Design and Development of Geofencing Based Attendance System for Mobile Application

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Abstract—**In this digital world, everyone has an android mobile phone. In a company, growth depends on employee regularity. Determining their regular attendance is one of the major parts of the company. There are lots of employees working in the company, and it is not possible to take everyone's attendance through the use of thumbprint and RFID technology. It will take a long time. So, in this paper, we are implementing a geo-fenced mobile app for the company's employees.**

Keywords—geo-fenced, Android, GPS tracking, mobile attendance.

I. INTRODUCTION

Calculating each employee's attendance in the industry is very important for the industry's progress and growth. The employees' salaries also depend on their regularity in the company and work. There are biometric techniques that are available, such as RIFD, fingerprint scanning, retina scanning, and facial recognition. However, these techniques take time to calculate each employee's attendance, and the company has a large number of employees, so it will be very hectic to manage everyone's attendance records and also, it will necessitate a slew of devices and equipment, including a scanner, numerous servers for taking backups of daily attendance, and it will be prohibitively very costly.

 The goal of this study is to create and apply a geofencing-based approach [1] for tracking employee attendance. To ascertain the employee's present location, the application needs GPS x-coordinates and y-coordinates. There are two coordinates; they are latitude and longitude, and they are denoted by the x-coordinate, and another one is the y-coordinate. The resulting coordinates add up to 6 (10,6) decimal points and are then transferred to standard coordinates defined by the Industry Manager in the system database. To understand the coordinates, the Android/MySql [2] and [3] software are linked to Google APIs, allowing users to see the current location of the coordinates. In the mobile app, you can punch in your daily attendance, and after punching, it will show your daily punches history. as well as keeping a daily attendance record in which you just put From date-to-date, just click on "show attendance". It will show your attendance and also you're in-time and out-time. The whole framework is done on the Ionic platform. In the ionic platform, we can generate the android application as well as this application will be used on any android mobile phone.

II. MOTIVATION

This project's implementation purpose is to save employees' time and make it cost-effective by not requiring much hardware equipment to handle employee daily attendance reports. In particular, this application is very beneficial for the sales employees' department if they are outside of the company's location for company work purposes, so they can also, punch their attendance from the client location very easily. The industry administrator can set the boundary so that if they are present at the client location while punching their attendance, it will be marked as present, otherwise, it will be marked as absent. Because of the pandemic situation, most people will likely work from home, so in this situation, the geofenced Mobile App-Based Attendance System is very useful for every company employee, and it is very easy to use, requiring no other systems like scanners, fingerprint machines or RFID card based attendance machine [4] or any other complicated equipment.

III. ANDROID APPLICATION

We are designing an Android application with the help of the Ionic framework. The Ionic framework is a UI (user interface) kit, and it is open-source. In this kit, there are various components, designs, and styling elements. It is used to build high-quality mobile phone apps as well as desktop apps. With the help of web technology, for example, Ruby on Rails, CSS, HTML, and JavaScript, and the integration done with the help of Angular and Cordova, Angular is an open-source framework for web applications to build single-page apps.

Ionic provides specific UI elements from the library for Android applications, whereas the Cordova plug-in provides the means to run the application the same as a native app. The native app is nothing but the Android phone application that is specifically developed for the mobile operating system.

IV. FLOWCHART

Figure 1 shows the flowchart for the attendance system. In this, the attendance system starts, and employees can login to the android application (i.e., IBSL app). Employees can login only when the employee details are present in the industry database. If they are not registered in the industry database, employees cannot login to the app. If employee details are valid, then only employees can login to the app. After employees get logged in to the app, successfully. Then the employee can press the punch button with the help of geo-fencing. It will first track the employee's location and the

latitude and longitude coordinates, and also check whether the employee is restricted or not. If the employee is not restricted to a specific location, he or she can punch in anywhere in the world, whereas if the employee is restricted to a specific location, the employee must punch in at that location. It will check within the set time and range. Suppose an employee is not present at that specific range or may not be in that specific location, the punch will be rejected and
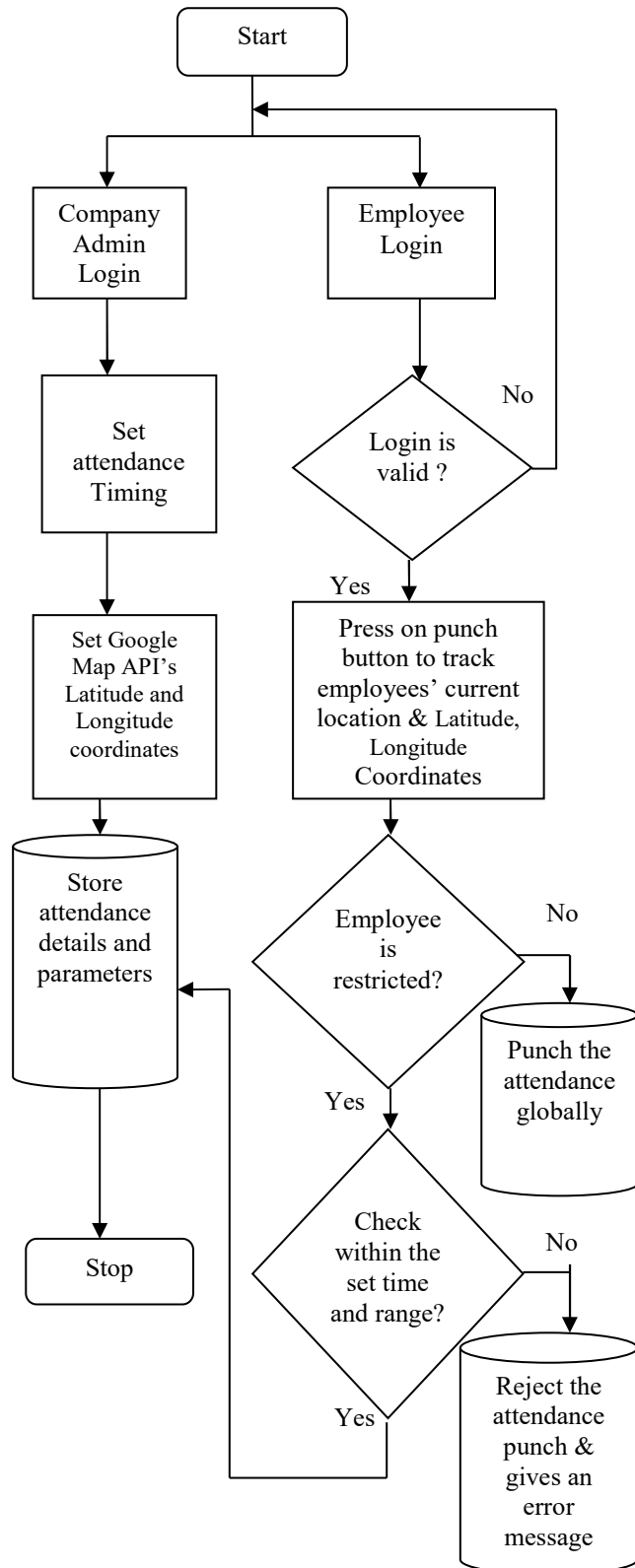
give the error message. The industry admin has all the privileges to manage the attendance system according to their own rules He can see attendance at the office timings where they are working, like at client location on that specific time they have to punch and at what timing they are punching attendance that specific time was recorded in the clock in history. The industry administrator also has the privilege of setting the Google Maps API's latitude and longitude coordinates. These Google map APIs serve as a barrier for employees who are restricted to specific locations. Only if the employee is in that specific location, then only he or she can punch the attendance. Only the admin can set these boundary parameters for the particular employee. It will become very easy to maintain every employee's attendance details, and the admin can check these details at any time and they will be stored in the database. After punching the employee, he or she is in the correct range and timing. Then attendance gets punched and marked as present in the system and stored in the attendance details in the employee database. After punching attendance, the employee can stop the app and walk away.

V. ANALYSIS OF FEATURES

The analysis of geo-fenced based mobile app attendance system features are as shown below:
(1) Employees can log in and use the app.
(2) Accurate GPS live location tracking
(3) Clock-in is permitted within the specified boundary and globally.
(4) Application available in android
(5) Real-time monitoring system
(6) GPS location history was saved.
(7) Daily attendance history record was saved.
(8) The search option is available to see the date-wise attendance as well GPS History.

Fig (2): Employee Attendance system of mobile app features.

Fig (2) shows the Employee Attendance system of mobile app features. The geo-fenced mobile app-based attendance system provides a solution to the manual attendance-taking problem. There are several options available in the mobile application, like logging in to the app, punching attendance, tracking live location and punch time, and submitting the

Fig (1): Overall flowchart for the attendance system.

attendance from client locations. You can check your GPS history and also see your daily attendance record in your app. The record is saved day-wise and you can check your previous date of attendance record from that date to whatever date you want your attendance record to be and just click on the button that says "Show Attendance". These features are very helpful for employees to maintain their attendance easily and quickly.
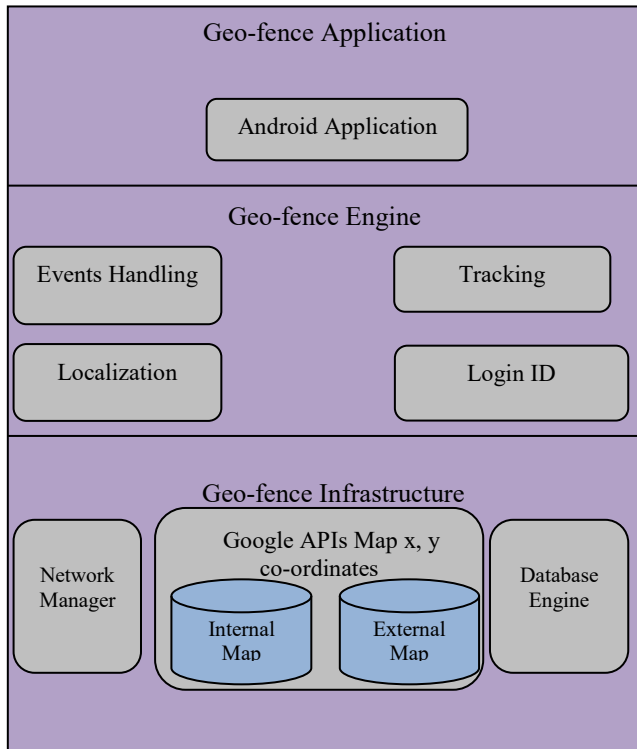
VI. SYSTEM ARCHITECTURE

Fig (3) : Geo-fenced System Architecture

Fig. 3 shows the geofenced system architecture. Geofencing establishes a virtual boundary around the location. This approach is very useful for tracking the employee's current location via GPS coordinates[5]. Our aim is to track an employee's current punch time if that employee is seriously present on the client-side, and if he is not present on the client-side but trying to punch the attendance, it will get rejected with the help of the geofence technology that we have developed. On the backend side, we have taken three parts. The first one is the geofenced application. The second one is the geofenced engine, and the third one is the geofenced infrastructure.

A geofenced Android application is developed with the help of the ruby on rails and the Ionic framework, and an Android app is created by connecting to our company's internet web server. An APK file has been created after building the program. That APK file can be installed on any Android mobile phone.

We integrated with Geofenced different kinds of features in the Gerofenced Engine, like events handling, meaning employee, manager, and admin events that are performed in the application, employee tracking, and localization, and only those people can login into the app who are company employees. That login-id has been saved in the database engine[6].

The Geofenced infrastructure is compatible with network managers[7] and Google APIs x, y, and coordinates, which

are the latitude and longitude to track the employee's current location. This is built on the ionic framework and employs the Angular programming language and a database engine.
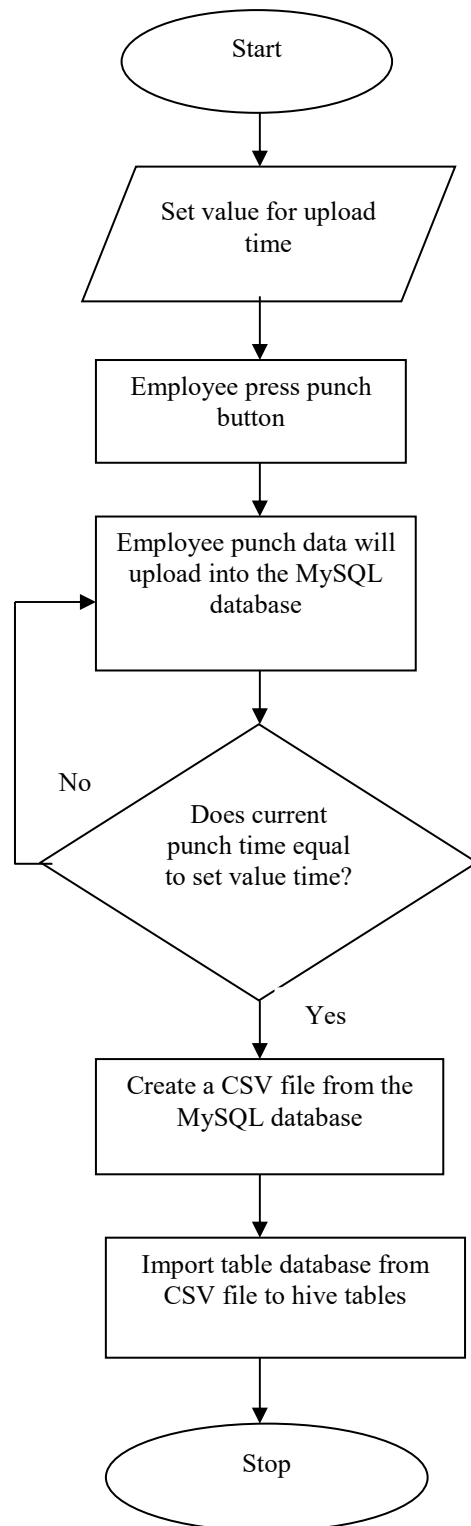
VII. FLOWCHART FOR DATABASE SYSTEM

Fig (4): Flowchart for the database engine

Figure 4 shows the flowchart of the database engine. When the application is started, the company admin has the privilege to set one particular time in the database. After that, employees can login into the app and punch their attendance. Employee Punching Time as well as their x and y coordinates have been uploaded into the MySQL database.

Does Is the current punch time and x, y coordinates equal to the set time? If not, then the time has been noted in the database and the employee's marked attendance has been rejected. If yes, the current punch time is equal to the set time value, then attendance has been accepted. After that, create a CSV file from the MySQL database and then import the table database from the CSV file into the hive tables.
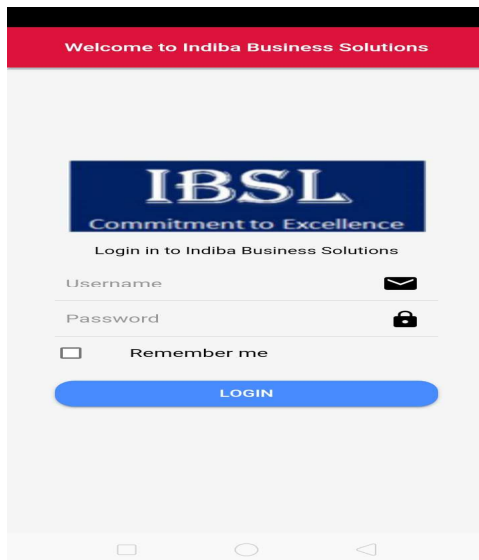
VIII. RESULTS

Fig (5): Screenshot of Attendance login Android App

Figure 5 depicts the attendance login application in which that company's employees can login with their company username and password, which are already stored in the MySQL database server.
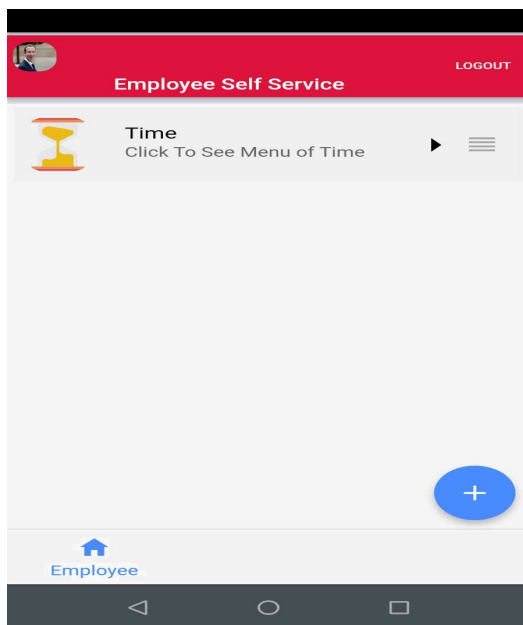
Fig (6): Screenshot of employee application

As Figure 6 shows, an employee application is in that time menu, and the blue plus button has been integrated with the punch click. Whenever we are going for the attendance punch, just click on that plus button, and In Figure 7 shows the employee punch button. Just press it. Your attendance time has been recorded, and your location has been tracked.
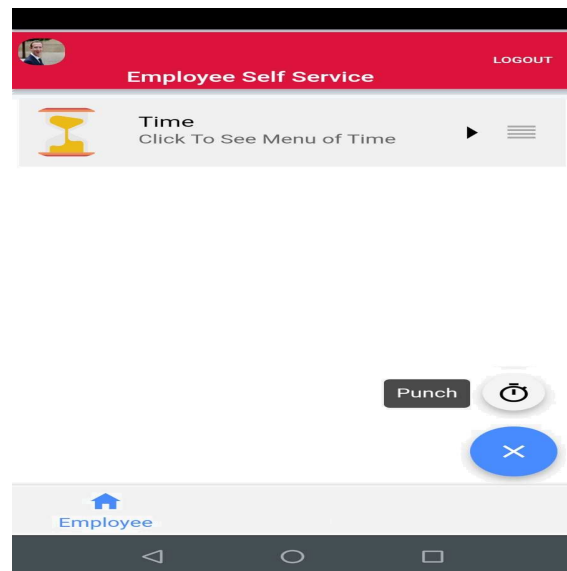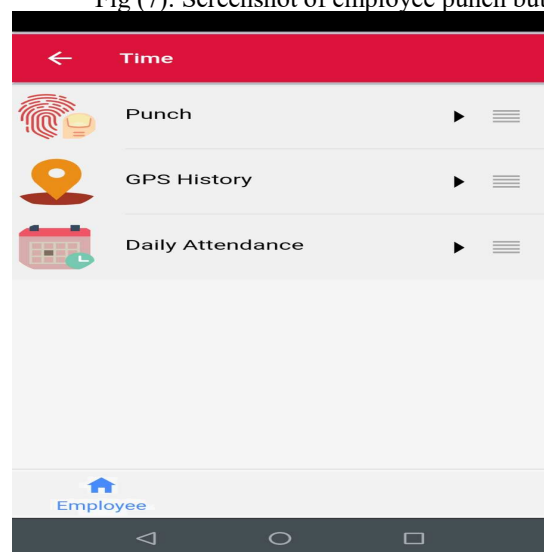

Fig (7): Screenshot of employee punch button
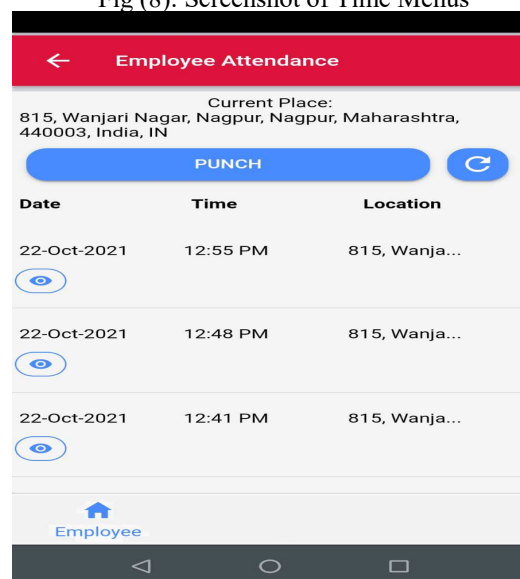

Fig (8): Screenshot of Time Menus

Fig (9): Screenshot of Employee Punches

In Figure 8, a screenshot of Time menus, we created three different menu bars to check employee punches, employee

GPS history, and employee daily attendance records, so just click on them and you will get all the daily attendance data of an employee. The following screenshots will delve deeper into the subject. In Figure 9, a screenshot of employee punches is recorded. This menu will pop up when the employee clicks on the punch bar, after which the employee will see all the punches with their current date, time, and location that they punched. All punch records have been saved in the database..
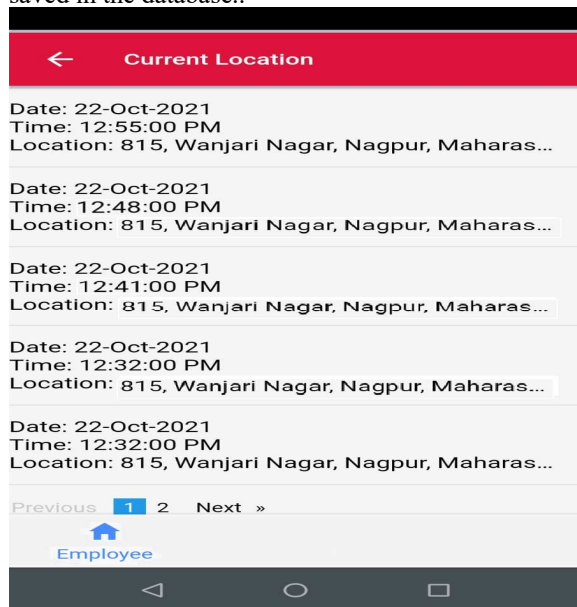
the date range you want to check. (From one date to the next), and press show attendance then recorded daily history, has been displayed in it as if it were a day. Present Status: If an employee is on a half-day, it will show (HD). If an employee has any week off, it will show (WO). The data shows that between the dates of 16 to 22, employees used the app only on 17 and 22. You and they can both monitor their three actions punch, attendance details, and regularization actions.

Fig (10): Screenshot of Employee GPS history

Fig (12): Screenshot of Employee punches Actions

Figure 12 depicts a screenshot of an employee's punching actions, including the date and time of each punch. In Figure 13, a screenshot of the employee attendance details their date and present status. In time and out of time, and working hours have been shown.
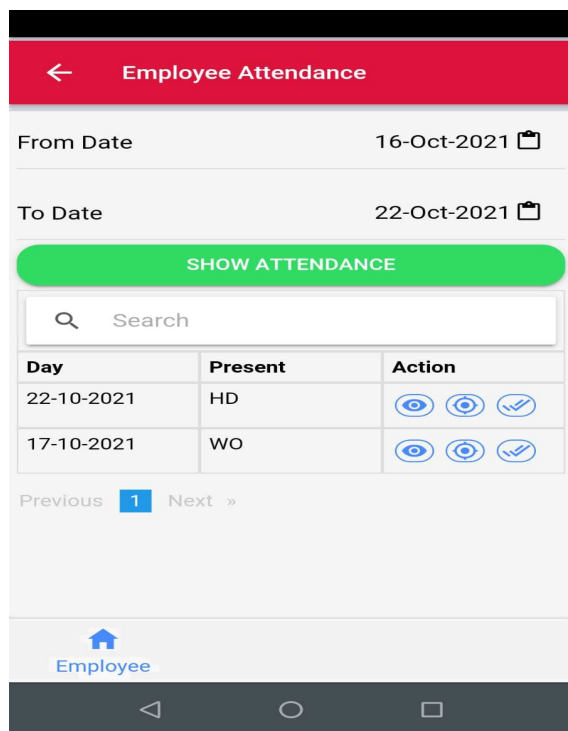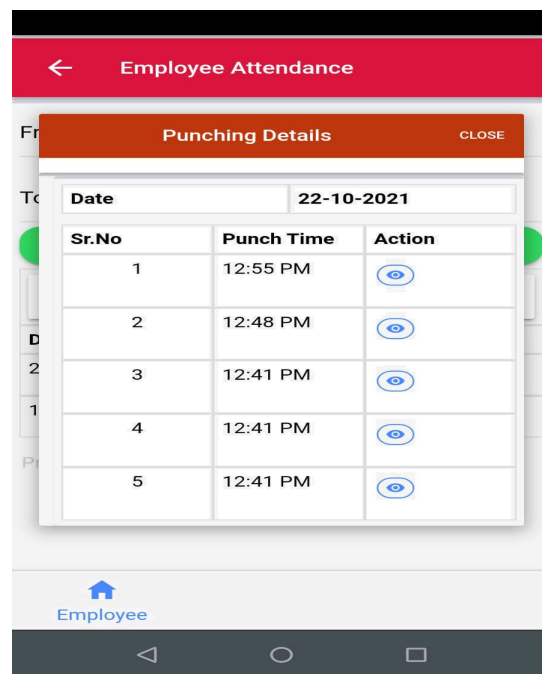

Fig (11): Screenshot of employee daily attendance

In Figure 10, a screenshot of an employee's GPS history shows that GPS [9] will track the employee's punched date, time, and punched locations compared to Figures 9 and 10, so you will get accurate results from GPS. Figure 11 shows a screenshot of an employee's daily attendance. If you want to see if there is any daily recorded history of attendance, put in
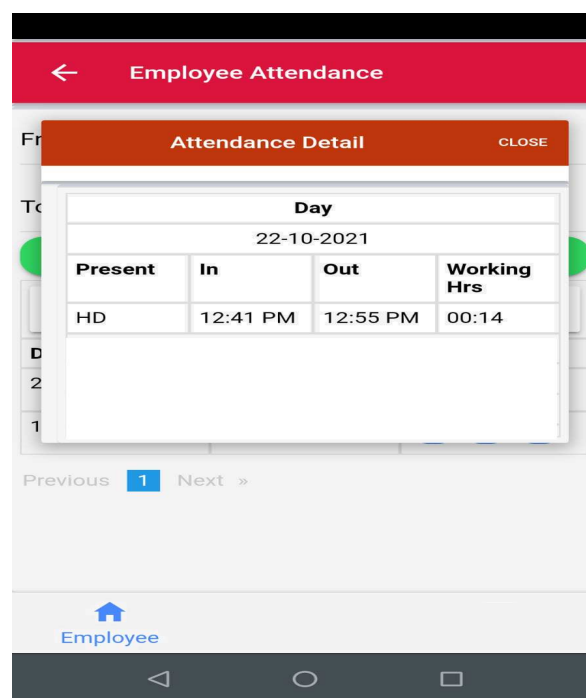

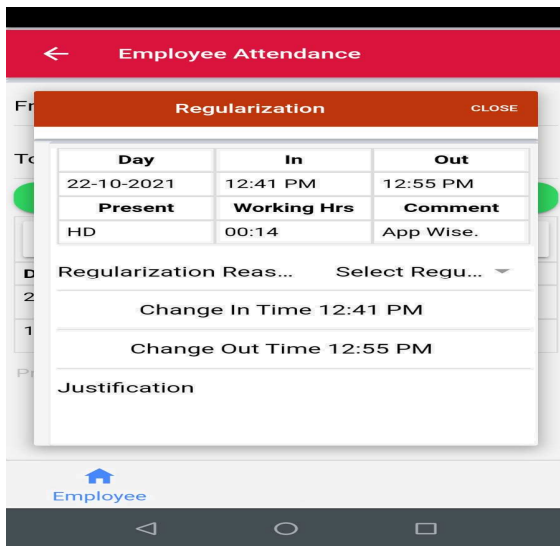Fig (13): Screenshot of Employee Attendance detail Action

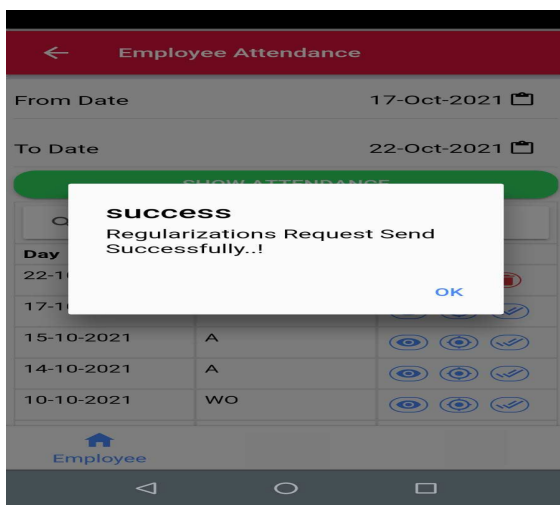Fig (14): Screenshot of Employee Regularization Action

Fig (15): Screenshot of Employee Regularization request send

Figure 14 shows a screenshot of Employee Regularization Action if an employee is facing some issue in between that time for punching attendance while changing their location. Just select Regularization and put in what kind of issue you are facing, like network issues or any other thing, and save it. In Figure 15, a screenshot of the employee regularization request was sent successfully. It will take into consideration why employee out time shows very early because of employee justification.

IX. CONCLUSION

In this project, we used geo-fenced technology and designed a software system for the industry's employees. They can use it anywhere if they are working outside of the industry. They will easily mark their attendance from any client location, and they can use it globally. It depends on the industry admin what kind of work the employee was assigned. We succeeded in building a geo-fenced mobile app-based attendance system.

X. FUTURE WORK

This project has numerous advantages, and in the future, we can expand it to include a wide range of features, like shift management for employees, leave management in the mobile app, and we can integrate it with mobile sensors[10], so we can not only use it for company employees, we can use it for institution employees as well.

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