connected, and tested at the conclusion of a prototyping cycle. The figure depicts the project's final system architecture. Figure 5 depicts a visual illustration of how the project proceeds step by step.
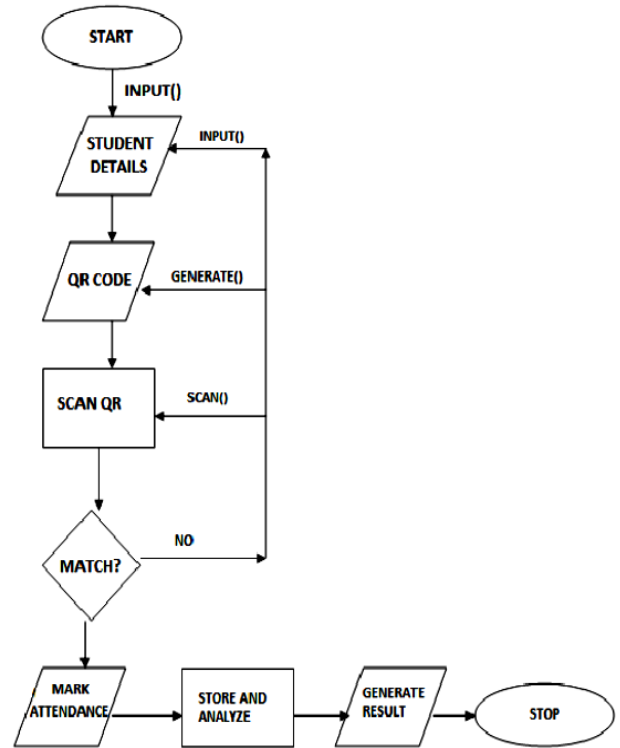

Figure 5 The Proposed System Flow Diagram

VI.   RESULT AND ANALYSIS

Our website's homepage is located on this page. It includes a link to the faculty sign up website and the student sign up page, as seen in Figure 6. In case of failure during QR code scanning, we have provided a button to indicate attendance, as well as two buttons to login, namely faculty login and student login if previously enrolled.

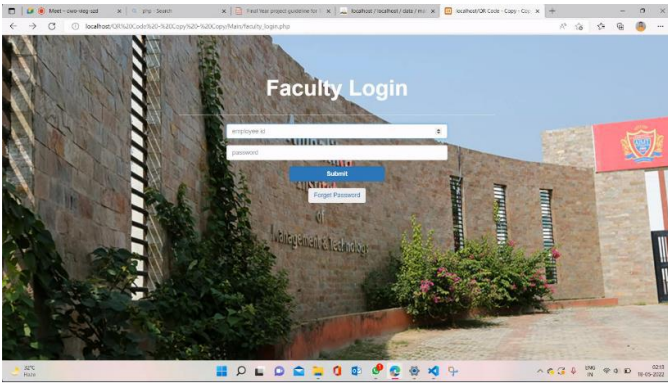**Figure 6 The Homepage of Proposed System**

Figure 7 The Faculty Login Page of Proposed System

This is the website where new professors can sign up. Faculty must complete out all of the fields in order to register. Following that, the faculty login page, seen in Figure 7, was used to login in order to progress the faculty to the faculty corner. Figure 8 depicts the faculty corner, where we have supplied courses for faculty to pick based on their preferences.

Figure 8 The Proposed System Flow Diagram

Furthermore, instructors must select the year of their selected course in order to advance to the contents of that course and year. This is the page where subjects from the selected year and course appear. In figure 9, we have provided two buttons with links to generate QR and view attendance of any single subject. Figure 10 shows a sample QR that, when scanned, will offer a link to a new website where students may fill out their information to have their attendance noted.
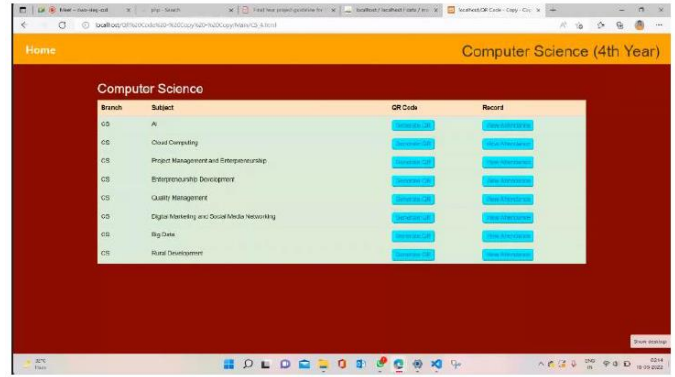

Figure 9 The Proposed System Flow Diagram

Figure 10 The Proposed System Flow Diagram

Once scanning the QR code, students will be able to fill out their information to have their attendance recorded. The updated student registration page. To register, students must fill out all of the essential areas. The student login page created to login to progress the student to the STUDENT CORNER displayed in figure 11 is shown below.
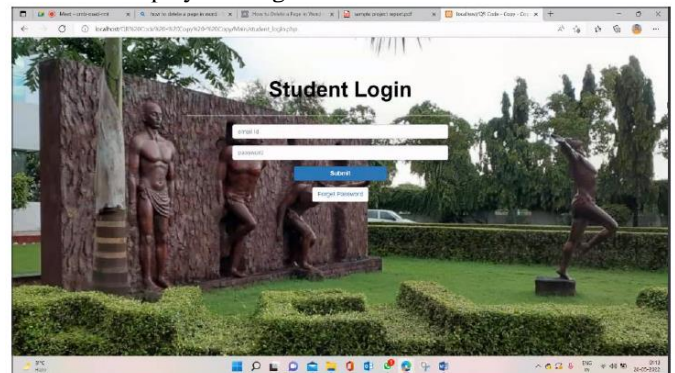

Figure 11 The Proposed System Flow Diagram

The following page is the student view attendance page. Figure 12 depicts how students may view their attendance. The admin login page takes you to the admin section, where you may conduct numerous tasks. The admin corner, which appears after the admin login page, is seen below. Figure 13 shows how administrators may regulate attendance and
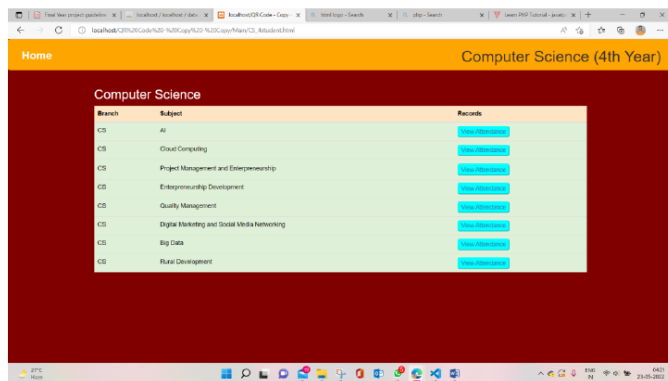
students.

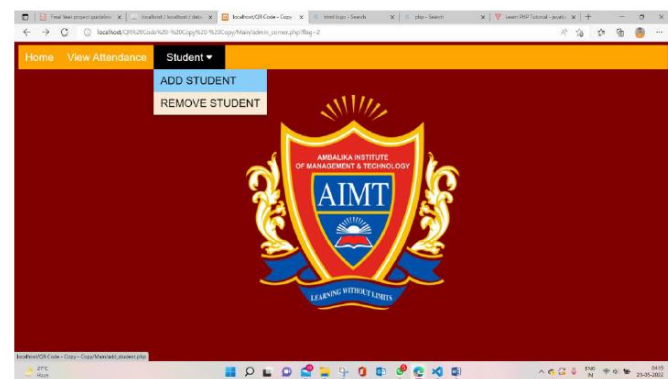**Figure 12 The Proposed System Flow Diagram**

Figure 13 The Proposed System Flow Diagram

By concentrating on establishing a simple student attendance monitoring system that can be used to take attendance that is both fast and inexpensive in contrast to other ways, our suggested model varies in a way that should be easy to install and rapid in recording attendance during a class session. No extra hardware or gadgets are required [38]. There is no complication, and it is simple to use. It does not require any code or prior expertise to use. Since no signature on the attendance sheet is necessary any more, no one else may take an attendance on behalf of another kid because QR codes are unique to each student. The system assists the administrator in quickly identifying latecomers. Admin can simply obtain a student's attendance history. It saves a lot of time, money, effort, and resources for the organisation. People were not permitted to utilise biometric devices to mark their attendance at COVID. At such circumstances, the notion of a QR-based attendance system appears to be advantageous, as it eliminates the requirement for employees to physically contact any equipment and instead relies on their own mobile devices.

VII.   CONSTRAINTS

Experts in the area highlighted a number of limitations related to the implementation of the QR code attendance system, as well as provided remedies for each issue. Because there is a chance that the website would go down, it was decided to

implement a manual attendance system in case the website fails. Currently, our technology does not support offline database integration. Google Drive, on the other hand, allows users to download files from their cloud storage for offline reading via applications. Google Drive applications, which are available for both desktop and mobile devices, will manage synchronisation with the cloud storage. In the event of a network breakdown, the system will not function until the internet is reconnected. To access the website, you'll need a smartphone with a good internet connection.

VIII.   CONCLUSION

An attendance system is just as vital as the lecture itself since it helps teachers to keep track of their students' absences and respond appropriately. Because students may fake their attendance with the aid of others, the traditional attendance method is no longer deemed credible. The electronic attendance system is the way of the future. Current electronic solutions, on the other hand, need specially built gadgets that may be too expensive for a learning institution. As a result, this system assists in avoiding the failure of the proof of attendance system, and it serves as a replacement for all current methods. By providing an alternate electronic method for tracking attendance, our technology aims to increase the dependability of the educational institutions attendance system. As a result of the method, there is less reliance on paper as an attendance medium. Users that volunteered to test the website said that the system is capable of replacing the present attendance system, despite a modest increase in the time it takes to record attendance. The created system described in this work has been constructed and tested effectively. The attendance status of the student will be assessed and exported. It may be inferred that, in place of a manual and unreliable approach, a dependable, secure, rapid, and effective class attendance management system will be established.

IX.   WORK IN THE FUTURE

If we combine our attendance tracking system with a face recognition tool in the future, the system will be able to tackle the real-world attendance problem. Fake attendance will be reduced to some extent. We've considered implementing a GPS, or Global Positioning System, that would track a student's whereabouts and send messages to their phones if they are detected skipping classes. The application software may be transferred to other mobile operating systems, such as iOS (Apple) and Windows Phone (Microsoft), to broaden the customer base and boost product availability. Students will be able to access missed class topics and notes in the future as part of our work. Professor has complete control with more secure and expanded alternatives.

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