Attendance Register Application

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Abstract **— Over the years the process of manual attendance has been carried out which is not only time consuming but also provides erroneous results. Automated time and attendance monitoring systems provide many benefits to organizations. This reduces the need for a pen and paper based manual attendance tracking system. Following this thought, we have proposed a smart location-based time and attendance tracking system which is implemented using the QR code on android mobile application on smartphones reducing the need of additional biometric scanner devices. The location of a classroom has specific coordinates, which can be determined by the GPS. Each student's location can be determined by the GPS using a smartphone. Additionally, the application involves generating the QR code which is scanned by the students to mark their presence in the class.**

I. INTRODUCTION

Research has shown that regular attendance and academic achievement are closely linked, and many universities find that monitoring student attendance allows them to identify students who need support at an early stage and put in place measures to help them continue their studies. When students miss a class they miss out on vital information that is essential to their learning. Instructors also suffer, as they cannot gain a true understanding of whether the course content is being taught effectively without the necessary feedback from these absent students. Therefore, it becomes necessary for the teachers to maintain an account of attendance. The traditional way to maintain attendance information is where the teacher checks if every student is present in class by calling out their name and marking them present in a register. This method is tedious and time consuming. It is also more vulnerable to proxies.

In this project, we have implemented an android app which facilitates attendance monitoring and keeps track of the timetable of a student. Using smartphones to speed up the process of taking attendance by university instructors would save lecturing time and hence enhance the educational process. We have developed an app which is based on a QR code, which is being displayed for students during or at the beginning of each lecture. The students will need to scan the code in order to confirm their attendance. We also use the GPS location of the student to determine if they are in class while marking the attendance thereby removing the risk of proxies.

The same application can be used by both students and teachers, but the functionality will be different. The teachers will have the permission to generate the code while the students will only have access to scan the code.

II. CHALLENGES

Existing smart attendance applications have various features in it. But there exists many challenges to resolve the proxy issues that the students can do. Considering these issues, we propose to present two ideas through our project. Firstly, we are motivated to include the generation of QR code which is unique to each instructor and for each class. The students should be able to scan this code which will be projected on the screen during the lecture of the class through their smartphone. But there might be a case where a student might not be present in the class but can mark their presence with the help of shared code by their fellow mates. In order to overcome this situation, we provide a buffer of time duration which helps teachers to consider only those students who would have scanned it within that buffer time. Additionally, the teacher will have the access of the students' location coordinates to ensure that the student is present in that class. Any student whose coordinates are away from a certain radius will not be considered for the attendance.

III. IMPLEMENTATION

The application is designed to be used for both attendance management and timetable scheduling. The system lies between online learning and traditional learning as a facilitation for the attendance record-keeping process, in a way that enriches the lecture time so that it can better be utilized in giving useful materials rather than wasting the time taking attendance. The first step to gain access to the features of the application is by creating an account.

Fig 1: Logo of the application

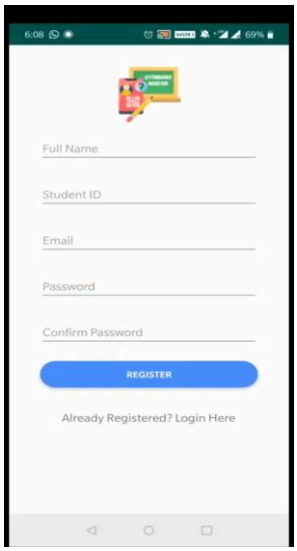

Fig 2: Registration page for the users

The application can be used by both students and teachers, but their functionality will differ. In the next sections we explain how each of the modules work.

A. TEACHER'S MODULE

The teacher module explains the functioning of our application for an instructor in a university. The teacher will register through the same register page as students, later the superadmins change the status to TEACHER in the main database, thereby permitting the teachers to get the control of their classes and the attendance reports of corresponding students. The application requires a simple login process by the class instructor through its Server Module to generate an encrypted QR code with specific information. This can be done at any time before the class, during the class, or at its beginning, the instructor displays an encrypted QR code to the students. The students can then scan the displayed QR code using their account in the same application.

1. QR code: Quick Response Code

QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional bar code) first designed for the automotive industry in Japan. Recently, 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 code consists of black modules (square dots) arranged in a square grid on a white background. The information encoded may be made up of four standardized types ("modes") of data (numeric, alphanumeric, byte / binary, Kanji) or, through supported extensions, virtually any type of data

A QR code, as shown in Fig.3 is read by an imaging device, such as a camera, and formatted algorithmically by underlying software using Reed-Solomon error correction until the image can be appropriately interpreted.

Fig 3: Example of a QR code

In our application only the class instructors have the access to generate a QR code. The instructor must select the 'Generate QR code' option to obtain the QR code for that class. This code will then be displayed to the class to allow students to mark their attendance. The attendance recorded is saved in the attendance window. The teacher can access the attendance information by

clicking on the ‘Open Attendance Window’ button. The Attendance window consists of the details of students who scan the QR code. The details include the students’ name and their student ID. If no student has marked their attendance, the attendance window sends a report unavailable message. This not only saves important lecture time but also reduces discrepancies or attendance proxies. The system stores the attendance data in the cloud and the teacher has access to check the attendance of any date they prefer. This helps them in keeping track of irregularity of students' attendance and can give insights about a student’s interest in the curriculum.

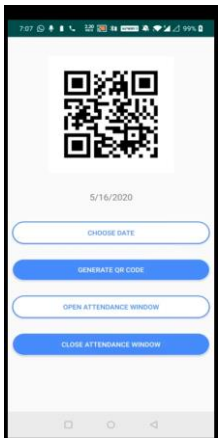

Fig 4: The generated QR code window

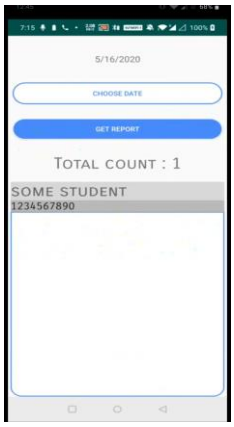

Fig 5: Attendance report available for teachers

We have also implemented a timetable scheduler in our application. The teacher has access to add or delete content in the timetable. It will be visible to the students, but they are not allowed to make any changes.

B. STUDENT MODULE

This section explains the functioning of the application for a student. Similar to the teachers module the first step to access the application is to create a student account. The student will need to login by providing details like email ID and their student ID. The student uses the app for two things, first one is to mark attendance in a particular class and the second is to check their timetable in that class.

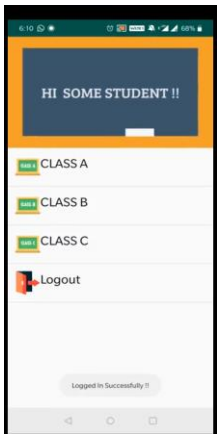

Fig 6: Main page after a student login

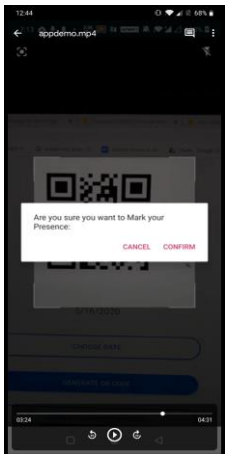

Fig 7: Shows a student marking attendance by scanning the QR code

The student can mark the attendance by scanning the QR code displayed by the teacher anytime during the class. To avoid the occurrences of faulty attendance marking the location of the student is taken as the deciding factor. The coordinates of the classroom within a certain range is considered as the legitimate area within which the student can mark their attendance. Before marking the attendance, the application requests to turn on the GPS location of the phone. The attendance is marked faulty if the students’ location is not in the given range. This way we avoid the occurrence of proxies. The students can also access the timetable by inputting the date. Any updates made by the teachers in the schedule will reflect in the student timetable.

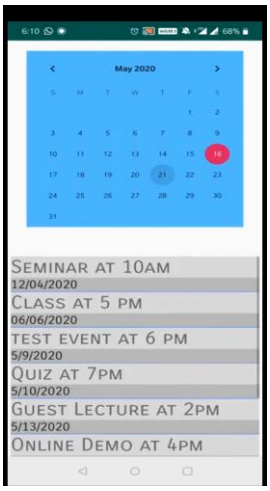

Fig 8: Timetable for a particular date

This ensures that the student is aware of the time and place of the classes for all courses. This makes it simpler for the student to keep track.

IV. TOOLS AND PLATFORM USED

The main Integrated Development Environment (IDE) that we have used in the project is Android Studio. Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse Android Development Tools (ADT) as the primary IDE for native Android application development. The language that we preferred for the application is java. Every app project will have an AndroidManifest.xml file (with precisely that name) at the root of the project source set. This manifest file describes essential information about the app to the Android build tools, the Android operating system, and Google Play. The manifest file of our application had various permissions included in it as the application requires the access to Internet, camera and location coordinates of the students.

Additionally, our application is connected to the cloud and has access to the database with the help of google cloud platform (GCP) Firebase. Google Firebase is a Google-backed application development software that enables developers to develop iOS, Android and Web apps. Firebase provides tools for tracking analytics, reporting and fixing app crashes, creating marketing and product experiments.
Firebase offers a number of services, including:

- Analytics – Google Analytics for Firebase offers free, unlimited reporting on as many as 500 separate events. Analytics presents data about user behaviour in iOS and Android apps, enabling better decision-making about improving performance and app marketing.
- Authentication – Firebase Authentication makes it easy for developers to build secure authentication systems and enhances the sign-in and onboarding experience for users. This feature offers a complete identity solution, supporting email and password accounts, phone auth, as well as Google, Facebook, GitHub, Twitter login and more.
- Cloud messaging – Firebase Cloud Messaging (FCM) is a cross-platform messaging tool that lets companies reliably receive and deliver messages on iOS, Android and the web at no cost.
- Realtime database – the Firebase Realtime Database is a cloud-hosted NoSQL database that enables data to be stored and synced between users in real time. The data is synced across all clients in real time and is still available when an app goes offline.
- Crashlytics – Firebase Crashlytics is a real-time crash reporter that helps developers track, prioritize and fix stability issues that reduce the quality of their apps. With crashlytics, developers spend less time organizing and troubleshooting crashes and more time building features for their apps.
- Performance – Firebase Performance Monitoring service gives developers insight into the performance characteristics of their iOS and Android apps to help them determine where and when the performance of their apps can be improved.
- Test lab – Firebase Test Lab is a cloud-based app-testing infrastructure. With one operation, developers can test their iOS or Android apps across a variety of devices and device configurations. They can see the results, including videos, screenshots and logs, in the Firebase console.

In our application, the information of the students and teachers are stored in the database cloud. The teacher can verify the location coordinates of the students in

order to avoid the proxy issues. Unique Id will be provided to each user, each class and for each QR code ensuring the authenticity and security.

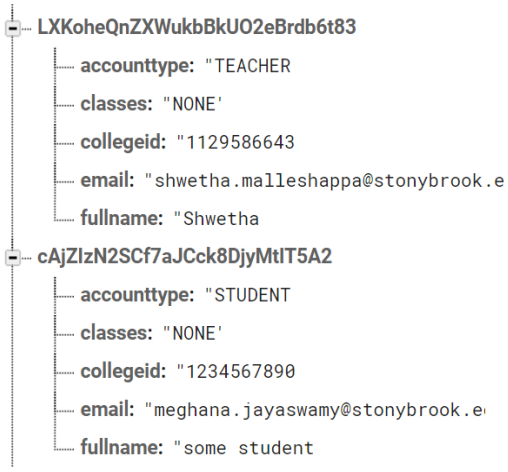

Fig 9: Cloud storage of user's information present in the database

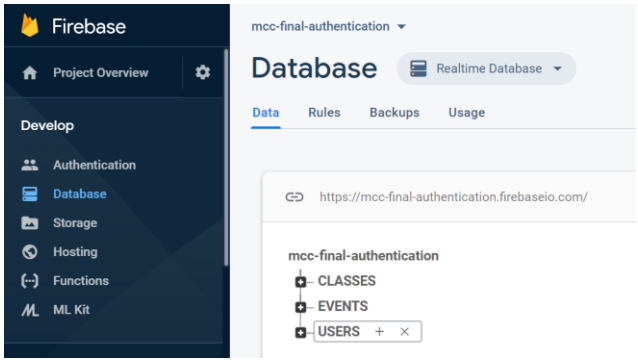

Fig 10: Database in Firebase

V. FUTURE WORK

Our future work will focus on making lecture notes available to students. Complete control to professors with more secured and enhanced options is also something that could be improved upon. Our application is only developed for Android devices. We could further work on making it available to other mobile operating systems like iOS and Windows. Also, if we can integrate this attendance monitoring system with face identification tools which will also involve image processing techniques then this system can be made more reliable. NFC can also be used to mark attendance instead of using the QR code system. The NFC Tag is used to tap on the NFC Reader while entering Classrooms, Labs, etc.

VI. CONCLUSION

Educational institutions have been looking for ways to enhance the educational process using the latest technologies. Time taken by instructors to take attendance may be viewed sometimes as a waste of the lecture time, especially when classes are big. For that, we have proposed a way to automate this process using the students' devices rather than the instructor's device. In other words, the instructor need not do anything extra during the class beyond presenting the slides of the subject to be taught to the students. The proposed system allows fraud detection based on the GPS locations for each student.

VII. ACKNOWLEDGEMENT

We are grateful to Professor Shan Lin for providing us the opportunity to explore and implement an android application. It was a great learning experience and led to many stimulating discussions and exchange of views.

VIII. REFERENCES

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