

A Real-Time Attendance Capturing System Using 2-Step Authentication

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Abstract— The paper proposes a real-time attendance capturing system that uses a two-step authentication process and is based on the user's location using GPS. The proposed system is implemented as an Android mobile application that communicates with the real-time location of the user and allows the user to mark attendance using the in-built camera of the smartphone. Once the attendance is marked, the application updates the database with the time stamp of the provisional attendance to keep a record of the time difference between provisional and final attendance. The proposed system does not require any auxiliary equipment except for a smartphone, which reduces the computation time and cost of placing redundant equipment. The two-step authentication process involves both location-based service and facial recognition to avoid proxy attendances.

Keywords— Smart Attendance Capturing, Location-based service, GPS.

I. INTRODUCTION

Attendance monitoring and calculation of working hours are indeed essential for almost any institution or association. Generally, there are two types of attendance systems available: i) Manual and ii) Automatic. A traditional system uses paper or books to take attendance, which workers fill out and directors oversee for faults. This system could be incorrect because the manual calculation of working hours is tedious and takes lots of time. It takes a redundant hand to verify the attendance and time of other workers, which also includes expenses of the association as well.

On the other hand, automated attendance systems involve the use of electronic marks, barcodes, stripe cards, and biometrics such as Hand impression, iris detection, and facial detection defenses in place of paper waste. In this way, workers tap or swipe to provide identification, and there in and out times are used to calculate working hours. The information transmitted is recorded and automatically transferred to a computer for processing. Using an automated system for time and attendance tracking system can reduce errors caused by the self-created system. It conserves the optimal amount of time, but these automatic systems do not entirely solve the issue and pose a certain problem for the employee.

In our work, considering the widespread popularity of smartphones, we introduce the use of a time and location-based attendance-capture process. We've provided an intelligent location-based presence shadow system based on

the concept of applying Global Positioning System controls in an Android mobile application.

The suggested application communicates with the real-time location of the user and with the help of an in-built camera of the smartphone, the user can mark his attendance. Once the attendance is marked, the application will update the database with the time stamp of this provisional attendance to keep a record of the time difference between provisional and final attendance. Internet connection(Wi-Fi/4G) is required to connect to the databases present in the organization.

Our proposed intelligent system does not require any kind of auxiliary equipment except a smartphone, which will reduce the computation time and the cost of placing redundant equipment. Anyone who crosses the border of the area with a smartphone in hand, ongoing operations will automatically detect the presence after logging into the application using the facial recognition method.

II. RELATED WORK

This section reviews some related techniques and previous work on similar location-based applications. Several affiliated works exist on using different methodologies and principles to capture employee attendance effectively. Attendance capturing systems have been used in various fields, including education, healthcare, and workplaces. Two-factor authentication (2FA) or multi-factor authentication (MFA) has been widely used in such systems to ensure the security of attendance data. In the context of education, there have been studies on using 2FA for attendance capturing in various ways, such as using a combination of QR codes and biometrics, or RFID cards and facial recognition.

An embedded computer-grounded lecture attendance operation system was proposed by (Shoewu, O. O. M. Olaniyi, and Lawson et al, 2011).[1] The system provides active electronic cards and card readers connected in series to a digital computer system.

An attendance marking system using android and biometrics has been proposed by (Mr. Gautam Shanbhag, Mr. Hussain Jivani, and Mr. Sushil Shahi, 2014). The system integrates a biometric scanner on the android mobile device which directly communicates with the database and authenticates the user's attendance. A similar work has been proposed by (Mohammad Salah Uddin, Member, IACSIT, S.M. Allayear, N. C. Das, and F. A. Talukder, 2014).[3] where

the user's location is captured. As soon as he enters the workplace premises user is required to connect to the official internet service that sends the employee id and the time stamp to the server. This proposed system is somewhat similar to ours except that it is only relying upon the location-based mechanism which can lead to proxy attendance and more ambiguity can occur.

Another similar idea has been presented by (Akshay A. Kumbhar, Kunal S. Wanjarai, Darshit H. Trivedi, Anay U. Khairatkar and Deepak Sharma, 2014). [4] where attendance is captured based on location using an android application. The only drawback these systems possess is that they fail to provide double authentication to avoid proxy attendances which is the major problem in systems like these as they only consider only location as proof to mark the attendance which can lead to various misuses by the employees.

(Bharath N Parashar, Alex Abraham Mathews, Ashwin SA, 2021) [5]. has proposed a system for capturing attendance that uses face recognition and body temperature as proof of attendance. This system was proposed keeping in view the covid situation. It involves no physical contact between the teacher and the student. It also solves the problem of the plethora of time consumed in the manual attendance process.

(Alaa Albahrani et al, 2022) [6] mentioned in their work a system made to capture students' attendance using face recognition and location as a tool. It captures students' attendance using face recognition and stores it using a classroom location identifier. The whole proposed system was made using deep learning and its future scope is to use cloud technology to add more security to the system.

(Shubhobrata Bhattacharya, Gowtham Sandeep Nainala, Prosenjit Das, and Aurobinda Routray, 2018) [7]. has also addressed the problem of time-consuming attendance-taking systems. They have proposed a system that uses face recognition using machine learning and deep learning.

Hence, The proposed system for capturing attendance in the research paper is a smart location-based attendance capture system that uses facial recognition and double authentication to reduce the occurrence of proxy attendance. Unlike previous systems that rely solely on location-based mechanisms, the proposed system uses facial recognition as a more secure and reliable method of attendance verification. Additionally, the system requires double authentication, first through the mobile application and second through the installed system at the workplace, to further reduce the possibility of proxy attendance. Overall, the proposed system provides a more secure and efficient approach to employee attendance management.

Also, to avoid any misuse and to reduce cases of proxy attendance, the user is required to mark attendance twice, once through the application and second through the system installed at the association in case of odd scenarios. The first provisional attendance will be considered valid only if the user succeeds in marking the final attendance within a limited range of time his final attendance is considered valid and his attendance is marked.

III. SYSTEM OVERVIEW

The proposed system offers a solution to the day-to-day odd scenarios that employees face which results in missing attendance by a slight time difference such as being stuck in

traffic at the entry gate or time consumed in finding the parking lot. This system is an intelligent location-based attendance registration system based on the concept of web services, implemented as an Android mobile application. Employees must install the appropriate APK file developed for them on their Android devices. Initially, it is important to allow the app to capture real-time location to determine if the user is within a specified range. The employee has to log in and authenticate with the help of an in-built camera of the smartphone with a Facial recognition mechanism.

At the same time, the app captures your time stamp and stores it in the database. Now, for the final attendance, the local time of the employee is considered to validate and check whether the time difference lies within the specified range or not. If the time difference is valid, the final attendance is accepted or rejected if there is a slight delay. This functionality is added specifically to avoid proxy attendance.

IV. SYSTEM DESIGN

This system features four essential hardware and software components that work to provide accurate location data. A smartphone's in-built GPS receiver can access satellite radio signals, which allows it to track the user's current physical location. Google Maps is used here to find places of significance based on your GPS readings. This information is then passed to time and attendance software for further processing. After verifying the data, the software stores the information in a database.

A. Software Architecture-

The software architecture consists of databases, the application, and the geo-fencing APIs.

1) Database

Firebase provides a real-time Database. It is a cloud-based platform that enables easy storage of data, as well as provides an entirely serverless infrastructure. Cloud Functions let instantly deploy code to fire up response times for the application.

2) Application Program

The mobile application is written in Kotlin programming language using the Android Studio Platform. XML is used to design a user-friendly GUI for the users.

3) GeoFencing API

GeoFencing is responsible for combining the user's current location with the proximity of the location of interest. It takes the latitude, and longitude of the place as input to mark up the radius of the specified place.

4) Hardware Requirements

The basic and only requirement to run this application is to have an Android device with which the employees can mark their presence.

V. METHODOLOGY

User authentication is the first and most important step in the process. Each user is validated using

UserID and Passwords. User authentication is an extremely important step in the process as it helps in preventing any unauthorized log into the system. Users can log in with their Email ID and choose passwords at their convenience.

The second step of the process is enabling the device's location to let GPS capture the live location and decide whether the user has reached within the specified radius or not.

The third step involves the marking of the first provisional attendance with the help of face recognition using the device's web camera. There will be a default flag set to False in the system. As soon as the user logs in to the system and marks his/her attendance only upon entering in the desired radius of the region as set using Geofencing, the default flag is set to True. The work doesn't end here, to mark confirmed attendance, final authentication is used to avoid any chance of false attendance. The organization will set a specified time range to let the user mark his attendance by the biometric system installed at the center of the geofencing range.

Once the user marked his second and final attendance inside the office, the second default flag turns to True. Only if final attendance is marked within the given time range and both the flag values true, the attendance is finally marked.

VI. RESULT

The proposed system in the paper "A REAL-TIME ATTENDANCE CAPTURING SYSTEM USING 2-STEP AUTHENTICATION" is an intelligent attendance capturing system which is a location-based service enforced on Android smartphones where the position of the employees can be identified by the GPS. With the help of its location, the user can mark their attendance once they are within the prescribed range from the office premises. The system does not require any kind of auxiliary equipment except a smartphone, which will reduce the computation time and the cost of placing redundant equipment. The system uses two-step authentication, which includes facial recognition and internet connection (Wi-Fi/4G) to connect to the databases present in the organization. The attendance data is then recorded and automatically transferred to a computer for processing.

VII. FLOWCHART

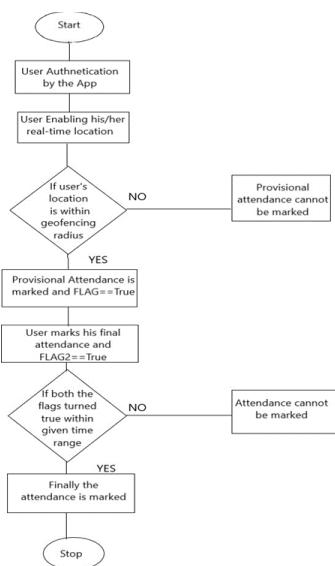


Fig. 1.

VIII. CONCLUSION

The proposed system in the article "A REAL- TIME ATTENDANCE CAPTURING SYSTEM USING 2-STEP AUTHENTICATION" is a location-based attendance

capturing system that is enforced on Android smartphones. It uses the Global Positioning System (GPS) to identify the position of the employees and allows them to mark their attendance once they are within the prescribed range from the office premises. The system does not require any auxiliary equipment other than a smartphone, and it utilizes a two-step authentication process which includes facial recognition and an internet connection (Wi-Fi/4G) to connect to the databases present in the organization. The attendance data is updated in real-time, and the system keeps a record of the time difference between provisional and final attendance.

IX. FUTURE SCOPE

This system has a few more factors to improvise upon to make it more accurate and successful. The most important factor to work on is scalability. The system requires to get more scalable so that it can be used to record not only employee attendance but also student attendance. More scalability can lead to deployment at other big firms and organizations. More functionality can be added to the User Interface to improve the user experience on the application. Further, this mobile application can be extended to the web application as per convenience.

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