

A Comprehensive Review on Geolocation Based Attendance Monitoring Systems in Various Industries

Abhendra Pratap Singh¹, Dushyant Kumar^{2*}, Bhumika Sharma², Jagriti Sharma², Abhishek Kumar², Keshav², Diya Gupta²

¹. Assistant Professor, Department of Mechanical Engineering, HMR Institute of Technology and Management, New Delhi, India

². Department of Computer Science & Engineering, HMR Institute of Technology and Management, New Delhi, India
*dushyant8811@gmail.com

* Corresponding author

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ABSTRACT

This review based study unites the various research efforts conducted for the automatic attendance procedure, which helps in decreasing illegal activities and simplifying data handling, etc. For proper work management, correct attendance tracking is important. However, many current methods still depend on old methods like paper records and manual inputs, which may not be suitable or secure enough. Proper geographically based verification is confirmed by this geolocation mechanism. On the other hand, accurate, touchless identification is made possible by using biometric technology. When we combine these technologies, the rate at which errors are made manually decreases to some great extent, along with reducing the chances of substitute attendance. This way, the companies and the institutions are available with a better choice. Along with these features, the system can unfortunately be prone to some unwanted disadvantages, like privacy and data security issues. This paper highlights the transformative potential of these technologies while emphasizing the importance of secure and ethical implementation.

Keywords: Workforce Management, Automated attendance monitoring.

1. INTRODUCTION

Traditional attendance tracking methods, such as registers and RFID cards, are inefficient and susceptible to fraud. With remote work and flexible shifts, a mobile-based attendance tracking software application using Google's geofencing and location API offers a contactless, fraud-resistant, and real-time solution [1]. Accurate attendance is vital for organizational efficiency, resource management, and productivity. Conventional attendance tracking methods often fall short for remote employees across various industries, including sales representatives, service technicians, consultants, delivery personnel, and field researchers, among others, who travel to multiple locations during their work shifts. This paper presents an attendance tracking system for modern remote work scenarios. It utilizes the Google Maps API to address the challenges faced by employees in various industries who travel to multiple locations. The system ensures accurate and precise attendance tracking for organizational efficiency and productivity [2].



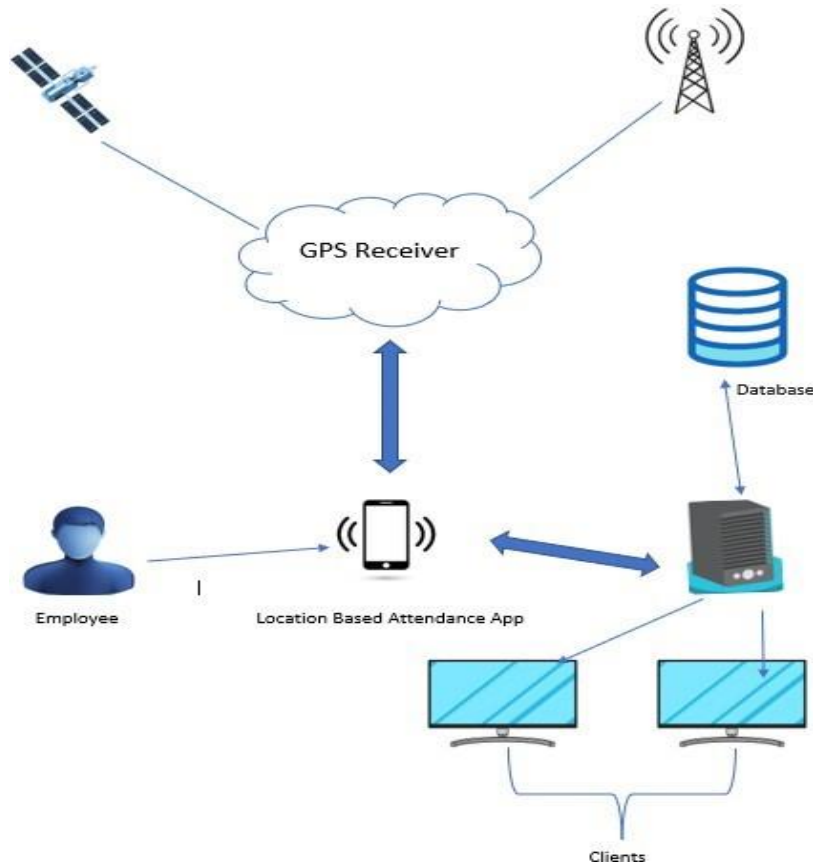


Fig.1 Data Flow Diagram (DFD)

1.1 PROBLEM STATEMENT

This review paper aims to analyze different technologies and provide insights into the working of geolocation based attendance systems in various industries.

2. LITERATURE REVIEW

Khan et al.[3] researched that Wi-Fi positioning estimates a device's location by using the signal strength of neighboring Wi-Fi networks. This approach works better indoors, where GPS signals may be spotty or non-existent. Wi-Fi positioning can track employees or students inside buildings to make sure they are in the room where attendance is recorded. Since many institutions and organizations already have a network infrastructure in place, it is an affordable option.

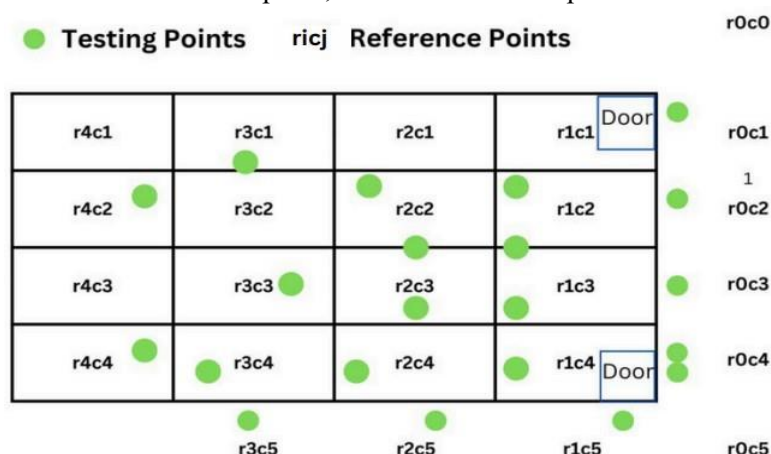


Fig.2 A Grid based Classroom. Here, ric_j are reference points at i – th row and j th The column and green points are test points.

Simas et al.[4] suggested that cell tower triangulation is a method used to determine a mobile device's location in areas with limited GPS signals. It is often used in areas with inconsistent Wi-Fi or GPS signals. Bluetooth Low Energy beacons are used for precise attendance tracking in indoor settings like businesses, schools, and hospitals. These beacons send signals that can be received by devices, making them ideal for continuous use in various settings. Kumari et al.[5] said Near Field Communication (NFC) is a short-range wireless communication technology that can be used in attendance monitoring systems. NFC allows devices to communicate at a few centimetres, making it suitable for use in contactless payment systems and attendance tracking. Geolocation based attendance tracking systems improve accuracy and efficiency in various sectors, including education. In schools and universities, QR code scanning systems can minimize fraudulent entries and ensure smooth academic progress. In online and distance learning environments, geolocation-based systems can verify students' location and ensure authorized areas. In businesses, GeoWorkTrack technology can manage staff attendance using GPS, generating attendance percentages, recording check-in and check-out times, and automatically checking attendance using geofencing technology. Mane et al.[6] studied that Geolocation based solutions are crucial in industries like construction, field services, and healthcare to ensure workers are available.. These solutions enhance resource utilization, safety, and accountability. In retail and hospitality, geolocation-based attendance systems improve customer service, ensure the right number of workers, and accelerate payroll processes. These systems also increase accuracy, accountability, and efficiency.

Nallusamy et al.[7] investigated that real time tracking allows organisations to monitor people's location, enhancing security and ensuring punctual attendance. GPS technology and geofencing facilitate immediate attendance verification, reducing the need for extra inputs. Techniques like biometrics provide safer user recognition. This simple system makes working easier for users and updates them on status and changes. Gite et al.[8] researched that a software program uses GPS locations to track student attendance in schools. Each student is given a GPS tool that sends their location to a central server. The server records attendance status, indicating presence when inside the school and absence when outside. This system requires no manual input and can create alerts based on trends. Geofencing techniques create virtual boundaries around areas, automatically logging occurrences once a person crosses them. This technology can be customized for specific industries. Bailke et al.[9] suggested that this research describes a mobile attendance system that was created with Flutter and Appwrite and includes the three crucial components of location, teacher certification, and fingerprint authentication. The solution uses GPS location to ensure precise attendance tracking, instructor verification to ensure authorized access, and biometric fingerprint authentication to stop fraudulent attendance. Our analysis shows increased security and accuracy, providing a dependable answer for attendance control in educational institutions. This study intends to help both students and educational institutions by advancing the field of attendance tracking systems. Ray et al.[10] studied that the paper introduces an advanced face recognition-based attendance system that integrates machine learning, computer vision, and geospatial APIs to improve traditional methods. The system automates attendees' identification and logging, with features like live video recognition, user registration, CSV-based logging, and geolocation-aware tracking. This technology is particularly useful for distributed teams or multi-location setups.

Babatunde et al.[11] investigated the study that presents a student attendance management system for schools and colleges that combines Geo Fencing, Firebase, Geofire, and Face Recognition functionality. The system acquires live student locations and a geo-fence of the class area, performs face recognition for pre registered students, and automatically takes attendance when a student spends over 90% of the time within the set geo-fence. The system was developed using Android Studio Integrated Development

Environment (IDE) and a questionnaire was designed to evaluate its functionality. The results showed that the attendance system improved the identification, verification, and accuracy of student attendance.

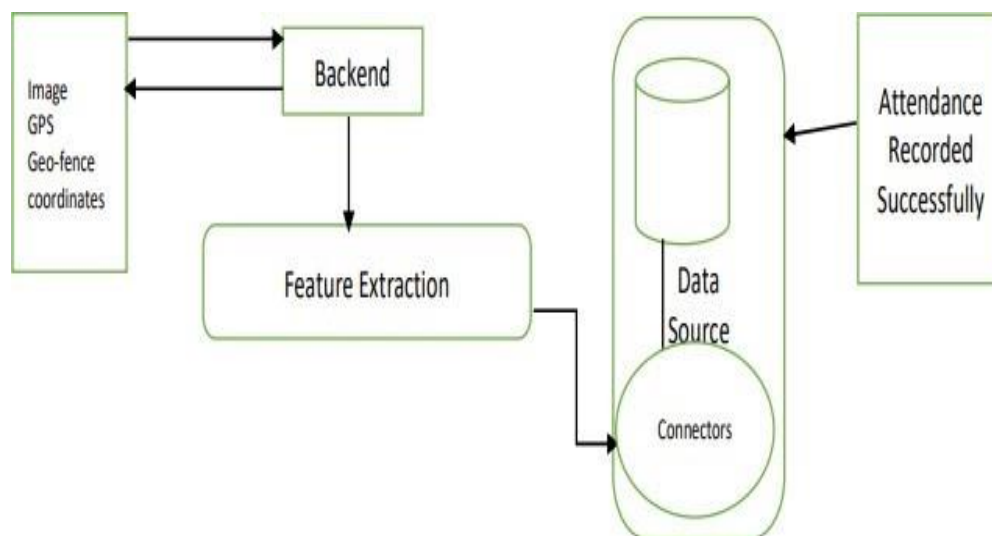


Fig.3 Proposed System Architecture Diagram

3. CONCLUSION

In conclusion, the evolution of attendance tracking systems has been significantly driven by advancements in technologies such as Wi-Fi positioning, GPS, geofencing, NFC, BLE beacons, biometrics, and AI-based solutions. These technologies offer enhanced accuracy, efficiency, and automation, catering to diverse environments ranging from educational institutions to healthcare and field-based industries. Mobile platforms, cloud integration, and machine learning further contribute to creating smart, secure, and user-friendly systems that minimize manual intervention and reduce fraudulent activities. However, as these systems grow more intelligent and interconnected, challenges related to data security and user privacy become increasingly critical. While the current solutions are effective and reduce human effort substantially, the future of attendance monitoring lies in striking a careful balance between technological innovation and ethical data handling. With proper safeguards, these advanced systems can redefine attendance management by making it seamless, reliable, and secure across a wide range of applications.

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