PSG Hackathon May 2022

Team members

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Chosen problem statement

P3. IOT & Hardware: Automatic attendance system

Proposed solution

Overview

In most universities, attendance is taken using pen and paper and this approach has been in use for a long time. But it is slow and prone to errors. In addition, it requires a manual data entry phase for any subsequent analysis or report generation. This solution aims to propose an automated student attendance system using QR code based on mobile application. While there are other viable options like using fingerprint scanners and webcams for facial recognition, considering the number of classrooms to be equipped with the required devices, our solution proves to be more affordable. A fingerprint scanner would cost around Rs. 4000 min for a classroom. More advanced solutions like iris scanners and facial recognition cost much much more considering the computing power needed for real-time attendance systems using those. If it's not implemented in real-time, it will take much more time, so much so that at which point, manual attendance would prove more effective. Whereas, our solution will only need an arduino, which can be as low as Rs. 700 and a tiny display. This already saves at least Rs. 3000 from the basic method. Our solution is simple, cost efficient and intuitive when compared to other biometric options.

Each classroom will be equipped with a screen and the system provides the students with a mobile application which will be used to scan the QR code displayed on said screen. Upon scanning the qr code using the app, it will authenticate the student's identity by fingerprint verification using the fingerprint sensor available on the phone. This feature helps in the elimination of false registrations and proxies, making the system robust. After the positive verification, the attendance for that student will be automatically marked according to the user ID. Firebase documentation APIs are used to record and send the student data.

The proposed system can be improved upon by implementing NFC(Near Field Communication) which is a short-range wireless connectivity. This eliminates the need for a screen to display the QR code and makes the process of marking attendance even faster.

Implementation details

The basic idea here is that there will be a display in each classroom that is used to show QR codes that are generated by the system. The student will use an app in their mobile phones to scan the QR code that is displayed. The system will then register the student's attendance on a private google sheet. The sheet will also have details on the information regarding the class like the course name and the staff's name.

The QR code that's generated will be generated using a random QR generator (works like RNG). This will be used to detect who is scanning the QR at what time and the interval between the scans. The QRs are generated on a hub system and arduino will be used at the ends to receive the QRs and display it. Students use the mobile app to scan the QR that is displayed. The app will then send the data of the verified student to our system and it will be recorded using firebase documentation. Firebase is also used to keep note of the course details. The app that is used to scan will have security features to prevent attendance proxies. Fingerprint scanners that are already built-in in almost all of the android phones can be used to check whether it's actually the said student who's attending the class. The timetable can be pre-programmed for efficiency. Then when the teacher needs to look at the attendance, it can be done with ease.

Tools & Technologies

Software Requirements:

- Android OS
- Firebase
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Hardware Requirements:

- Android Smartphone with fingerprint scanner
- Display
- Arduino

Mobile applications are implemented using python language. To build the app, Android IDE is used. The web application will use the data stored in firebase containing student records to cross-check the login of each student.

Firebase is a platform developed by Google for creating mobile and web applications. This backend application enables us to build our web application.We use it to store student information , it manipulates and tracks the attendance of students. It is also used to keep track of the course names and their respective teachers.

Android smartphone is used for scanning the QR code that is generated. To ensure authentication, the fingerprint sensor in the smartphone is used for verifying the identity of students.

Arduino has not yet been incorporated in this project due to time constraint. Proof of concept(POC) will be demonstrated through our laptop