

QR Code Based Attendance System with Face, Biometrics and Location Verification

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Abstract— The most time-consuming part in university classes is attendance process, the traditional way of tracking attendance using pen and paper can be harder. This problem can be solved through smartphone very quickly and easily. This paper describes a method for Student's Attendance System which will integrate with the face recognition and the fingerprint technology and the use of QR code. Automated attendance system is a system which will record the status of the student whether the person is absent or present. This involves a simple app built using kotlin in android studio. The proposed system has two applications, one is for the faculty where QR code can be generated and second one is for the students. A unique feature of QR code generation for every session makes it easier for the faculty to take the individual attendance. The students will need to scan the QR code generated by the faculty and the attendance downloaded by the faculty will be generated in the form of XLS sheet for recording the attendance. Furthermore, the paper will present and discuss the features and applications of the module and technical solutions.

Keywords: GPS (Global Positioning System), Android Studio, Quick Response (QR) Code, Automated Attendance System

I. INTRODUCTION

Time is the most valuable thing a man can spend as the famous line goes, time is very precious in today's fast changing world where everything is developed on a pace where by the time we understand one, another is already out there. Man was never satisfied, the world of automation came into existence where everything is done at ease. Automated attendance system will definitely be a huge burden that is off the teacher's shoulder. Attendance is a vital aspect to keep track of individual students in a class, usually the manual way will be a very repetitive, tedious process and consumes a minimum of 10 mins and if the crowd is large then it will extend.

Face detection and recognition or the use of fingerprints is an essential field in many applications, one which is Attendance Management System. Human face recognition is an important branch of biometric verification and has been widely used in many applications. Even the various gadgets that are available today come in with various level of security unlock system amongst which biometrics plays a very important role. To reduce the absence of students and reduce work load of the faculty this method is being proposed, where a QR code is generated for every new session by the faculty and the students have to login and use their registered biometrics to obtain the attendance for the particular session, which will be automatically stored in an excel sheet and the admin can download.

The proposed system is user friendly, generates result quickly, accurate, efficient and prevents unauthorized

attendance, paper works and keeps track of individual students in the class.

II. LITERATURE SURVEY

Literature survey is carried out to gain information and knowledge. Before starting with the analysis and design of a project, we referred to multiple papers, manuals, documents related to the concept to infer the pros cons of the same.

A. Related Work

- Savitra Paharekari [1] proposed a system of attendance monitoring system using NFC along with face recognition to realize the functionalities This system uses face recognition for attendance at the college gate and the NFC tag is used to tap on the NFC reader while entering classrooms, labs etc. Test results showed the accuracy of the attendance to increase.
- Sagar wale [2] proposed an Automated Wireless Attendance system based on ZigBee technology. the system includes independent fingerprint acquisition module and attendance module in computer. System comprises various wireless fingerprint attendance functions, which could be used for public/private institutions. Test results showed that the fingerprints sensor successfully captured new fingerprints to be stored in the database; fingerprints placed on the device sensor and compared them with those stored in the database successfully.
- Aarushi Jalundhwala [3] proposed a system of Wireless Fingerprint Attendance Marking System where a fingerprint module is used and then is updated to the database by transmitting the information through use of Xbee. Test results showed that there were certain limitations in respect with the Xbee and further repeaters were required to enhance the process but can still be used.
- Pooja G.R [4] proposed a system Automated Attendance System Using Image Processing where the system is based on face detection and recognition algorithms, this detects the students entering the classroom using a webcam and marks attendance by recognizing the person. Test results showed that the images of the students were uploaded successfully.

B. QR Code [4]

QR code have become common in consumer advertisements. Our very own smartphones have served the purpose of being the code scanner. QR code has numerous applications like the payments, buying movie tickets, ordering movie tickets or even the commercial tracking of goods. QR codes have really eased our lives, this has been proved to be an easier way of reaching the required site rather the searching with URL and finding. Now using this technology, we have devised an

application where the student will have to scan the QR to obtain attendance.

III. METHODOLOGY

The task of the proposed system is to provide attendance to the students by scanning the QR code (which is unique for every time the QR is generated) that is generated by the admin (faculty). After which the biometrics (face recognition or fingerprint) is asked then verified with the database, if the student is present within the given location range and if the biometric verification is successful the student is given the attendance.

The QR code is generated through an android application, this android app is developed from a software Android studio. QR code functions as an input and XLS sheet having student attendance list is an output. The database used is firebase. The database stores information like student's name, subjects name, attendance details, etc.

This application consists of two parts:

- 1) The admin application: requires the admin to generate the QR code.
- 2) The student application: requires registration of the student with certain details.

The functions and principal parts of the system is represented in figure 1. First, the user or student needs to register and log in to the system.

The student must enter their email id, password, registration number and biometrics. For biometrics, both face recognition and fingerprint details are stored in database so that if any one of the biometric fails, the user can choose the other one to submit the attendance and after the process of registration, the student can login.

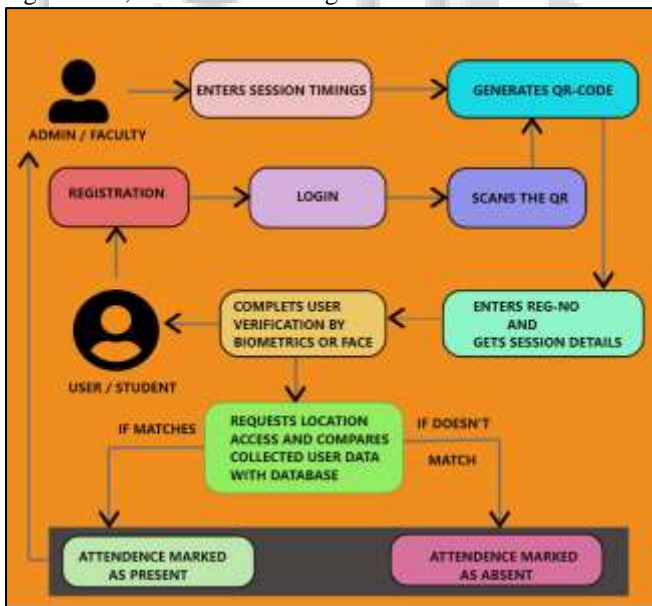


Fig. 1: Block diagram of the system

For admin or faculty application, he can upload and set the session timings and generate QR code for the students and then he can download the attendance.

A. Software Design

Kotlin is a general purpose, free, open source, statically typed "pragmatic" programming language initially designed for the

JVM (Java Virtual Machine) and Android that combines object-oriented and functional programming features. It is focused on interoperability, safety, clarity, and tooling support.

Android Studio is Android's official IDE. It is purpose-built for Android to accelerate your development and help you build the highest-quality apps for every Android device.[6] Using kotlin in android studio the app is built.

B. QR Code

QR codes are used in many apps for displaying data in machine-readable form. These codes are used to represent data in a secured manner that is readable only by machines and not by humans. We have seen many apps that provide QR codes that and we can scan that QR codes with our mobile device.[8]

androidmads.library.qrgenerator:QRGenerator:1.0.3, this Library is used to Generate QR Code Automatically for our specified input.[7].

C. ML-Kit Barcode Scanning

- ML Kit is a cross-platform mobile SDK (Android and iOS) developed by Google that allows developers to easily access on device mobile machine learning platforms.
- All the ML Kit's APIs run on-device, allowing real-time and offline capabilities.
- To use the standalone ML Kit on-device SDK, we can just implement it directly — we don't need to create a project on Firebase or an accompanying google.json file.
- With ML Kit's barcode scanning API, you can read data encoded using most standard barcode formats. Barcode scanning happens on the device, and doesn't require a network connection.[11]

D. Bottom Sheet

- Bottom sheets are surfaces containing the further content that are affixed to the bottom of the screen.
- Bottom sheets slide up from the bottom of the screen to reveal more content.
- Modal bottom sheets are primarily for mobile and can also present deep-linked content from other apps.
- Persistent bottom sheets integrate with the app to display supporting content.
- Bottom sheets are displayed only as a result of a user-initiated action.[10]

E. CameraX

- CameraX is a Jetpack support library, built to help make camera app development easier.
- It provides a consistent and easy-to-use API surface that works across most Android devices, with backward-compatibility to Android 5.0
- CameraX introduces use cases, which allow you to focus on the task you need to get done instead of spending time managing device-specific nuances.
- Managing consistent camera behavior across apps is hard. There is a lot to account for, including aspect ratio, orientation, rotation, preview size, and high-resolution image size. With CameraX, these basic behaviors just work.[9]

IV. OPERATION OF THE APPLICATIONS

The application is built in such a way it is very user friendly and requires just 2 to 3 user information and admin information. This app consists of two parts one where the admin access the class information and the other where the student needs to login to access the attendance.

A. Admin Application

- 1) As shown in figure 2, admin needs to register into the app with their email id and password. The registration is a one-time process and doesn't require multiple registration for different classes.
- 2) Once the registration process is completed, they can login into their account. If the registration is done priorly, then he/she can directly login.
- 3) Figure 3 shows the initial page of the admin which consists of two buttons one is the generate QR code and the other is to download the attendance.
- 4) The admin must enter the starting and ending time of the session and when he/she selects on 'generate QR code', QR code will be generated as shown in figure 4 and the generated QR code can be shared to the students by selecting 'share QR code' button. The QR code is valid for 10min.
- 5) After the attendance is available the respective person can download it. The attendance will be downloaded in XLS sheet

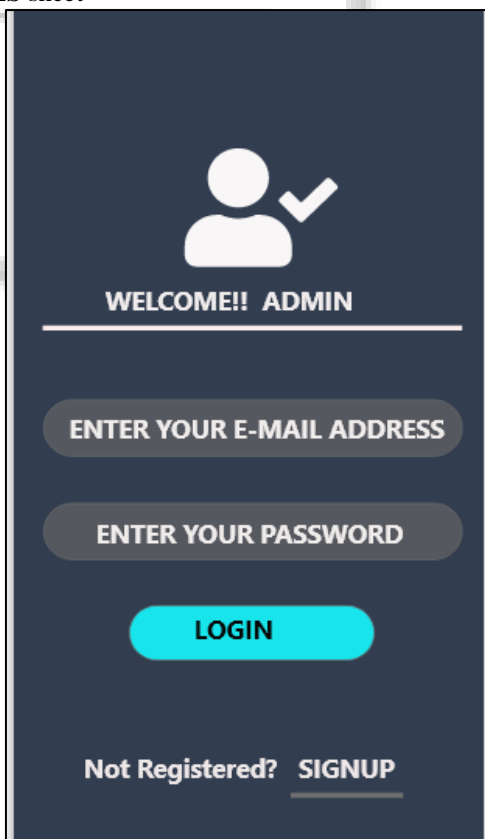


Fig. 2: admin registration page

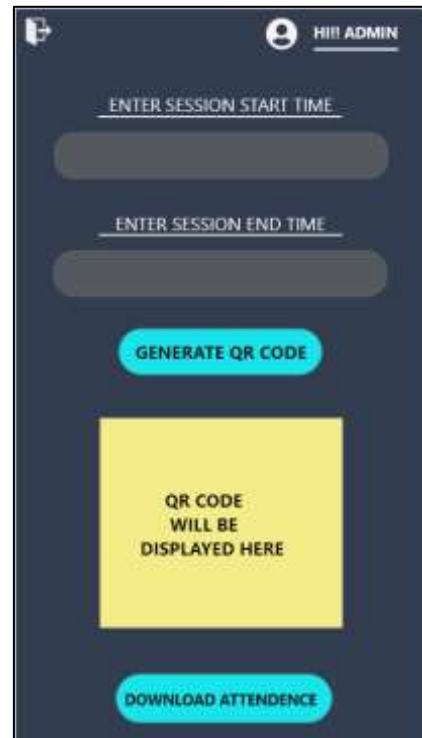


Fig. 3: Admin initial page

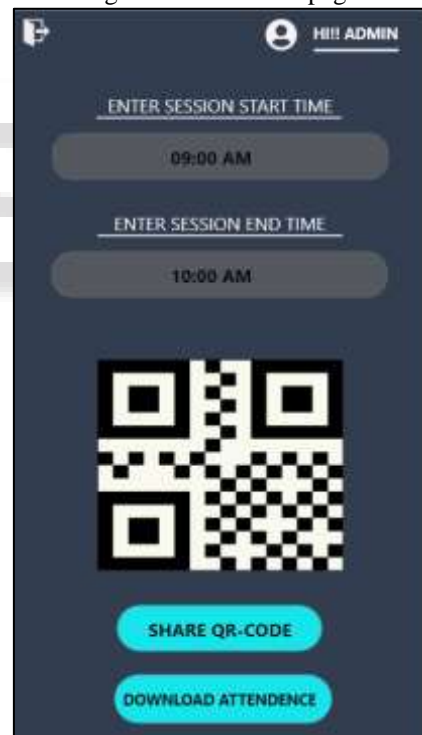


Fig. 4: admin page after generating QR code

B. Student Application

As shown in figure 5, the start page takes the student to register him/her-self for the particular class. Registration is a onetime process and doesn't require multiple registration for the various classes.

The registration (figure 6) requires the student to enter his email-id, password, student registration number, the biometrics i.e., the face recognition and fingerprints.

After which the login page pops up (figure 7) where the student is required to login using the credentials used during registration

As the final step (figure 8) he/she can register their biometric and click the request for attendance button, which will successfully register their attendance in an automated excel sheet which the admin will be able to download.

The faculty can share the QR code at the beginning of the session where the QR code will be valid only for 10min and students must scan the code within that time.

Student location will be in track via GPS. If the student location is not in the allotted range, then he/she cannot scan the QR code and his attendance will not be considered.

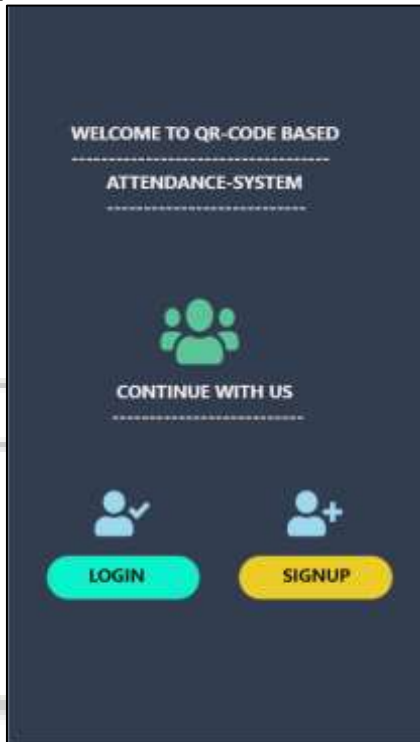


Fig. 5: User/student app 1st screen

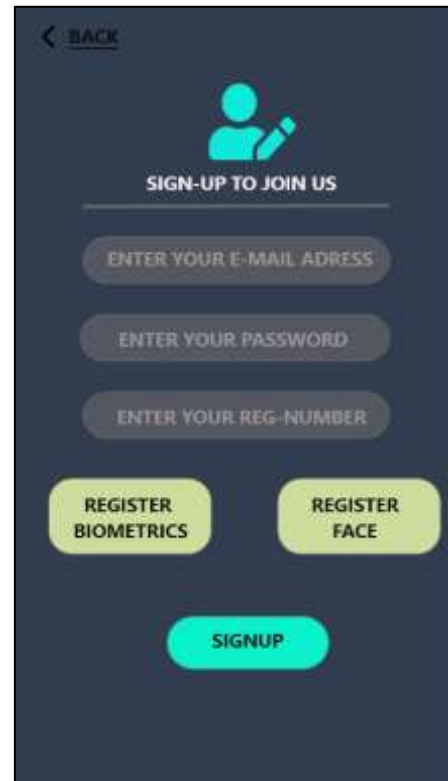


Fig. 6: Registration page

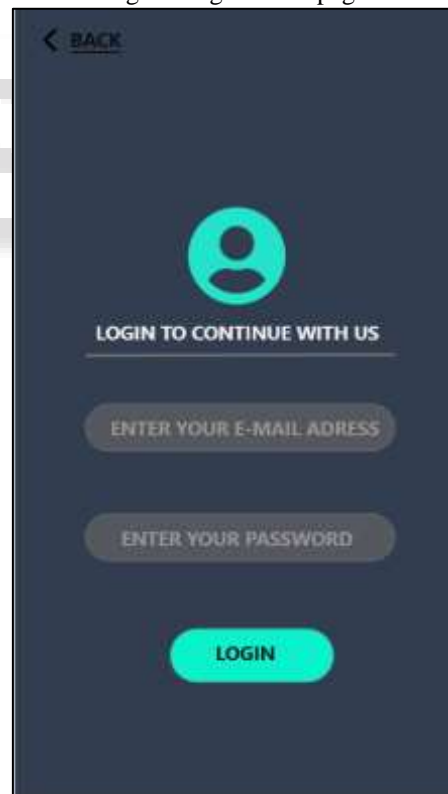


Fig. 7: Login page of the student



Fig. 8: student page to scan attendance

V. MERITS OF THE PROPOSED SYSTEM

- Provides accurate results
- It excludes the use of paper work and human efforts.
- The system is helpful as it generates a systematic overall report of every class attendance.
- It maintains the records in a large database instead of conventional method of maintaining register which further simplifies the process of searching for a particular record.
- User may easily get attendance history of a particular student.
- The system introduces a manageable and systematic approach of maintain attendance records.
- It saves user time.
- Eliminate duplicate data entry and errors in time and attendance entries
- Improve visibility to track and manage student attendance & absenteeism

VI. CONCLUSION

This is an ongoing project. This paper gives basic idea of how to take attendance through QR code in addition to the use of biometric which is a convenient method and takes very less time with maximum safety. It reduces the time taken by the faculty to take the attendance. This system requires only smartphones and internet accessibility to operate and it does not require any additional device like scanner to scan the QR code. As the system included face detection and GPS locations taken for each student, there will no fraud practices in marking the attendance. The integrated attendance system with face recognition or fingerprint i.e., biometrics verification provides accuracy and security. It is a most

efficient method to store and take attendance rather than paper work as the data can be transformed to the database for further analysis.

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