Bluetooth-based Attendance Management App

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Abstract:- Attendance being a pivotal part for successful student engagement, it is prioritized by almost all the schools and universities. Tracking of attendance is a crucial component while assessing the progress. Therefore, in order to ease the attendance monitoring task, we came up with an Android Application system which makes the use of Bluetooth technology on smartphones to record an individual's attendance which apparently provides time saving and cost-effective attendance monitoring solution. Moreover, the system also generates daily, weekly and monthly reports along with tracking and recording attendance. Apart from recording and maintaining attendance multiple features are provided in the application which allows the instructors to set the class schedules and customize attendance thresholds which enables real time monitoring of the attendance that makes the instructor receive real time alerts if a registered person is not marked present. There is also a feature which allows the instructor to communicate with other users via emails and messaging which allows the instructors to send important notifications to other users. The other systems that are used to record attendance uses SQL and Java which are very basic and they also do not provide the feature of analyzing the attendance. Therefore, making use of Bluetooth technology to develop a system is a very unique process.

Keywords:- Bluetooth, Attendance, Real-Time, RFID, Monitoring System.

I. INTRODUCTION

Monitoring the attendance is a critical task which needs to be carried out by an organization. In schools and universities, student attendance is an aspect that ensures the engagement and participation of students in the curricular activities. The traditional method of recording attendance is vulnerable errors leading to inaccurate data and ineffective monitoring of attendance. However, as the use of smartphones is spreading widely this time-consuming task is automated by introducing an Attendance Management Application. This application uses bluetooth technology to record the attendance which eliminates human intervention and provides an effective, efficient and accurate way of monitoring attendance.

The process and technology used by the Attendance Management application in monitoring the attendance in the educational institution is documented in this paper. The features provided by the application like real time tracking, analysis and communication are also discussed through this paper. Furthermore, the potential challenges of implementation and potential future of mobile application of attendance management system is also discussed in this paper.

II. LITERATURE SURVEY

Recording and managing attendance on a day-to-day basis for every lecture and seminar is a cumbersome duty that needs to be satisfied. If attendance is recorded by taking signatures on the sheet, then it is time-consuming and if it is recorded by calling out names then the process in itself is tiresome. So, there was a need for research to be carried out in this field in order to automate the attendance recording and monitoring process. Several researches and surveys were conducted on the process of automating the attendance process. One of the systems proposed made use of ASP .NET and SQL server [1]. This system was proposed by V. Somasundaram, M. Kannan, and V. Sriram [1] in their paper Mobile Based Attendance Management System [1]. However, this system required the users i.e., the students to send the message as present or absent to the instructor through the system developed. This system was vulnerable to breach as the students even though absent were able to send the message as present to the instructor.

Another system that was proposed by Olubunmi Adewale Akinola, Sikiru [2] Olatunde Olopade, Akindele Segun Afolabi [2] in the paper Development of mobile and desktop applications for a fingerprint-based attendance management system [2] involved development of a system based on JAVA and MySQL [2]. It used a surname, password and fingerprint for verification. The users first needed to register using name and fingerprint and after registration once the fingerprint was scanned the user was marked as present. However, there was a single system which was developed and used by everyone in the lecture or seminar. Therefore, it was a time-consuming task [2].

One more system that was suggested used Radio Frequency Identification also known as RFID. This system was proposed by Arulogun O. T., Olatunbosun, A., Fakolujo O. A., and Olaniyi. O. M [3]. They also documented their research in the paper RFID-Based Students Attendance Management System [3] which suggested the use of RFID technology to calculate the attendance. They made use of automatic wireless identification for recording the attendance [3]. In addition to these, Mohd Ameer Hakim bin Mohd Nasir, Muhammad Hazimuddin bin Asmuni, Norsaremah Salleh, Sanjay Misra [4] proposed a solution to

reduce the hassle in recording the attendance through their paper A Review of Student Attendance System using Near-Field Communication (NFC) Technology [4]. In this, they made use of NFC technology that made use of a tag in the device which helped them detect the users that were in close proximity and marked them as present [4].
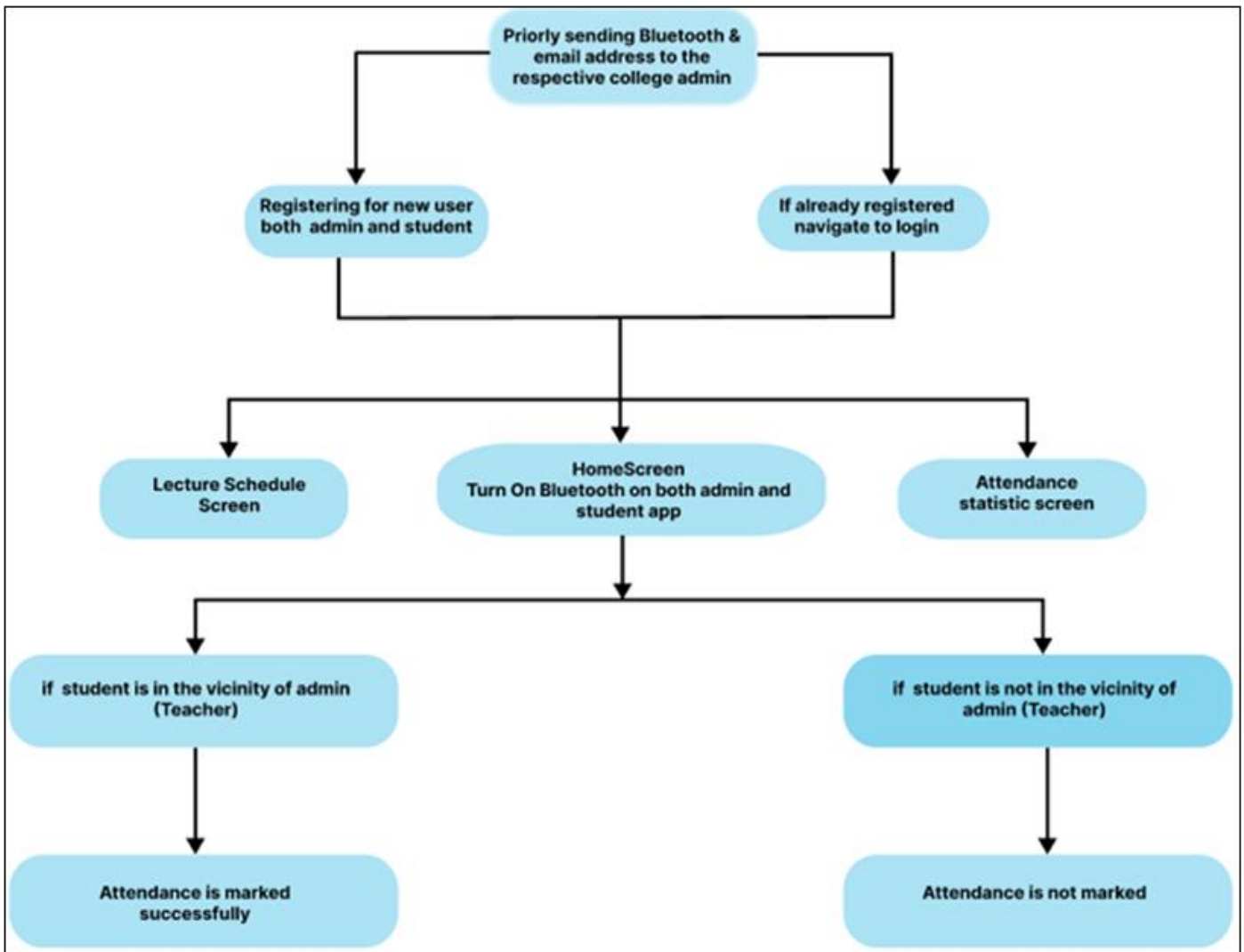
III. PROPOSED SYSTEM

Fig 1 Logical Workflow of app

In order to automate the attendance recording and monitoring process we came up with a solution. We developed an attendance management system which is deployed as a mobile application. This system makes use of Bluetooth technology of both the parties (administrator and user) in order to record attendance [6]. Figure 1 demonstrates the logical workflow of the application.

➤ *The Process of Marking the Attendance is as follows:*
In order to record the attendance, the user's device must scan the bluetooth of the admin's device [5,14] and during this process both the devices must be connected to the internet. After the bluetooth connection is successful the Attendance Management Application marks the user present. This application automates the manual method of recording the attendance thereby making the process faster and accurate [10,16-18].

For education purposes the application can generate the report based on the number of classes scheduled, number of classes attended and number of classes missed by the students. This report can be accessed by the administrator and can be used to monitor the engagement of the student.

Furthermore, this application is also used in corporate settings, where tracking employee attendance is essential for payroll processing and work scheduling [7,9]. Overall, this technology provides an efficient and accurate way of taking attendance, reducing the workload of teachers and improving the accuracy of attendance records [8].

The architecture of the Attendance Management System is represented in Figure 2.
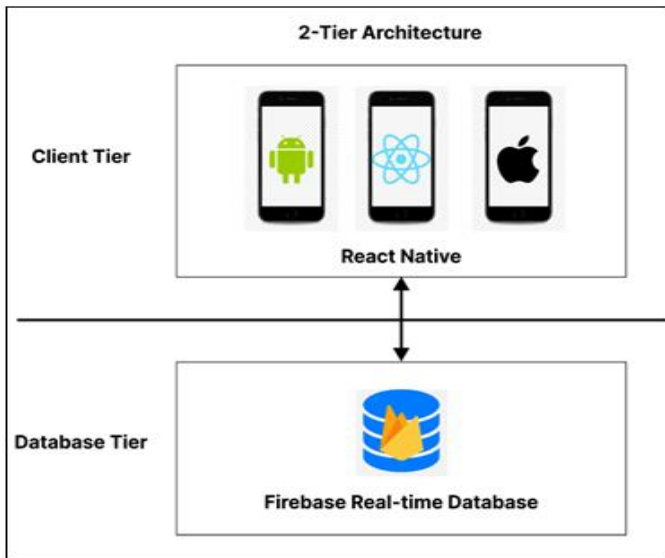
Fig 2 Architecture of App

➢ *Hardware used in the System:*

The hardware components depend on the version of the smartphone and the producer of the phone [13]. However, there are some components that are present on each device which includes:

• *Chips:*

This component is the major component of any smartphone's Bluetooth system. This Bluetooth chip manages the communication and connection between two or more devices [13,15].

• *Filters and Switches:*

They are useful in deleting any unwanted noise or disturbance that would destroy the connection [13,15].

• *Battery:*

The required voltage which allows the components of Bluetooth to operate is provided by the battery [13,15].

➢ *Software used in the System:*

The software's was used to develop the Android application. The application was developed using react native for frontend and the backend was developed using Firebase [12]. The records of the attendance are stored using cloud which is provided in integration with Firebase. It provides backend infrastructure that is secured [11]. The real-time synchronization of data between the user and backend application is one of the features of Attendance Management System.

IV. METHODOLOGY

➢ *The Process of Registering the Device and then Recording the Attendance is Illustrated in Figure 1.*

• The Bluetooth and email address of the user must be submitted to the organization administrator for the purpose of registration.

• The process of registration must be completed for both the users e.g., student and instructor for a particular class.

• If both the users are already registered then the users are navigated to the login page where they have to enter their credentials and login.

• After successfully logging in the users can navigate through three screens.

✓ The first one is to schedule lectures and classes.
✓ The next one is the statistics and analysis of the data used.
✓ The third screen is the home screen which prompts the user to turn on the Bluetooth of the device.
✓ Once the Bluetooth devices are connected, if the user is within the specified radius of the connection boundary, then he is marked success or present, otherwise the user is marked as absent.

➢ *The Step by Step Walk Through of the Application is Explained below:*

• The two screens described in fig. 3 and fig. 4 are user-authenticating screens. Both teacher and students have to go through an account process. But no one can create an account directly. first they have to send their Bluetooth and email address to their respective college admins and then only they will be able to create an account.

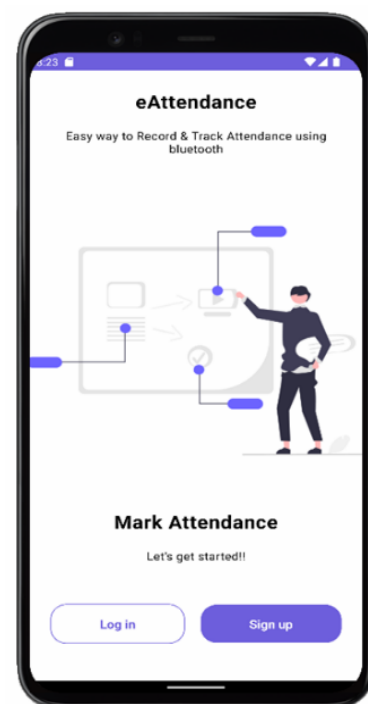• The two screens described in Figure 5 and Figure 6 are the admin and student home screen.
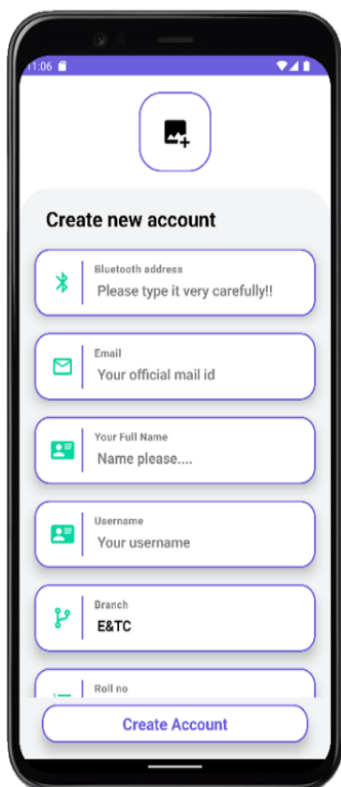

Fig 3 Login Screen
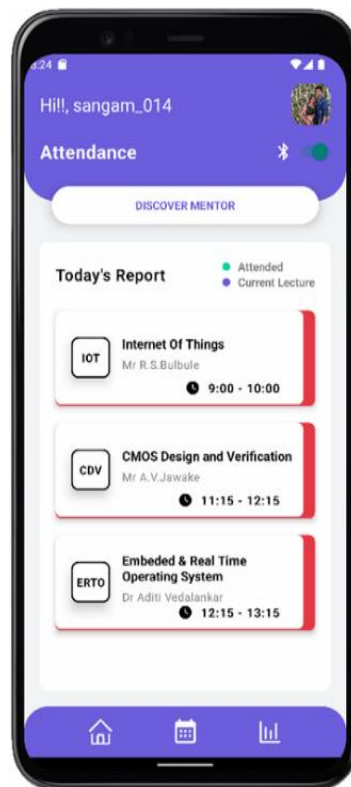
Fig 4 Create Account Screen
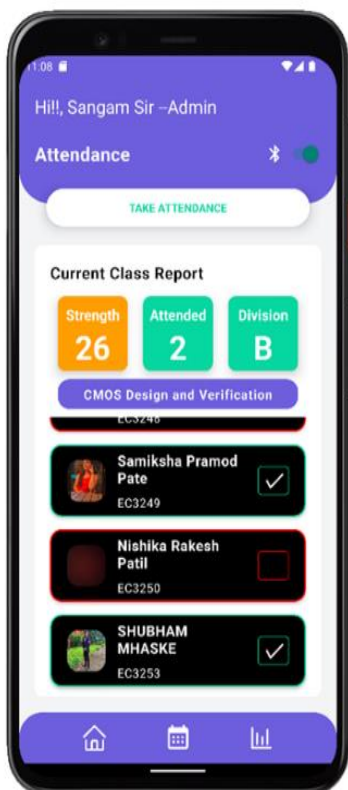

Fig 6 Student Home Screen

Fig 5 Admin Home Screen
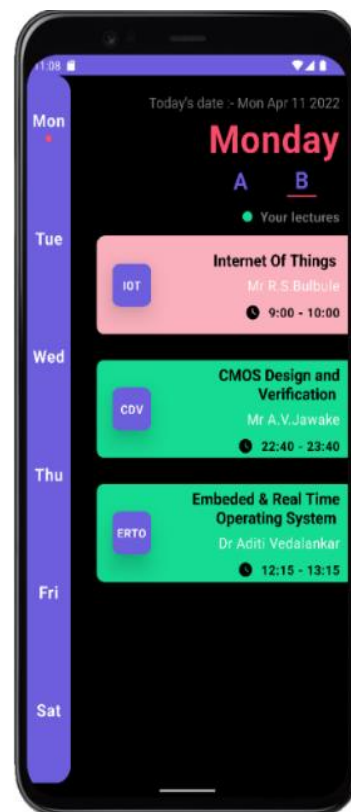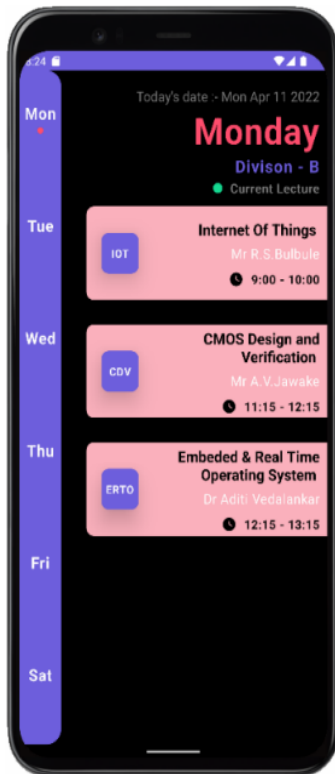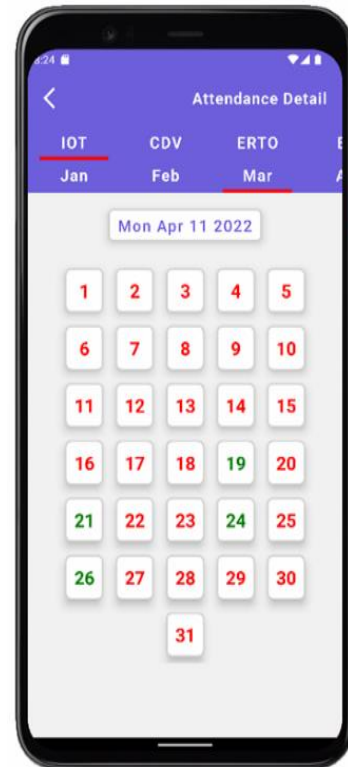

Fig 7 Admin Schedule Screen

Fig 8 Student Schedule Screen

- The two screens described in Figure 7 and Figure 8 are lecture's Time Table for both students and admin. In this screen, both can view their Current lecture.

Fig 9 Admin Statistics Screen

Fig 10 Student Statistics Screen

- The two screens described in Figure 9 and Figure 10 are the Statistics Screen of both students and admin. For admin, they have to choose a student name from a particular division to see their statistics.
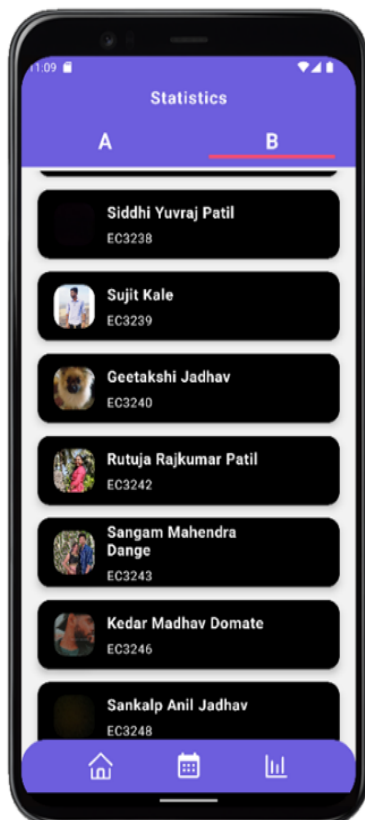
➢ *Attendance Marking Process:*

- First of all, both teacher and student must keep their Bluetooth on.
- If the teacher i.e., admin is in the vicinity of the students, they should start scanning or discovering their current teacher for marking attendance by just clicking on the "DISCOVER MENTOR" button.
- If they are in the vicinity of the teacher then they will get a prompt on their screen which says "Your current mentor is: -XYZ".
- After this, the next step is in the hands of the admin. After all the students have successfully scanned their current mentor, the admin just has to click the "TAKE ATTENDANCE" button.
- After admin clicks on the "TAKE ATTENDANCE" button, students will the get prompt of give attendance button, then students must click on this button to mark their attendance.
- For the acknowledgment that students have successfully marked their attendance, admin can see that particular student's name in the list and if that student's name panel is green, it means he/she has marked attendance successfully
- As for the students, they can just see the border of the current subject's panel. If it is green, it means they have marked attendance successfully. If it is red then they have not.

V. RESULTS

As shown in the figure 5 and figure 6 two screens are the admin and student home screen. Figure 5 represents is the admin screen and Figure 6 is the student screen. On the Admin Home Screen, the tutor or teacher can see the strength of the current class as well as the current division and how many students have attended the class. Below that tutor can see their current lecture name and all the students of their current lecture. So, after successfully going through the attendance marking process, all those students who got the tick mark in front of their name and their User Interface block border color changes from red to green, it means their attendance is marked successfully.

On the Student Home Screen, the student can see all their today's lectures as well the lectures they have attended successfully. So after successfully going through the attendance marking process, The student whose current subject User Interface block border color changes from red to green, it means that their attendance has marked successfully.

The Statistics Screen of both students and admin are demonstrated in Figure 9 and Figure 10. For admin, they have to choose a student name from a particular division to see their attendance. For Students, they can directly choose any subject name and month to see their attendance. The green digits signify student has attended the lecture on that particular day and the red means absent.

VI. CONCLUSIONS

The app successfully marks the attendance of students via bluetooth very effectively and efficiently. It is done completely in a wireless manner as bluetooth is a wireless technology. The app is basically based on IOT where bluetooth of students are sensor nodes and tutors bluetooth is a master node which is getting scanned by the sensor nodes. Thus, app provides a centralized way of managing attendance of college where data can be stored in the database and can be accessed at anytime and anywhere using just mobile device. It also doesn't require any kind of extra hardware device that is to be mounted in every classroom and thus saves money of the institute.

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