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QR Code Attendance Scanner

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***Abstract*—** This article proposes a safe and efficient way to track student attendance through QR codes. Both students and teachers have their own user interfaces within the system. Real-time participation tracking, monitoring the number of attendees, and observing student attendance history are all available through the teacher interface. The student user interface allows them to view their attendance for specific classes or subjects. Each student has a unique QR code that is refreshed every 30 seconds to prevent duplication or misuse. The attendance has to be marked within the five to eight minutes provided by scanning the QR code. For greater security, the QR code screenshots are disabled for preventing unauthorized sharing. Once scanned, the attendance gets automatically recorded, and teachers are able to see the list of present students in real-time and also download the CSV file which includes the details of students.

***Keywords*—** Secure attendance system, student tracking, QR Code Attendance, Real-time attendance

I. INTRODUCTION

Technology is the application of scientific knowledge to the practical objectives of human life. It is also referred to as the modification and manipulation of the human environment. Machine learning, artificial intelligence, and industrial robots are just a few examples of emerging technologies that are changing at an exponential rate. Technological innovations have the capability to enhance the quality, speed, and price of products and services. Attendance is more necessary for teachers as well as students. Even in the present day Just like the past taking attendance is done through registers or book. Taking attendance in this manner is very old-fashioned and it takes much time. For instance, in a class with a length of around 50 mins, nearly 15 mins are wasted in taking attendance. In order to prevent wasting time, we want to suggest a new attendance-taking system. Attendance using QR-Code. Taking attendance is possible by numerous means, attendance is also classified as biometric and non-biometric. Face recognition, fingerprint will fall under the category of biometric and

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QR-Code etc. will fall under the category of non-Biometric. Our suggested technique falls under the category of non-biometric. At times Biometric sensors can fail to identify the user because of some reasons such as Sweaty fingers, user may be wearing a mask, in order to overcome this we Would like to implement a new system which will be more efficient and will aid in decreasing failures that can be caused due to some uncertain reasons. How precisely our system will function and how we are going to Introduce will be explained later. Our system will have an interface for every type of user such as Students, Teachers etc. Whenever a student logs in, he/she will be provided with various options such as attendance, timetable etc. whereas whenever a teacher logs in, he/she will be provided with various options such as view attendance of student of each class etc. QR will be updated every 30 seconds and will be dynamic. No screenshots can be captured while on the site. The class time limits are established and one of them the teacher can choose. Once chosen, student on the app is able to log in and scan the QR. The QR gets refreshed every 30 seconds and no screenshot could be taken when on the app which maintains the privacy and avoids any misuse of the attendance system. The system is quick and scans the QR rapidly. The teachers can easily download the CSV attendance and then are able to view the attendance of the students. This system intends to perform the process of attendance in the shortest time as the manual attendance system and fingerprint/ face take time.

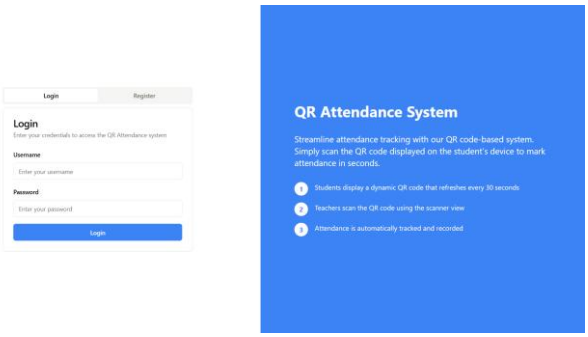

Fig 1. Login Page of Attendance System

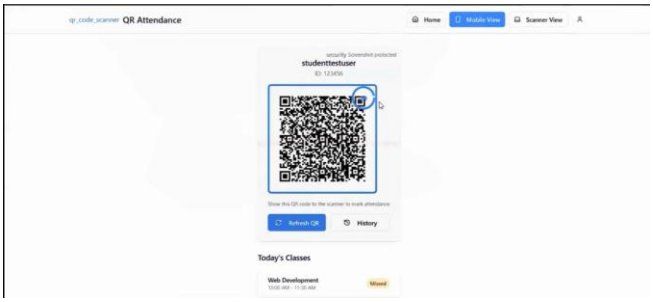

Fig 2. QR Code Generation in Student Page

II. Literature Survey

In paper [1], QR code or Quick response code was invented in Japan in 1994 by Toyota subsidiary. It is typically a matrix of cells. QR codes are not readable by human eyes and hence they are employed as a substitute for 1D barcodes. QR-codes offers large range of angle for scanning and also the data is more organized and precise in this. QR code has 8 major structures. In smart phones, in the past years, development has been made on the speed of phone processing, better camera and screen. This paper also describes about the framework of our system. The framework has 3 modules:

1. Teacher module handles classroom creation and the administration of code generation and sharing with students.
2. Generate module is of two types. The first one is the code for students to enroll and the second is for the students to scan.
3. Student module handles the student operations depending on the username and passwords.

In [2], This paper describes about the basic reason behind this system is to make the attendance system simple and systematic by automating. Because most of the students in a university possess smart phones, this system can be implemented effectively. This system provides variable code to each student so that it will not be able to be shared to conduct any malpractices. The advantages of this system are easy maintenance, easy to administer and enhanced protection in security terms. Outcomes can be produced instantly and the information is accurate and competent. A QR code has four encoding modes through which information is stored. The modes of encodings include numeric, alphanumeric, byte/binary and kanji. The operation of the system applied in this paper is as follows, the pattern in QR code addresses binary codes which subsequently can be decoded to locate the information in the code. It relies on three massive squares external to the QR code. In [3], The paper describes about

how the process of attendance taking manually has become more time consuming. As per the survey's conducted Nearly 45 hours are spent on each topic in total, but nearly 5 to 6 hours are spent in attendance. This might cause wastage of time and might also result in not completion of syllabus. How the QR-Code is generated and scanned, various technologies which have been utilized have been explained through this paper. Software such as OpenCV etc. have been utilized. some of the key issues discussed is proxy and what if student exits the class after attendance has been taken. The system proposed has been implemented among students. Implementation, An link to the website will be provided via the groups such as WhatsApp groups etc. if one clicks like the website will be opened, if registered previously they can click directly or if opening the website for the first time they need to register beforehand. The implementation of the proposed system was accomplished successfully. In [4] discusses about how audio QR codes are implemented. Audio QR codes are generated by uploading the audio files on a server and then employing the URL of the website to create QR code. By scanning the QR, the user is redirected to the location where the audio file is kept and listens to it. As technology is growing at a fast pace, the technology of QR codes has also advanced. Types of QR codes are prevalent in the present time. The initial model of QR Code, which is widely referred to as Model 1 was able to encode up to 1167 numerals. An enhancement of the same was the Model 2 that could encode up to 7,089 numerals. The usual type used on retail products are referred to as micro QR which enables greater amounts of information to be stored per unit area. Melgar [5] suggested a color QR code that is simpler to implement. RGB channels were utilized to display the three codes generated. Every segment of the string was utilized to create a QR code. This method was capable of creating nearly triple the data encodes' capacity for the same size of the original code. Figure 4 shows the proposed idea of Melgar.

Our system uses QR codes which embed a JWT token with student ID, class ID, and timestamp. Tokens are signed with AES-256 and invalidated after 30s. After every 30s, the token with QR Code is refreshed and no screenshots can be taken making it very secure to scan for attendance.

The paper also discusses about the problems which influence the performance of a QR code scanner:

1. Low quality QR Code images
2. Camera Quality (Hardware Problem)
3. Insertion of noise into the image because of image capture device glitches.
4. Software Problem

Feature	[1]	[2]	Our System
Dynamic QR Refresh	❌	❌	✅ (30s)
Screenshot Blocking	❌	❌	✅
Encryption	❌	AES-128	AES-256

Table 1. Comparison of system to prior work

III. METHODOLOGY

Here we are going to write about the software requirements, how we are going to implement our system, system requirements. We are going to use v model as a software model because it facilitates to build the application and test the application simultaneously. The main requirements of this project are good computer with good CPU, mobile phone, QR-Code scanner etc. than our competitors we need to design our scanner to be fast and accurate so we will be having newer hardware and tools. For scanning of QR-Code we will be using OpenCV. We will generate unique QR-Code for all using python pyqrcode module and we will use OpenCV for scanning. QR-Code will be used for 5 mins only and only within that time user will be able to scan the QR-Code.

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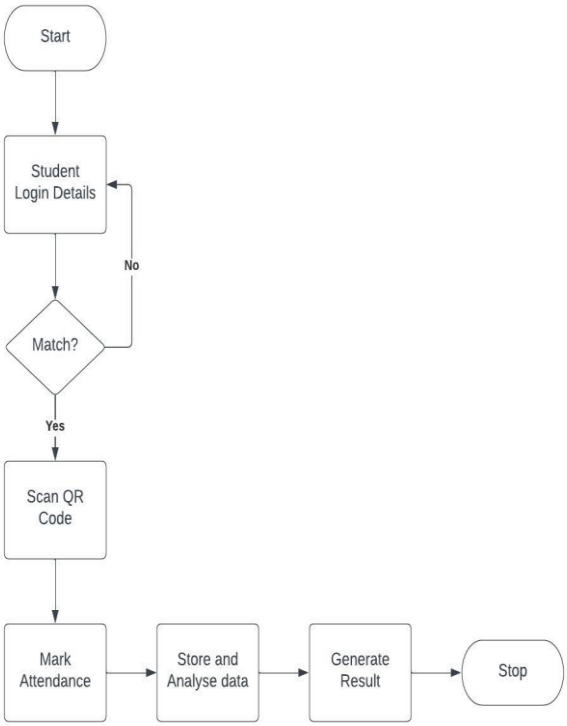

The V Model, or Verification and Validation model, is a formal software development life cycle methodology that incorporates testing at every stage of the development process. The model is named after its V-shaped chart, which graphically illustrates the relationship between development activities on one axis and their respective testing activities on the other. It is widely practiced in industries where software safety and reliability are paramount—e.g., aerospace, defense, automotive, and healthcare industries—because of its strict quality control process. The model stresses the significance of testing and validating software throughout every phase to ensure that the final product matches the initial specifications and is thoroughly tested before being deployed. The V Model is divided into two principal sides: the left describes the process of development, and the right is the respective verification and validation steps. Every step in development has a corresponding testing step linked directly to it, creating a dual structure. This mutual correspondence allows defects to be identified early on, and therefore, to fix them is simpler and less expensive. An important advantage of the V Model is its traceability, through which any test activity can be traced back to the corresponding development stage. This openness ensures that both development and test progress are easily tracked, and it makes the management of changes and trouble-shooting easier over the entire life cycle. By sequentially incorporating quality into the process right from the beginning, the V Model reduces the risk of software failure and enhances overall project results.

A. Phases of the V Model:

- Requirements Analysis: This is the first phase that is all about gathering and analyzing what the stakeholders want from the system. It entails defining functional and non-functional requirements to gain a clear picture of the objectives of the system.

- System Design: Once requirements have been determined, the high-level design of the system is established. This involves defining key modules, components, and the relationships between them to make up the entire system.

- Subsystem Design: The overall architecture is now sub-divided into detailed subsystem designs. Each subsystem is developed keeping in mind its individual functions, data-flow, interface definitions, and algorithmic processes.

- Component Design: During this step, individual components or software modules are designed thoroughly. This is where each portion is specified in terms of how it will be constructed and what will be used to test and verify it during testing.

- Coding: Once the designs are set, developers go ahead and execute the software implementation by coding up the components from the specifications drafted in the preceding steps.

- Unit Testing: After components are written, unit testing is performed on each one individually. This is to ensure that every module works as desired individually and any bugs are fixed at the time.

- Integration Testing: Once individual modules have been passed through unit testing, they are integrated and tested together. Integration testing verifies that the components talk to each other properly and that the entire workflow runs smoothly.

- System Testing: This phase tests the entire software system to confirm it fulfills the stated requirements. It involves extensive testing of

functionality, performance, stability, and usability through real or simulated use-case scenarios.

- Acceptance Testing: The last phase includes real users or clients testing the system to check whether it meets their requirements. This step assures that the software is ready to be released and conforms to all expectations for running successfully

On the whole, the V model gives a process and systematic methodology for software testing and development where quality is implemented into the system at the starting point and defect/failure risks are minimized.

IV. CONCLUSION

In summary, this paper has explored the use of QR code attendance scanners as an innovative and effective solution for attendance management systems. Through examination of current literature and empirical research, we have identified the advantages and disadvantages of QR code attendance scanning technology. Our analysis proves that QR code attendance scanners provide several benefits over conventional attendance tracking mechanisms. They capture data in real-time, correct manually typed errors, and ease the process of tracking attendance for administrators as well as attendees. QR code attendance scanners are also scalable, flexible, and economical, and thus appropriate for multiple educational institutions, workplaces, and event management contexts. Nonetheless, the paper also identifies some challenges that should be overcome when using QR code attendance scanners. These are including guaranteeing privacy for users as well as securing data, guaranteeing connectivity between devices in disconnected environments, and reducing scanning inaccuracies due to issues like substandard image quality or printing disparities. To alleviate these challenges, the paper prescribes possible remedies and future areas of research. These involve the addition of encryption and authentication protocols to protect user information, the creation of offline functionality for seamless scanning, and research into more sophisticated scanning algorithms and image processing methods to increase accuracy and reliability. In conclusion, this paper outlines the importance of QR code attendance scanners in transforming conventional attendance management systems. Through the exploitation of the advantages of QR code technology and overcoming the attendant challenges, educational institutions, employers, and event promoters can maximize efficiency, precision, and user satisfaction in monitoring attendance. Continued research and innovation in this direction will see QR code attendance scanning systems become increasingly better and universally adopted.

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