

Multichannel Attendance Management System using QR Code and Location

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ABSTRACT

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With the advent of technologies and multiple options available, it's very essential to rethink and optimize the current manual process by utilizing technologies, like web, mobile together. At present mobile phones play a vital role in our day-to-day life, and it also became a mode of identity. Using the mobile and its geo tagging feature we can precisely locate and validate once presence. The inbuilt ability of mobile can be very well leveraged to modernize the current manual attendance system. QR Code scanning is one of such features of mobile phones that enables them to quickly capture and process the data. Smartphones can be used to speed up the process of taking attendance. This project 'Multichannel Attendance Management system using QR Code and Location' focuses on simplifying & solving the problem of manual process of taking attendance. The project proposes a system that is based on using a QR code. QR stands for 'Quick Response'. They can be read quickly by a cell phone. It stores information such as the lecture number, date, name of the professor, etc, which is used in this proposed system.

Keywords : Smart attendance system, QR code, Education system, QR scanner, GPS, Real-time location, Authentication, Web user interface, Android application

I. INTRODUCTION

Taking student's attendance is the most important and crucial part of academics. The attendance rate is important because it is observed that students are more likely to succeed in academics when they attend school or college consistently. This process historically is manual. In many schools, colleges and universities there is an allotment of marks for

attendance rate. If the attendance rate is higher, he/she will be allocated maximum marks in the attendance section. This helps to increase the overall grade of the student. Professors spend a valuable amount of time from the lecture to note the attendance of the students and to verify that the student who is not present in the lecture is marked as "present". This procedure is repeated for every lecture and thus, consumes a lot of time. The

Multichannel Attendance Management system using QR Code and Location uses a QR code, which will be displayed by the teacher during the lecture. The students will have to scan the QR code using a smartphone application. The system also uses location tracking to eliminate false attendance marking by the students. Smart Attendance takes the student's previous attendance record from today and carries it forward through any of their remaining classes. It helps to generate various types of reports of a class or student attendance. Now that the technology has improved and everything is getting digital, there is a need for this traditional process of marking attendance to be modernised. The proposed system helps to reduce the workload of faculty and saves many man-hours that could be utilized in more fruitful tasks. It helps to record attendance efficiently and accurately

II. LITERATURE REVIEW

Many attendance management systems have been proposed in the past. These systems include the installation of devices like biometric scanners and cameras.

Reference [1] addresses the attendance systems which had been used previously and provides a methodology for the attendance system using QR Code. The proposed paper comprises a device to be installed in a classroom that is connected to a camera and the internet. The lecture is registered once the professor reads the QR code and the students are required to scan the code using their mobile, displayed on the device at the end of the lecture.

Reference [2], makes use of two applications. One application is a Desktop application that is used for storing the attendance of the students and the other application is a mobile application. This paper also makes use of GPS (Global Positioning System) to avoid false registrations by the students. The desktop

application is used by the teacher to generate and display the QR code.

Reference [3] is an example of a biometric scanning system, which proposes a planned system of recording student uses fingerprint identification that enables faculty and students to track student attendance electronically. The system proposed in this paper is going to display attendance on a computer with additional enticing graphics and have students complete details with Microsoft Visual Basic Studio and integrated exploitation of the Fingerprint Reader.

Reference [4] proposes a mobile device with the application installed. The device is passed among the students, wherein two options for registration are provided, registration using selfies and using signature. The images will be stored for identification during attendance.

III. PROPOSED SYSTEM

Presently, several attendance monitoring systems are being implemented in various organizations and universities. One of the most widely used systems is the traditional paper based attendance management system. The teacher has to manually mark the status of the student and also log this data into multiple registers which consumes a lot of space. Over a period of time, keeping a track of these registers becomes difficult and the papers can get misplaced or damaged easily. The process is tedious and also time consuming. Biometric scanners are also used, which record the fingerprint of the student. The model demands a separate device which needs to be maintained. The installation is expensive and the implementation is complex. A drawback of this system is, if the fingerprint is not recorded properly, the attendance will not be marked. Multiple attempts have to be made to scan the fingerprint successfully.

Facial recognition systems are also implemented which require the cameras to be installed, the maintenance and installation cost of the respective system is expensive. For verification, this technology uses the person’s features via a digital image stored in a database. High-definition pictures occupy significant amounts of storage. The system requires good lighting conditions as it is an important factor of the system. Poor image quality limits facial recognition’s effectiveness.

The proposed solution offers QR code generation and a system consisting of a web application and an android application.

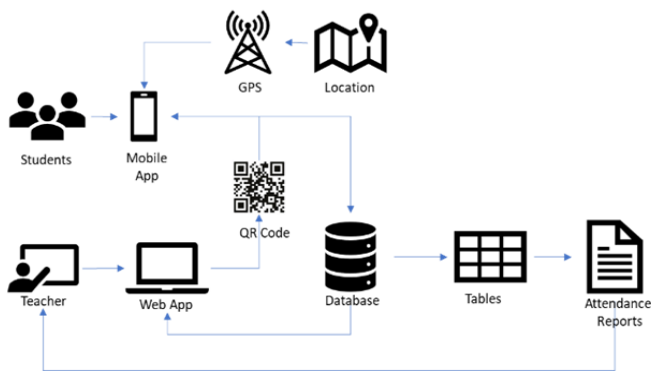


Figure 1. System Architecture

Initially, during the start of the lecture, the teacher will log in to the web application and by entering the details of the lecture, to generate the QR Code. The details of the code will be stored in the database after clicking the “GenerateQR” button. This code will be displayed to the students through the website on the smartboard.

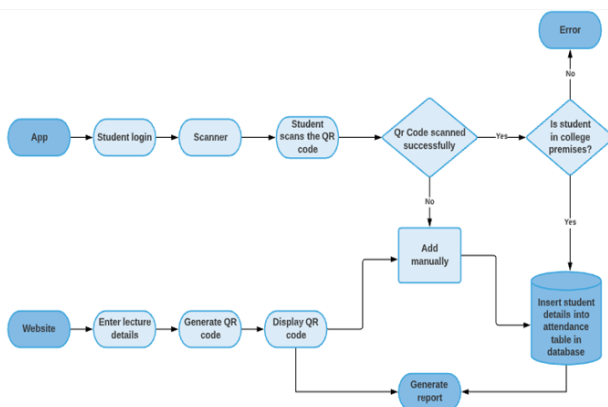


Figure 2. Location Based Smart Attendance Process

Meanwhile, the students will open the respective application on their phones and scan the QR Code. If the student is using the app for the first time, then he/she will first sign in to the app, using their credentials. Upon logging in, they can select the “Scan QR” button to start the camera. Once the background check is performed, the student details will be inserted into the “attendance” table. The student will also be notified, whether the attendance was marked successfully.

A challenge faced here is that it is possible that the student can scan the QR code from outside the class, once the student receives an image of the code. Thus, to prevent this activity, a location check is performed to prevent the students from marking the attendance for that session, which they have not attended. Since the system uses online applications, the use of external devices like QR scanners or biometric scanners is eliminated. Hence the maintenance and expenses of such devices is eliminated.

Various popular platforms were used to create this system which comprises Visual Studio Code as an Integrated Development Environment (IDE) along with Android Studio. For testing out the PHP code, Postman was an effective tool. While working with a team it is important that the team members must be up-to-date with the code progress, GitHub which allows developers to collaborate with others was used frequently.

IV. RESULTS

Implementing this project in the universities will make recording the attendance digital and simple to manage. Various resources which are used to record the attendance traditionally will be replaced and time will also be saved. The proposed system makes use of GPS (Global Positioning System), which is used to keep a track of the student’s location, i.e., whether the student is present on the university premises, which in turn prevents false attendance from being awarded to a student by means of his /her friends or

batchmates. Once the QR code is scanned by the student, the student's data is then stored in the database, which can be accessed by the teacher real-time. Thus, the teachers need not worry about recording the attendance and also cross-check whether students have marked any false attendance for their friends. The time can then be utilized by the teachers accordingly. However, one limitation of GPS is that GPS doesn't give accurate results in indoor locations due to low signal strength and low accuracy. Hence, in order to overcome this, the proposed system verifies whether the student lies within the specified range of the college premises.

A. QR Code

A QR (Quick Response) code is a type of matrix barcode. A QR code consists of three large squares which are used for positioning and several small squares which contain the data. The number of squares in the QR code increases as the amount of data stored in it increases. Figure 3. Displays the QR code format which will be used for the system.

It can be scanned using any imaging device like cameras or smartphones which support QR scanning or have the respective application installed. The small squares which contain the data are decoded and error correction is also performed. QR code will speed up the process, reducing the time taken by traditional procedures significantly. It will eliminate the need for keeping track of the reports. Hence, less maintenance is required in the proposed system.



Figure 3. Quick Response Code

```
{"sessionId":"1117","qrCode":"AISC1117",
"date":"2021-03-17","time":"20:45:26","d
eptId":"DCS4","subjectId":"AISC"}
```

Figure 4. Decryption of QR Code as shown in Figure 3

B. Mobile Application

The main functionality of the mobile application is scanning the encrypted QR code.

The following data will be checked upon scanning the code:

1. A check whether the student is enrolled in the course will be performed.
2. The status of the QR code at the time of scanning will be checked, i.e., the status should be "Active" and not "Expired".
3. The real-time location (latitude and longitude) of the student, as well as the university, is compared. The attendance will only be marked if the student lies within the specified range.

The location check is performed by calculating the distance between coordinates of the university and the student. The distance is calculated by using the Haversine formula. The Haversine formula calculates the shortest distance between two points on a sphere given their latitude and longitude. The code for calculating distance between two points is given below:

```
function distance($latitude1, $longitude1, $latitude2,
$longitude2, $earth_radius = 6371000)
{
    $lat1 = deg2rad($latitude1);
    $lon1 = deg2rad($longitude1);
    $lat2 = deg2rad($latitude2);
    $lon2 = deg2rad($longitude2);

    $latDelta = $lat2 - $lat1;
    $lonDelta = $lon2 - $lon1;
```

```

$angle = 2 * asin(sqrt(pow(sin($latDelta / 2), 2) +
cos($lat1) * cos($lat2) * pow(sin($lonDelta / 2), 2)));
return $angle * $earth_radius; //result in meters
}

```

The database is accessed by using the Retrofit API (Application Programming Interface), which is a type-safe HTTP client for android and JAVA. All the responses in the proposed system are sent and received in json format.

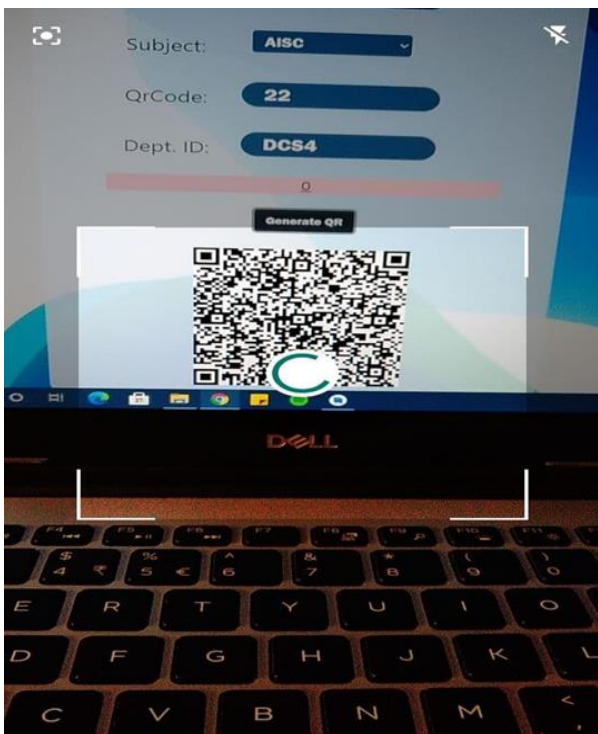


Figure 5 : Mobile Scanner

C. Website

The website is used to generate the QR. The main input “Session ID” is a 6-character long randomly generated string, which will be unique for each session. After the QR is generated and a few minutes are given to allow students to scan the QR, after this specific amount of interval a popup will be generated indicating the number of students who scanned the QR. Professor also has the flexibility to add the attendance manually. The website also generates reports depending on the Session ID. Also if there are

multiple sessions on the same day, then multiple reports can be generated separately.

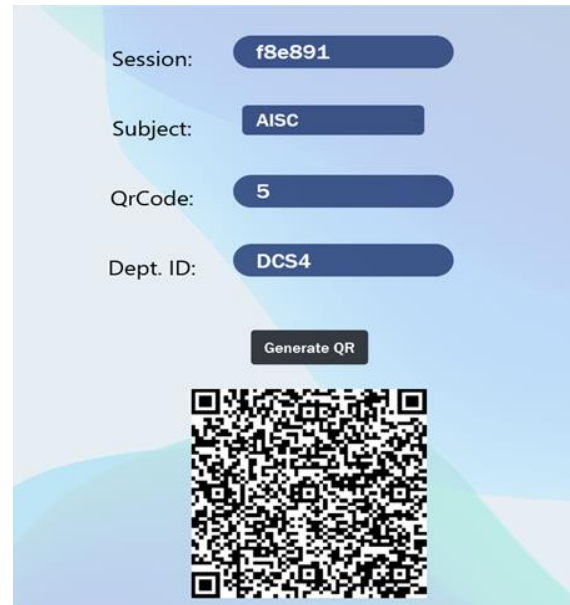


Figure 6. Generating QR

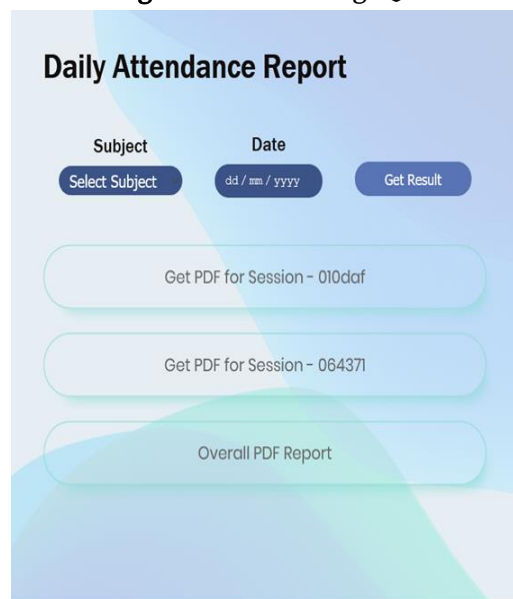


Figure 7. Report Generation



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Attendance Report of Session - 064371 (Date : 2021-05-06)

Prof. Name: S Total Students: 5
 Subject: AISC Total Present: 2
 Session No.: 064371 Total Absent: 3

Sr No.	Moodle Id	Name	Status
1	17102029	KOMAL LONKAR	Present
2	17102040	APURVA PATIL	Present
3	17102018	SALONI JACKERY	Absent
4	17102019	RITIKA RANE	Absent
5	17102022	VEDA KOWALE	Absent

Figure 8. Session wise attendance Report

Overall Attendance Report

Prof. Name: S Total Students: 5
 Subject: AISC Total Lectures: 6

Sr No.	Moodle Id	Name	Total Lectures (6)
1	17102018	SALONI JACKERY	0
2	17102019	RITIKA RANE	0
3	17102022	VEDA KOWALE	0
4	17102029	KOMAL LONKAR	2
5	17102049	APURVA PATIL	2

Figure 9. Overall Attendance Report

D. Database

MySQL is used as a database which is deployed on the cloud.

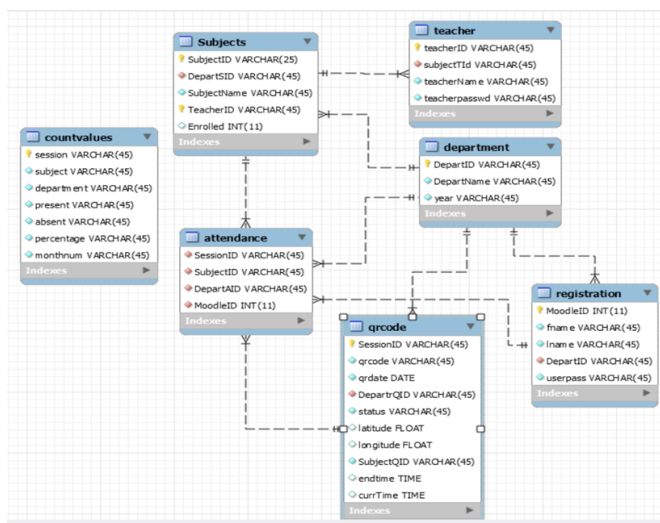


Figure 10. Database Schema

V. CONCLUSION

Attendance recording is a tedious and laborious task, which requires lots of paperwork and the process is usually cumbersome. In the digital era, there is a need for educational institutions to adopt the latest technologies. The conventional method of recording attendance involves manual logging of attendance, which might lead to inaccurate and misleading data. Hence, it is essential for the institutions to automate the system. The Internet has brought a paradigm shift in almost every domain, especially in the education system. The paper has proposed an efficient and an economical online attendance management system which scales down manual work to negligible

amounts. It helps to record attendance in a paperless manner which helps the environment. The proposed system is systematic and effective. The functionality is simple to use and can be accessed easily by everyone. The ideal case to use this system is an education system such as schools, colleges. But further, with modifications, it can also be implemented in workplace settings. Apart from a smartphone, additional devices such as biometric devices, ID card scanners, specially developed ID cards (which increase costs), etc are not required. This makes the proposed system cost-efficient.

The system helps to increase productivity, and as the system is online, with just a few clicks, students can track their attendance and teachers can keep a check on student’s attendance. In the future, face recognition or fingerprint functionalities can also be added.

The future work of the proposed system can be a mailing system which generates an email or message about the student’s attendance report that can be sent to the parents on a weekly or daily basis. An auto-generated email or message about the low attendance can be sent in the form of a monthly report to the parents whose children are in the defaulters list. As the GPS system advances in future, accurate indoor location of the student can be used to track the student’s location inside a classroom. For tracking location indoors, Wi-Fi Positioning System (WPS) can also be used, which detects the current location using the Wi-Fi devices in the nearby vicinity of the user.

VI. REFERENCES

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