
**MOBILE BASED STUDENT ATTENDANCE SYSTEM USING
GEO-FENCING**

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ABSTRACT

Developing an effective attendance management system has always been a difficult issue for any company, ranging from schools to universities. Smartphones have been used for attendance with technologies such as face recognition, fingerprint-based attendance, and other types. The attendance management system (AMS) and its problems are discussed in this study. The study presents a student attendance system for schools and colleges combining Geo Fencing using the geofencing API from Google Play services and Google location services dependencies along with Firebase. This is performed by acquiring live location of students and a geo-fence of the class area, taken when a student has spent over 90% of the time within the set geo-fence (Classroom). This system was developed using Android Studio Integrated Development Environment (IDE) which is being used for the development of native android applications. A questionnaire was however designed and results gotten to further explain how well the functionalities work. The responses derived were subjected to statistical examination using SPSS. Discoveries showed that attendance system was able to improve identification, verification and accuracy of student attendance.

KEYWORDS: Attendance, Geo-fence, Global Position System, Database.

INTRODUCTION

Attendance plays a pivotal role in determining the academic performance of children and youth in schools and colleges. The regularity of attendance shows that the students are less likely to engage in delinquent or destructive behaviour. Attendance is a state of being present at a place, especially an institution. Attendance is very important in an institution as it

represents how punctual a student is. Manual maintenance of attendance is inefficient due to attendance by proxies or impersonations. Class attendance has a significant effect on academic scores. Therefore, most institutions of learning require students to have a certain percentage of attendance to be eligible for examination [1]. This is due to the belief that an above-average attendance will enhance student academic performance. Before the advent of computers and mobile devices, the most common method of taking attendance in classrooms in our Institutions employs the use of pen and paper. The attendance system usually involves calling out the names of students in a classroom or by passing an attendance sheet around the class where each student is expected to sign the sheet to confirm their physical presence. Also, the likelihood of having incorrect attendance records, altered data, attendance fraud etc. is very high with this attendance monitoring system. To resolve this problem of attendance, many mobile based attendance management systems have been proposed and introduced in recent years, though approaches to solving this problem could be classified into RFID/NFC-based and visual-based methods.[2] Smartphones have been used for student attendance with technologies such as face recognition, fingerprint-based attendance, Bluetooth based attendance, geo-fence-based attendance and so on. The use of smartphones as an attendance and monitoring device is prone to fraud by students such as attendance records not at the specified location, recording of attendance by others, or student who leave the campus after recording its presence. The combination of fingerprint, Secure user ID, and GPS location as authentication factors can be used to secure and improve the process of recording attendance. However, the electronic attendance management system with example in all available biometric system (such as the eye, face, finger etc.) being introduced and used. [3]

In order to solve these problems, the various mobile attendance systems proposed are also unable to fundamentally solve problems such as interim and proxy attendance because they check attendance using only the application of a smartphone. This paper focuses on the use geofencing technology, which is a positioning-based technology that detects the entry and exit of people, objects, etc. in areas separated by virtual boundaries. The proposed system solves the problem of intermediate attendance and alternate attendance by setting the student to automatically record the access record when entering and leaving the classroom set as a geofence with a smartphone. Geofencing is a sophisticated time management system with geofencing capability that helps track student attendance in real-time. It enables organizations to record the attendance of staffs and institutions to manage the attendance of students from any location. The use of Geofencing in the system is intended to provide a location boundary where student can make presence for their validation to minimize the occurrence of fraud in

absenteeism. In the proposed system, every student is required to have a student ID, login password and register a existing mobile application. [4]

LITERATURE REVIEW:

A number of related works exist on the application of different methods and principles to effectively monitor the attendance of students. The issue of poor class attendance rate in higher institutions of learning has been and is still a major concern for educators and educational researchers all over the world. In recent years, several researchers have dedicated a lot of their effort to the development of attendance monitoring systems, this has made possible the availability of several attendance monitoring systems based on current technologies lately. There were many studies aiming at building automated attendance tracking systems, and many of them have been implemented in the real-world environment successfully. Normally, approaches solving this problem could be classified into RFID/NFC-based and visual-based methods.[5] RFID technology was widely used in many scenes in our daily life from apartment security tags to payment card etc. Students using RFID/NFC-based systems would be equipped with a RFID tag containing unique registration code, or directly write the code into their cell phones using NFC technology. By hovering tags or cell phones upon the RFID reader placed in every classroom, students' appearance in a class would be recorded instantly. They have utilized RFID readers connected to the Internet and attendance records would be transmitted to a backend server.[6]

Other hand employed NFC modules inside modern cell phones integrated with secret code for authentication whereas provided a web-based platform collecting and analysing records in real time, along with SMS and email notification functionalities, which was distributed into real environment and indicated its efficiency.[7] However, using RFID technologies involves installations of specific readers in the classroom leading to expenses on hardware and engineering works. Besides, these methods also have less or no considerations for student with multiple RFID cards or card losing situations, which cannot accurately authorize student's identity. Summarily, the major drawback of most RFID system is not being able to ascertain whether the user detected is the owner of the actual card. Nowadays, the use of smartphones both Android and IOS is growing rapidly.[8] At least, almost every University student talk less of working-class people can afford to use a smartphone to communicate. Based on that, the use of an application on a smartphone can be a solution to help the attendance process in the school and at work, hence, the Visual-based systems can come into play. This system is being believed to possess mechanisms to help minimize student fraud in case of absences.

Instead of using single camera, implemented a system using three Kinects to track students' appearance, providing much higher accuracy in real environment test. However, face recognition algorithms are far from perfect at present and engineers have to deal with the so many issues. Bad light conditions, different facing angles and poses by the students might cause serious decrease in accuracy of the result. In real world applications, such inaccuracy means even more manual work than to check and correct the records and developed smart location-based time and attendance monitoring system.[9] This is implemented on a smart-phone with Android as its operating system. Any organization has a specific location that can be determined via GPS service of the phone. This application is made specifically for corporate organizations without many privileges given to the user. It is based on GPS location services only and is therefore not very accurate. An attendance system using video and face recognition. The system used a camera placed in various classrooms in order to detect student's presence in class automatically. This system simplified the attendance process but it required a high cost to operate. If it is used in a company which has various locations, the companies must provide a large number of cameras and thus very expensive to acquire and maintain. Face recognition is difficult with this approach as the Eigen vector used in work has an accuracy of between 60-70%. However, the Haar features which yields a better result other than the Eigen vector can be used to improve on the accuracy solution.[10]

The research explained how real-time face detection and recognition can be used to track student's attendance. The work presented an automated attendance device that consists of a camera mounted in the classroom to capture photographs, accompanied by multiple face detections. Students' Face Database Development, HOG features, Face Detection and Eye Detection, SVM Classifier, Comparison/Recognition, and Attendance Marking are just a few of the steps in this method. To achieve the desired results, Viola-Jones and HOG functionality as well as an SVM classifier were used. Presented a simple user-friendly mobile application called "Automated Mobile Attendance System" (AMAS). AMAS is interfaced with a website in the backend for data entry and report generation. The application is able to track students using GPS and Bluetooth beacons to confirm and verify their presence in classrooms. The application maintains a record of the absentees that is synchronized with tables in a remote database server regularly. This application reduces the time required to take attendance, prevents the loss of data as well as provisions to edit incorrect responses. They conducted a review of several modern methods to select the most suitable open framework for individual tasks; this led to this proposed design which is flexible and allowed applicability to largescale set of students without compromising predictive accuracy. and initial numerical results shows

the effectiveness in both aspects of the accuracy and performance of the prototype. The result of this method showed a 92% efficiency compared to traditional methods; it also showed some drawbacks that can be easily addressed by improving the environment and using artificial intelligence techniques. A biometric (face) recognition system which uses with it a QR code on Android phones for attendance management. The QR code was used so that students could be present in available classes, the code which is made up of the course information was placed in each available class and displayed on a raspberry pi screen. However, after a thorough and critical review of the literature, it is clear that a timing Geofence application for attendance monitoring which can provide a major solution to this menace of attendance monitoring has not been developed, hence the need for the development of the proposed system. The proposed system as earlier discussed will use a technique (a geofence algorithm) such that student fraud during absence and leaving of lecture rooms after taking attendance is drastically minimized. [11]

A Comparison was made with a previous research study in terms of their evaluation, techniques, tools, advantages, disadvantages, terminology, and main contributions based on these metrics.

AUTHORS	MODEL\TECHNIQUE	TYPE	WORKING PRINCIPLE	ADVANTAGES	LIMITATIONS
Mrs. Keerthana M M, Mohammed Arshad, Mohammed Umar,	Fingerprint Recognition (ANN, SVM)	Biometric	Extracts ridge and minutiae points → matches with enrolled template	Highly accurate, unique for each user	Needs physical touch, hygiene issue
Yasmeen Taj, Zayed Kifaiyatullah					
Minghan Li	Face Recognition (CNN, OpenCV, DeepFace, Face	AI / ML (Deep Learning)	Captures face image → extracts features using CNN	Touchless, fast, accurate, integrates with E: FCCTV	Affected by lighting, occlusion, and similar faces

	Net)		→ matches with stored database		
Sumit Tiwari	QR Code / Barcode Scanner	Image Processing	Generates unique code per user → Scanned to log attendance	Cost-effective, easy to implement	Manual scanning required
Vanshika Kalra ¹ , Yashika Hooda ² , Ashish Choudhary ³ , Ekta Soni ⁴	Geo-Fencing (GPS-based)	Location-based	Logs attendance when user is within a defined GPS boundary	Good for remote/work-from-home tracking	GPS drift and spoofing possible
Mahesh K. Singh ^{1*} , Kishore ² , R. Anil Kumar	Voice Recognition (MFCC + ML Models)	Biometric / Audio	Analyses voice patterns for authentication	Hands-free, non-intrusive	Noisy environment affects accuracy
Zulqarnain Khokhar ¹ , Murtaza Ahmed Siddiqi	Wi Fi Based	Location based	Wi- Fi Signal Strength	High Accuracy, Low Cost	Limited Coverage
Dr. B Kursheed, Dr.Wahida Banu, Mr.Ashfaq Ahmed, Mrs R Yashodara	Hybrid	Location based	Combination of GPS, Cell Id, and Wi-Fi	High Accuracy, Robust Performance	Complex Implementations
Aushikar, Ashwini	GPS Based	Location based	Geo Fencing Using GPS Coordinates	High Accuracy, Wide coverage	Signal Loss in Indoor Areas
Mothabhau, Prof. N. S. Khairnar					

Logaraja. M, Dr. J. Vijayakumar, Thavamani S	Ultra Sonic Based	Location based	High Frequency Sound Waves	High Accuracy, Low Cost	Limited Range
Duckki Lee	Bluetooth Based	Connectivity	Bluetooth Signal Strength	Low Power Consumption, Easy Implementation	Limited Range
C. Nallusamy, R.S. Gowri & S. Hari Priya	GPS - INS Based	Navigation	GPS and Inertial Navigation System	High Accuracy, Robust Performance	Complex Implementations
Bawar Ali Abdalkarim and Devrim Akgün	Wi Max based	Wireless Broadband	Wireless Broadband Technology	High Speed, Low Latency	Complex Implementations
Bharath Parashar, Alex Abraham Mathews, Ashwin SA	NLTE Based	Wireless Broadband	Long Term Evaluation Technology	High Speed, Low Latency	Complex Implementations
Mr. Sasi Kumar AN, Vasanth S, Surendar G, Vishnu J	Cloud Based	Data Storage	Cloud computing and Storage	Scalable, Flexible	Dependent on Internet Connectivity

METHODOLOGY

In this section, a detailed description of the design and development of the automated mobile based student attendance system will be discussed, location-based monitoring system using geo-fencing. The approach suggested in this research is to use a geofence technology to monitor presence of the student for attendance using real time presence within the set perimeter for as much as 90% of the total period of time the Lecturer stays in the class.

The application identified landmarks which is already linked to the student database. Attendance will thus be recorded if the GPS coordinate of the student lies within the geofence for up to 90% of the time for the lecture of a particular course. The use of Geofencing in the system is intended to provide a location boundary where student can make presence for their

period of stay within the Geofence of student to minimize the occurrence of fraud when students are absent. [12]

Geofencing is a technology used for time management and attendance tracking of students. It allows organizations to monitor and record student attendance from any location. Geofencing is like a virtual boundary around a physical location. It can be set up using software or hardware. Our proposed application will use geofencing to create a virtual boundary around each lecture room.[13]

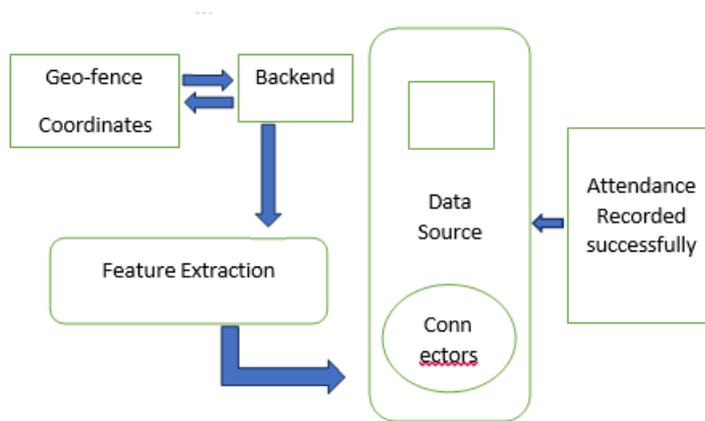


Fig 1: Proposed System Architecture Diagram.

MODULE DESCRIPTION:

Geofencing: Geofences are virtual perimeters or boundaries around actual geographic areas implemented with the help of software or hardware. The proposed application would implement geofencing as virtual boundaries around each lecture room that the lecturer would use and subsequently activate the lecture hall per lecture for a course and thereafter all registered students can mark attendance.[14] The geofencing API uses the Google Play services and Google location services dependencies along with Firebase and Geofire dependencies. The location service uses the Geofire service of Google Firebase, a no-SQL real-time database to store the current location of the student which gets updated every time a new location is requested. [15]

RESULT:

Radius	Teacher co -ordinates	Student co - ordinates	Inside	Outside	At boundary
5m	26.954799, 80.99282	26.9548166,80.996267	2.42m	—	—
5m	26.954799, 80.99282	26.954842,80.9963741	—	10.3m	—
5m	26.954799, 80.99282	26.954834,80.9962932	—	—	5m
10m	26.954799, 80.99282	26.9548034,80.9962801	1m	—	—
10m	26.954799, 80.99282	26.9548252,80.9964112	—	14m	—
10m	26.954799, 80.99282	26.9548321,80.9963626	—	—	10m
15m	26.954799, 80.99282	26.95482,80.9963741	11m	—	—
15m	26.954799, 80.99282	26.956396,80.9963962	—	244m	—
15m	26.954799, 80.99282	26.9548507,80.9964069	—	—	15m

DISCRPTION

For ensuring the working of our application we assumed different radius boundaries. First chose a 5m radius boundary and evaluated the results for inside the fence and on the boundary of the fence, we found a well accurate results of our evaluation. Similarly for cross checking the working of the application we evaluated the results on 10m and 15m boundary and we found a great result, our application was working perfectly. For all the different values.

CONCLUSION:

The main motive behind this GPS based attendance system application is to reduce time to take attendance in a traditional way. It reduced the extra efforts required for maintaining the records and to examine the minimum eligibility criteria to appear in exams. It would be very

effective in organizations and institutes. This application is very useful for lecturers to take attendance and increase their teaching timing.

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