

CONTACTLESS ATTENDANCE USING GEOFENCING AND FACIAL RECOGNITION

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Technology Degree in
Information Technology
by

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**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of who carried **DEEBIKA S (37120019)** and **AKSHAYA V (37120007)** out the project entitled **CONTACTLESS ATTENDANCE USING GEOFENCING AND FACIAL RECOGNITION** under my supervision from November 2020 to April 2021.

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ABSTRACT

Attendance systems were developed before the mobile device has been introduced to the market. The traditional system and web-based system are accepted method to keep track of the faculty. Some companies introduce a secure and expensive system such as RFID and Fingerprint technology. With the emergence of the GPS enabled device in smart phone, there is a need to introduce a smart phone as a medium to clock in and clock out for faculty attendance. This project will discuss the geo-fence technique and its implementation for contactless attendance using android application. The technique is suitable for analysing the location and boundaries of a GPS mobile enabled or faculties inside the institution. From the implementation conducted, the application functions well to keep track of the staff attendance records. In some cases, the biometric devices are not close to their offices or classrooms, so they forget to register their workdays, wrong workday's registrations. With the aim of improving this registration process we have developed GeoMark, a novel mobile application for biometric authentication by face recognition, which allows to convert the user smartphones in biometric devices, connected to the attendance management software, avoiding large crowds especially in the present pandemic. In addition to assess its performance, we have carried out some experiments measuring the features accuracy and workday's registration time. Despite the limited CPU and memory capabilities of today's mobile phones, the obtained results are very promising, shows a high accuracy facial identification and a faster and easy alternative to the workday registration.

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LIST OF ABBREVIATIONS

1. GPS – Global Positioning System
2. CCTV – Closed Circuit Television
3. LBS – Location Based Service
4. IP – Internet Protocol
5. ROI – Return On Investment
6. J2ME – Java 2 Platform Micro Edition
7. CN – Crossing Number
8. GSM – Global System for Mobile Communication
9. LCD – Liquid Crystal Display
10. API – Application Programming Interface
11. SDK – Software Development Kit
12. IDE – Integrated Development Environment
13. ADT – Android Development Tools
14. RFID – Radio Frequency Identification
15. COTS – Commercial Off The Shelf
16. CART – Classification and Regression Tree
17. CHAID – Chi-square Automatic Interaction Detection
- 18. MARS – Multivariate Adaptive Regression Splines**

CHAPTER 1

1. INTRODUCTION

Face detection software is simply a system aided app which identifies or verifies an individual based on either from a picture element or from animation frames. Due to its nature, facial recognition has lately become of great importance. Over the last few years, it is set as popular field of analysis and also unique way of image recognizing techniques. One way of doing this is to analyze a given set of facial features from the face database. Facial biometrics can be potentially integrated into any system anywhere using a modern camera. Governmental organizations across the globe use various biometric software to capture faces using CCTV cameras, in addition to identifying persons of interest in a public ground. Defense agencies use facial recognition to authenticate the identities of travelers. Facial recognition not only deals with hard identities, but can also be used to gather data on public. This is what makes facial biometrics solutions so popular among the retail marketing industry. Being a hands-free biometric solution that can be effortlessly set up in customers devices, face recognition is thus showing the consumers how convenient authentication can be. Geo based software is a software system that takes in data based on location for achieving certain characteristics in an application. LBS is an information service that has several applications in many digital services today as information, such as entertainment or security, which is accessible by any portable devices through the mobile network and which makes use of information such as geographical location of the device. LBS is cautious to many organizations and government agencies to obtain real-time information from a location. The vast relations that location based data and services can provide is an entertainment or security, which is accessible by any portable devices through the mobile network and which makes use of information such as geographical location of the device. LBS is captious to many organizations and government agencies to obtain real-time information from a location.

The vast relations that location based data and services can provide is an impertinent aspect where the location is a determining factor in these conditions as well as utilized for better understanding the internal commitments in the obtained patterns. Geolocation is one of the most sought-after applications of LBS. It is used to estimate the geographic location of any given object given a street, or a monument or even a device. Geolocation is the creation of a pair of geo points, but its usefulness has been enhanced by this points to generate a legit location, like an area address.

1.1 GEO-FENCING

A geofence is a virtual perimeter for a real-world geographic area. A geo-fence could be dynamically generated as in a radius around a point location, or a geo-fence can be a predefined set of boundaries such as school or a specific institution zones or neighborhood boundaries. This process is called geofencing, and one example of usage involves a location-aware device of a location-based service (LBS) user entering or exiting a geo-fence. This activity could trigger an alert to the device's user as well as messaging to the geo-fence operator. This information, which could contain the location of the device, could be sent to a mobile phone or an email account. There are various applications in which geofencing is used with recent technologies.

1.1.1 APPLICATIONS

Geofencing, used with child location services, can notify parents if a child leaves a designated area. Geofencing used with locationized firearms can restrict those firearms to fire only in locations where their firing is permitted, thereby making them unable to be used elsewhere. Geofencing is critical to telematics. It allows users of the system to draw zones around places of work, customer's sites and secure areas. These geo-fences when crossed by an equipped vehicle or person can trigger a warning to the user or operator via SMS or email. In some companies, geofencing is used by the human resource department to monitor employees working in special locations especially those doing field works. Using a

geofencing tool, an employee is allowed to log his or her attendance using a GPS-enabled device when within a designated perimeter. Other applications include sending an alert if a vehicle is stolen, and notifying rangers when wildlife stray into farmland. Geo-fence can be used for location based messaging for tourist safety and communication. Geofencing, in a security strategy model, provides security to wireless local area networks. This is done by using predefined borders (e.g., an office space with borders established by positioning technology attached to a specially programmed server). The office space becomes an authorized location for designated users and wireless mobile devices. Applications of Geofencing extend to Advertising & Marketing. Geofencing solution providers allow marketers and advertisers to precisely choose the exact geo-location that their ads show up on. Geofencing uses different types of targeting to identify geo-location such as zip codes, street addresses, GPS coordinates using latitude and longitude, as well as IP targeting.

Geofencing enables competitive marketing tactics for advertisers and marketers to grab the attention of in-market shoppers in their competitive store location, large scale events such as concerts, sports events, conferences, etc. in stadiums, convention centers, malls, outlets, parks, neighborhoods. For example: at a concert, a digital ad relating to the performer or an affiliated company could be sent to only those people in the venue. For example, a local auto-dealership builds a virtual boundary within a few square miles from its dealership's location to target car buyers within the same neighborhood. This way they limit their ad spending on prospects who are more likely to purchase in order to get a better ROI. Using tracking technologies to identify devices where the ads were shown, geofencing solution providers are able to provide walk-in attribution for their advertising. This means that using a geofencing solution, companies can now track the customers who walked into the showroom after seeing the ad. This level of attribution provides better visibility and analytics for marketers to spend their advertising budget wisely.

CHAPTER 2

2. LITERATURE SURVEY

2.1 ANDROID BASED AREA WEB MONITORING

The research objective is to develop an application that can be used in the monitoring of an area by using a webcam. It aims to create a sense of security on the user's application because it can monitor an area using mobile phone anywhere. The results obtained in this study is to create an area with a webcam monitoring application that can be accessed anywhere as long as the monitoring results have internet access and can also be accessed through Android Based Mobile Phone. The design of a webcam monitoring using client/server based on 3-tier architecture. It has three important processes that a client computer runs Graphical User Interface logic, server runs business logic and it has database system. The benefit of 3-tier architecture is moving the load to application server then it does not have a problem when a lot of client connected to it because in database side only one connection connected to it.

The architecture can be called as fat server architecture. The webcam monitoring application consists of client side and server side. The client is Android Smartphone, which only receive streaming data from server side. The server is webcam connected to the server and streams its data to the network. Class diagram of the design is shown in figure 2 which depict eleven classes. Most classes such as LoginActivity, Admin, Configuration, Record, Schedule, VideoLibrary, ImageCapture, StreamingActivity, Motion, and ConnectCamera are designed to be implemented as server side. MobileUser class is implemented as client side. Webcam monitoring application can help users to interact with the webcam on the computer by utilizing the Android-based Mobile Phone. It designed to assist and facilitate the user in monitoring the area with a webcam and access it directly to it. This simple application can be used by all Android-based mobile users. Webcam monitoring could make the user who previously not to monitor a certain area.

2.2 SMART DOT LOCATION BASED ATTENDANCE

Smart Dot is a composite application used to maintain the information of the students such as their personal details, attendance details and marks details. This project is mainly focused on location based attendance identifying system. Most of the educational organizations use computer based software for maintaining the student records but the existing system doesn't reduce manual work. The proposed system aims in implementing an android application that helps to maintain student information which can be accessed by the mobile via location identification and calculating distance. The proposed system provides portability and accessibility and is based on J2ME technology. The purpose of this project is to build an application which reduces the manual work for managing the student information using GPS to identify the location and calculate distance to mark attendance automatically.

In modern times everyone has an access to android supported smart phones. This application is portable and can be easily installed on mobile phones supporting android OS. The use of this application can result in the reduction of number of hours spent by teachers on entering attendance for students in PC as it also generates report. It also provides a user-friendly interface and greatly helps in reducing manual errors. In this Project, specialists survey the different modernized framework which is being produced by utilizing distinctive strategies for "Attendance System". In light of this survey, another approach is fabricated for different colleges or academic institutes. Since there are so many drawbacks in the existing system we go for a mobile based android application. In the proposed system, a smart phone based android application using android can be used to make the process more easier, secure and less error prone. Thus reduction of manual and more efficient information system will be achieved through this proposed system. The main advantage of proposed system is that it provides portability and also provides access from anywhere and at any time. Here, both the faculty and the students can make use of this application by installing it in their

mobile phone where student is given the authority only to view their record whereas the faculty has the authority to modify and make changes in the record. The proposed system is a fully automated one using wireless android. The proposed android application introduces portability as it is used on a mobile device and can be carried anywhere.

2.3 ATTENDANCE SYSTEM USING BIOMETRICS AND GPS TRACKER

This project is a study of a fingerprint recognition system based on minutiae based fingerprint algorithms used in various techniques. This line of track mainly involves extraction of minutiae points from the model fingerprint images and fingerprint matching based on the number of minutiae pairings among to fingerprints. This project also provides the design method of fingerprint based student attendance with help of GSM. This system ignores the requirement for stationary materials and personnel for keeping of records. The main objective of this project is to develop an embedded system, which is used for security applications. The biometrics technology is rapidly progressing and offers attractive opportunities. In recent years, biometric authentication has grown in popularity as a means of personal identification in college administration systems. The prominent biometric methods that may be used for authentication include fingerprint, palmprint, and handprint, face recognition, speech recognition, dental and eye biometrics.

In this project, a microcontroller based prototype of attendance system using fingerprint sensor and face recognition module is implemented. The tracking module is used here to identify the location of the missing person. The fingerprints are one of the main forms in biometric field which used to identify the individual and their uniqueness. Fingerprint authentication is one of popular authentication systems in the world. Due to their consistency and uniqueness it is used widely. There are several sources available for the collection and their established use. In the past, magnetic card attendance system was widely used. But, this system has lot of bugs in it. The card may be lost or damaged. This fingerprint attendance system is highly secure and cannot be forged easily. In recent time, there has

been high level of impersonation experienced on a daily basis in both private and public sectors, the ghost worker syndrome which has become a menace across all tiers of government, employers concerns over the levels of employee absence in their workforce and the difficulty in managing student attendance during lecture periods. Fingerprints are a form of biometric identification which is unique and does not change in one's entire lifetime. This project presents the attendance management system using fingerprint technology in a university environment. It consists of two processes namely; enrolment and authentication. During enrolment, the fingerprint of the user is captured and its unique features extracted and stored in a database along with the users identity as a template for the subject.

The unique features called minutiae points were exacted using the CN method which extracts the ridge endings and bifurcations from the skeleton image by examining the local neighborhoods of each ridge pixel using a 3x3 window. During authentication, the fingerprint of the user is captured again and the extracted features compared with the template in the database to determine a match before attendance is made. Attendance management system is one of the most advanced applications in biometric technology. It cannot be forged easily. With the integration and use of biometric technology getting simpler, many institutions are using down the biometric road to verify the time and attendance of their students and staffs. The system also contains a GSM Modem, which can be used to send the attendance information of the students automatically to their parents. The Embedded system using a small LCD user interface can be interfaced with the computer by using serial communication interface.

2.4 STUDENT ATTENDANCE THROUGH MOBILE DEVICES

In this project, an attempt has been made to record attendance through mobile devices. The aim of the project is to create an Android mobile application for attendance system that can be used by all teachers for their respective courses. This application fetches the details of the courses allotted to the

respective faculty and the students enrolled in the courses from the server using the internet connection and stores it in the mobile database. This application stores the attendance in the mobile internal database and the faculty can view and update the attendance whenever required. At the end of the month, when the faculty is needed to upload the attendance, they can directly upload it from their mobile in the server provided the internet connection is available. This application uses Android application development toolkit. Android is a Linux-based operating system developed for smart phones or tablet computers. It is a stack of software that includes operating system, middleware and libraries and APIs written in C. The Android application is developed in Java-like language using the Android software development kit (SDK). The integrated development environment (IDE) which is officially supported for Android apps development and used in this project is Eclipse, which uses the Android Development Tools (ADT) plugin.

In the attendance system through mobile devices, the faculty takes the attendance which is stored in the mobile database. At the time of submission of attendance report the faculty directly uploads the attendance in the server and does not need third person interaction. This project presents the Attendance system through mobile devices, which is developed using Android application. The application is installed in every faculty's mobile phones and can be used to take attendance in offline mode (that is even when there is no network connectivity as the application is a stand-alone application). This application fetches the details of the courses allotted to the respective faculty and the students enrolled in the courses from the server using the internet connection and stores it in the mobile database. This application stores the attendance in the mobile internal database and the faculty can view and update the attendance whenever required. At the end of the month, when the faculty is needed to upload the attendance, they can directly upload it from their mobile in the server provided the internet connection is available.

2.5 ANDROID APPLICATION FOR ATTENDANCE SYSTEM USING QR CODE ANALYSIS AND SPEECH ANALYSIS

In this project, the faculty's work of maintaining the student's academic information is minimized with the help of "ANDROID APPLICATION FOR STUDENT ACTIVITY REGISTER" which is a real time application. This project uses a QR code scanner to scan the student's attendance and update his/her attendance in the database accordingly. The database can then be queried in order to find the students with minimum attendance, the exact dates they did not attend the lectures and these dates will be sent to the students. There will be a warning SMS/mail sent to the students whose chances are there to come in defaulters. Taking attendance in a class is a very time consuming process and also fake attendance can be given by the students. We can provide voice based QR code attendance process for every lecture which will prevent fake attendance from any student. Students will receive a SMS when their attendance is less than the threshold after 15 days, so they can attend lectures and avoid coming in the defaulters. The defaulters list can be directly SMS/email to students and the students whose attendance is good can be sent a mail of appreciation. In our application admin can add student details and faculty details. Student scan the QR code which is generated by the faculty. Faculty can take attendance using QR code. In traditional way, students have to give attendance by calling their roll number every time or sometimes by signing on attendance sheets. There are chances that students can give false attendance for the lectures. Also preparing the defaulters list by calculating the student's attendance is a cumbersome task. So to replace such traditional way of attendance, this is an innovative idea, which focuses on marking attendance through an android application using voice based QR code scanning system. This project uses a voice based QR code scanner system to scan the QR code and update his/her attendance in the database accordingly. The database can then be queried in order to find the students with minimum attendance, the exact dates they did not attend the lectures and these dates will be sent to the students. There will be a warning mail sent to the students whose chances are there to come in defaulters.

CHAPTER 3

3. SCOPE AND OBJECTIVE

3.1 SCOPE

The main scope of this project is that it can be used in various software companies, production industries and many other industries to take the attendance of employees. Presently many of these companies have attendance register or muster which is a traditional and old way of maintaining attendance. It can be used in colleges, various educational institutes as well as university campus for taking the attendance of students. Education institutes have roll-call muster or teachers take attendance and note it down manually on project. We can replace it by our automated attendance system using geo-fencing and facial recognition.

3.2 OBJECTIVE

The main objective is to improve contactless attendance system due to the covid pandemic around the world. Post Covid-19 pandemic, biometric attendance systems like RFID and fingerprint are prohibited. Since they are considered as the transmitting factor of the virus. In order to avoid such critical situations, Geo-fencing metric is brought into action. Contactless attendance to avoid transmission of disease. Biometric authentication of faculties through facial recognition and real time geographic location. Mobile application development with GPS and image processing. Quick improvement of Radiofrequency Identification (RFID) innovation, RFID presently can possibly recognize individuals. RFID-based participation frameworks are in light of living biometrics, which extraordinarily lessens the chance of cheating. Through the examinations of signs from Commercial-Off-The-Shelf (COTS) RFID per users, numerous significant Radio-Frequency (RF) attributes can be extricated, The RSSI trademark, in spite of the fact that broadly embraced because of its simple openness and straightforwardness, experiences coarse highlights and helpless time soundness. This process helps increase more productivity and efficiency of time and work.

CHAPTER 4

4. SYSTEM DESIGN

4.1 PROPOSED SYSTEM

An Android Application development with Global positioning system and image processing for facial recognition. This app will capture the image of the faculty as soon as they enter the college premises and verifies it with the actual image in the database. It also records the in-time and out-time.

4.2 SYSTEM SPECIFICATIONS

Biometric time and attendance system has brought more precise system to measure group or individual's activities and attendance as well. Biometric attendance machine captures your unique biological/physical feature such as your hand or fingerprint, iris pattern, face and sometimes even your voice as a record for identity verification and allows you to perform something that you are authorized to do. In this project, we present Geo-mark, a novel mobile application for the biometric authentication using geo-fencing and face recognition of the users of the attendance management software. This application converts the smartphones in a biometric device that allows to register the workday entries and workday exits from any place inside of the university campus. The user-location is validated by the GPS coordinates using the Android Geofence API and the biometric authentication of the users professors is carried out by face recognition performed by Microsoft Face API features. Furthermore, with the aim of assessing its performance, we have carried out some experiments measuring the features accuracy and work days registration time.

4.2.1 GLOBAL POSITIONING SYSTEM

The **Global Positioning System (GPS)**, originally Navstar GPS is a satellite-based radio navigation system owned by the United States government and operated by the United States Space Force. It is one of the global navigation satellite systems (GNSS) that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS signals.

The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.

The GPS project was started by the U.S. Department of Defense in 1973, with the first prototype spacecraft launched in 1978 and the full constellation of 24 satellites operational in 1993. Originally limited to use by the United States military, civilian use was allowed from the 1980s following an executive order from President Ronald Reagan. Advances in technology and new demands on the existing system have now led to efforts to modernize the GPS and implement the next generation of GPS Block IIIA satellites and Next Generation Operational Control System (OCX). Announcements from Vice President Al Gore and the Clinton Administration in 1998 initiated these changes, which were authorized by the U.S. Congress in 2000.

During the 1990s, GPS quality was degraded by the United States government in a program called "Selective Availability"; this was discontinued on May 1, 2000 by a law signed by President Bill Clinton. The GPS service is provided by the United States government, which can selectively deny access to the system, as happened to the Indian military in 1999 during the Kargil War, or

degrade the service at any time. As a result, several countries have developed or are in the process of setting up other global or regional satellite navigation systems. The Russian Global Navigation Satellite System (GLONASS) was developed contemporaneously with GPS, but suffered from incomplete coverage of the globe until the mid-2000s. GLONASS can be added to GPS devices, making more satellites available and enabling positions to be fixed more quickly and accurately, to within two meters (6.6 ft). China's BeiDou Navigation Satellite System began global services in 2018, and finished its full deployment in 2020. There are also the European Union Galileo positioning system, and India's NavIC. Japan's Quasi-Zenith Satellite System (QZSS) is a GPS satellite-based augmentation system to enhance GPS's accuracy in Asia-Oceania, with satellite navigation independent of GPS scheduled for 2023. When selective availability was lifted in 2000, GPS had about a five-meter (16 ft) accuracy. The latest stage of accuracy enhancement uses the L5 band and is now fully deployed. GPS receivers released in 2018 that use the L5 band can have much higher accuracy, pinpointing to within 30 centimeters.

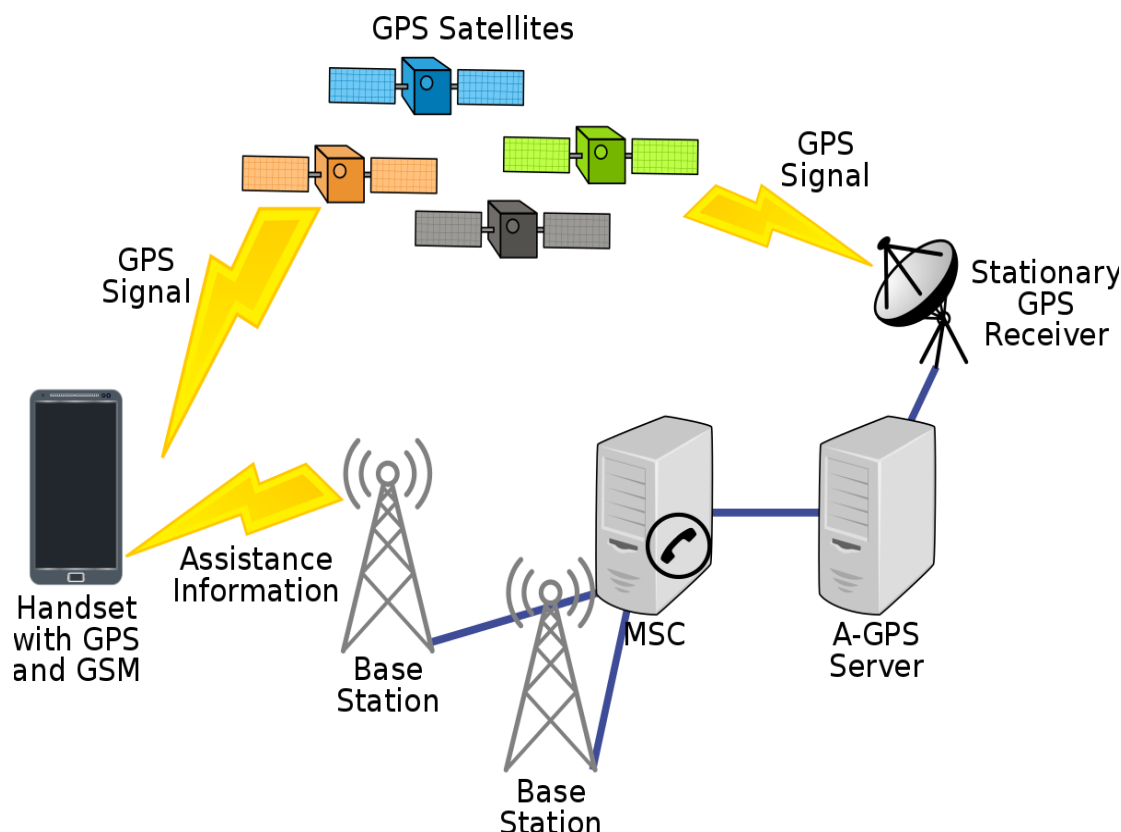


Fig. 4.1 GPS Tracker System Outline

The GPS receiver calculates its own position and time based on data received from multiple GPS satellites. Each satellite carries an accurate record of its position and time, and transmits that data to the receiver. The satellites carry very stable atomic clocks that are synchronized with one another and with ground clocks. Any drift from time maintained on the ground is corrected daily. In the same manner, the satellite locations are known with great precision. GPS receivers have clocks as well, but they are less stable and less precise. Since the speed of radio waves is constant and independent of the satellite speed, the time delay between when the satellite transmits a signal and the receiver receives it is proportional to the distance from the satellite to the receiver. At a minimum, four satellites must be in view of the receiver for it to compute four unknown quantities (three position coordinates and clock deviation from satellite time).

4.3 BIOMETRICS

Biometrics are distinctive, measurable characteristics that are used to identify a particular person. These identifiers are categorized as physical or behavioral characteristics, related the shape of body parts especially the iris of an eye or a pattern of behavior. Physical biometrics include fingerprints, facial structure and shape, hand geometry, iris patterns, even the shape of your ear. Behavioral biometrics refer to how we type, how we swipe our fingers on a touchscreen, our gait, or how we speak or sing. Unlike passwords, biometrics are part of us. They can't be forgotten, lost or borrowed. And they are not easily hackable. That is why biometrics are more secure than passwords and convenient to use.



Fig. 4.2 Biometric Recognition

4.4 GEO-FENCING

Geofencing is a location-based service, which sends a notification to a smartphone who enter a defined geographic area. For example, human resource department to monitor employees working in special locations or child location services can notify parents if a child leaves a designated area. To mark a location of interest, you specify its latitude and longitude. To adjust the proximity for the location, you add a radius. The latitude, longitude, and radius define a geofence, creating a circular area, or fence, around the location of interest. The following figure illustrates an example of geofencing on android. In Android, for each geofence, you can ask Location Services to send you entrance and exit events, or you can specify a duration within the geofence area to wait, or dwell, before triggering an event. You can limit the duration of any geofence by specifying an expiration duration in milliseconds. After the geofence expires, Location Services automatically removes it. Geofencing combines awareness of the user's current location with awareness of the user's proximity to locations that may be of interest.

To mark a location of interest, you specify its latitude and longitude. To adjust the proximity for the location, you add a radius. The latitude, longitude, and radius define a geofence, creating a circular area, or fence, around the location of interest. You can have multiple active geofence, with a limit of 100 per app, per device user. For each geofence, you can ask Location Services to send you entrance and exit events, or you can specify a duration within the geofence area to wait, or dwell, before triggering an event. You can limit the duration of any geofence by specifying an expiration duration in milliseconds.

After the geofence expires, location services automatically removes it. To make use of geofencing, an administrator or developer must first establish a virtual boundary around a specified location in GPS- or RFID-enabled software, which can be as simple as a circle drawn 100 feet around a location on Google Maps.

This virtual geofence will then trigger a response when an authorized device enters or exits that area, as specified by the administrator or developer. Today's use of geofencing has evolved beyond simply tracking where a target customer (or a herd of sheep) is at any given time. With privacy concerns challenging companies to rethink their use of geofencing, companies like Radar are leading the way in innovating how geofences can improve the user experience.

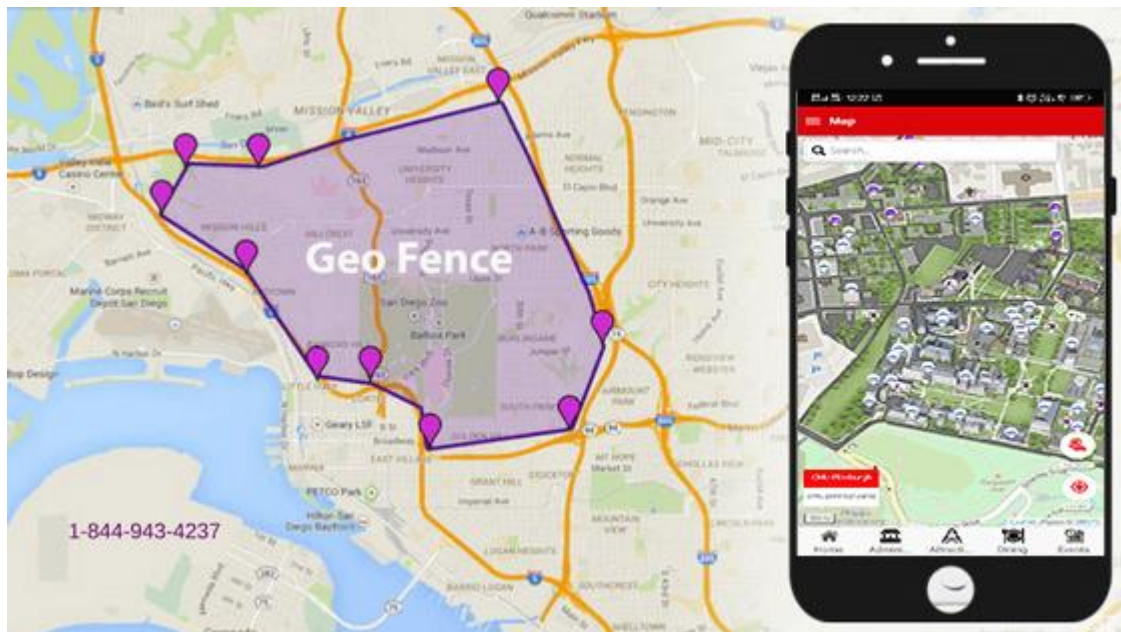


Fig. 4.3 Geo-Fencing

4.5 FACIAL RECOGNITION

Face recognition has been an active research topic since the 1970s. Given an input image with multiple faces, face recognition systems typically first run face detection to isolate the faces. Each face is preprocessed and then a low dimensional representation (or embedding) is obtained. A low-dimensional representation is important for efficient classification. The shape of the face is a very unique physical characteristic. Using computer vision technology, facial structure and shape can be identified and categorized, with specific “landmark”

features, including the relative position and shape of the nose, eyes, jaw, and mouth. The earliest work in face recognition was feature based and sought to explicitly define a low-dimensional face representation based on ratios of distances, areas, and angles. Today's top-performing face recognition techniques are based on convolutional neural networks. Facebook's Deep Face and Google's Face Net systems yield the highest accuracy. However, these deep neural network-based techniques are trained with private datasets containing millions of social media images that are orders of magnitude larger than available datasets for research. Advances in facial imaging today allow for 3D images, increasing the complexity and accuracy of face recognition algorithm.

4.5.1 FACE DETECTION

Detect one or more human faces in an image and get back face rectangles for where in the image the faces are, along with face attributes which contain machine learning-based predictions of facial features. The face attribute features available are: Age, Emotion, Gender, Pose, Smile, and Facial Hair along with 27 landmarks for each face in the image that can be specified by file in bytes or valid URL.

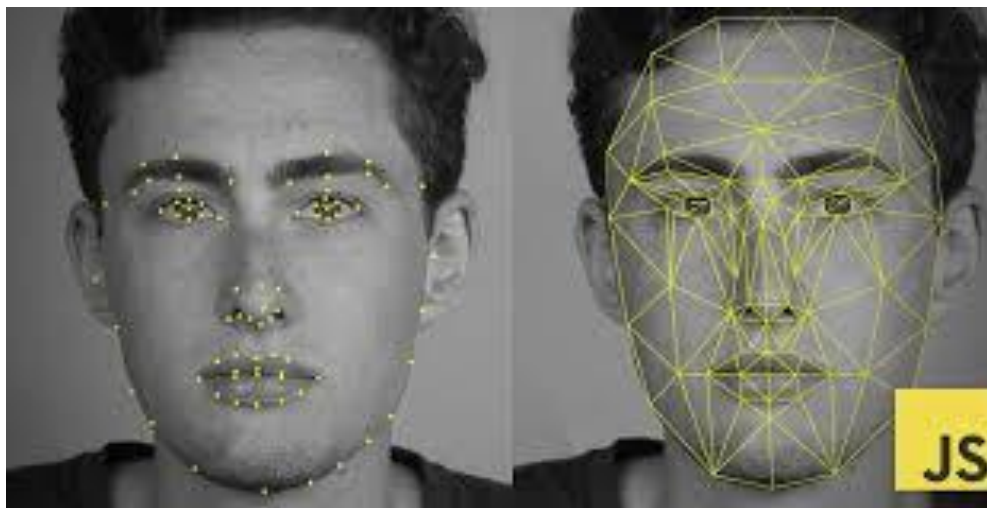


Fig. 4.4 Face Detection

4.5.2 FACE RECOGNITION

Face recognition is widely used in many scenarios including security, natural user interface, image content analysis and management, mobile apps, and robotics. Face-Recognition provides four face recognition functions: face verification, finding similar faces, face grouping, and person identification. To perform the facial recognition in our application we have used decision tree algorithm for increased efficiency.

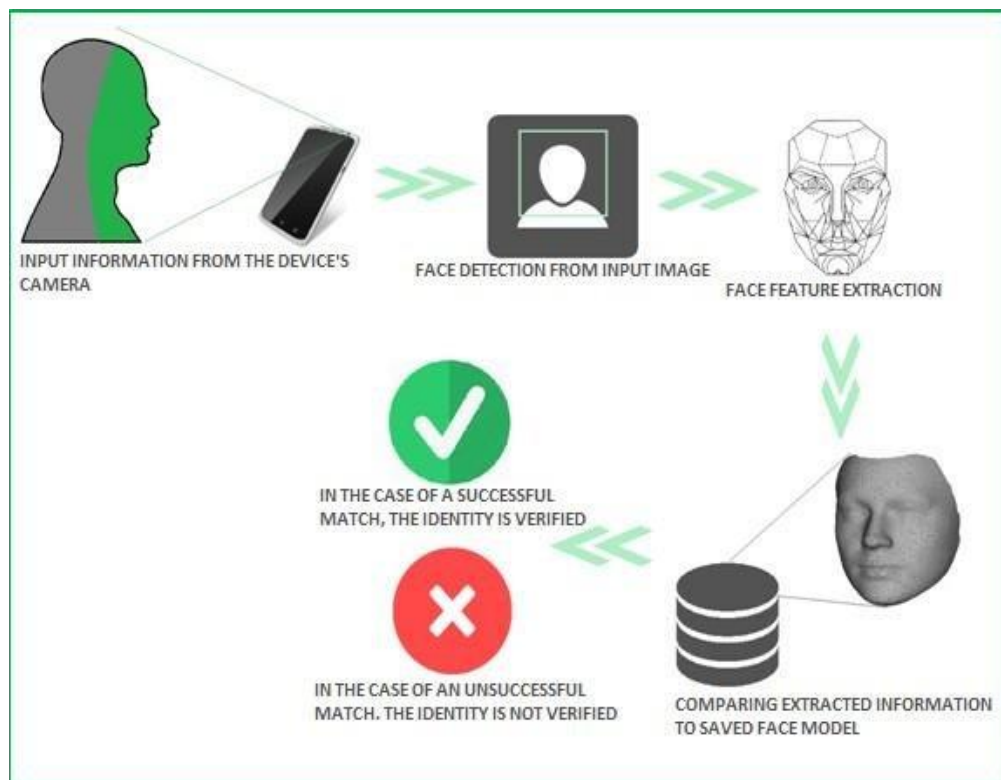


Fig. 4.5 Facial Recognition System

4.5.3 DECISION TREE ALGORITHM

This particular algorithm comes under supervised learning algorithms. This algorithm is used in solving regression and classification problems. The main objective is developing a model to determine the class or value of the target variable by uncomplicated orders. The algorithm here, which is used for determining each label for the data begins from origin of tree. We differentiate the origins attribute with the main data attribute. Based on the differentiation, we can track the branch parallel to the variable as well as hop to the upcoming node.

Types of decision trees are based on the type of target variable we have. It can be of two types:

1. Categorical Variable Decision Tree: Decision Tree which has a categorical target variable then it called a Categorical variable decision tree.
2. Continuous Variable Decision Tree: Decision Tree has a continuous target variable then it is called Continuous Variable Decision Tree.

For example, let's say we have a problem to predict whether a customer will pay his renewal premium with an insurance company (yes/ no). Here we know that the income of customers is a significant variable but the insurance company does not have income details for all customers. Now, as we know this is an important variable, then we can build a decision tree to predict customer income based on occupation, product, and various other variables. In this case, we are predicting values for the continuous variables. The decision of making strategic splits heavily affects a tree's accuracy. The decision criteria are different for classification and regression trees. Decision trees use multiple algorithms to decide to split a node into two or more sub-nodes. The creation of sub-nodes increases the homogeneity of resultant sub-nodes. In other words, we can say that the purity of the node increases with respect to the target variable. The decision tree splits the nodes on all available variables and then selects the split which results in most homogeneous sub-nodes.

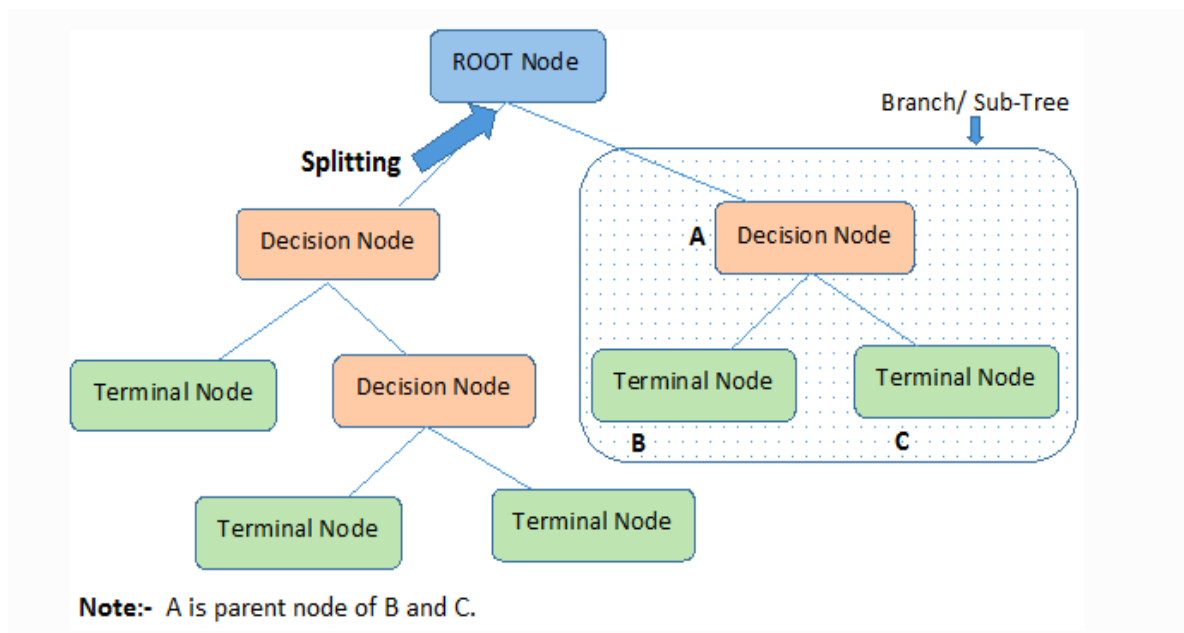


Fig. 4.6 Decision Tree Algorithm

4.5.3.1 DECISION TREE WORKFLOW

The algorithm selection is also based on the type of target variables. Let us look at some algorithms used in Decision Trees:

- ID3
- CART
- CHAID
- MARS

The ID3 algorithm builds decision trees using a top-down greedy search approach through the space of possible branches with no backtracking. A greedy algorithm, as the name suggests, always makes the choice that seems to be the best at that moment.

4.6 GEOMARK

Geomark is a mobile application for the control of biometric assistance from mobile devices that uses facial recognition as an authentication measure and the geographic coordinates of the GPS (Global Positioning System) as a validation of the location of the faculties in their respective dependencies or classrooms. It has a previous storage of the company's employees: personal and biometric (face) data and the GPS coordinates of the geographical location of our institution.



Fig. 4.7 Geo-Mark Icon

4.6.1 FEATURES

Biometric authentication of employees through facial recognition. Validates the institution's rank in real-time geographic location. Report of the attendance record of employees with: Day, Time, Date, and compatibility level of the authenticated face. Administrator profile to save basic data of the employees of the company. It is compatible with all Android operating systems. Interoperability with attendance management systems.

4.6.2 ADVANTAGES

Fast registration of the workday starts and workday exists of your working day from your same work location. Avoid long crowds in the place where the control of attendance rush hours entry or exit of the majority of employees. Ideal in companies where work offices are very distant from the biometric devices. Reduce costs by purchasing several assistance control equipment, maybe none is necessary. The physical characteristics of a face are much more difficult to counterfeit. Reasonable prices, flexible licensing and free customer support.

4.6.3 DISADVANTAGES

There are third-party applications that manage to modify the actual geographical location of GPS of mobile devices, but their operation requires technical knowledge such as: activate ROOT mode, activate developer options or apply location changes. Low internet connection. Facial recognition also requires updates to maintain accuracy, while fingerprints, for example, never need it, age affects our appearance, and so as we get older, the images will have to be updated regularly to ensure that the data is accurate.

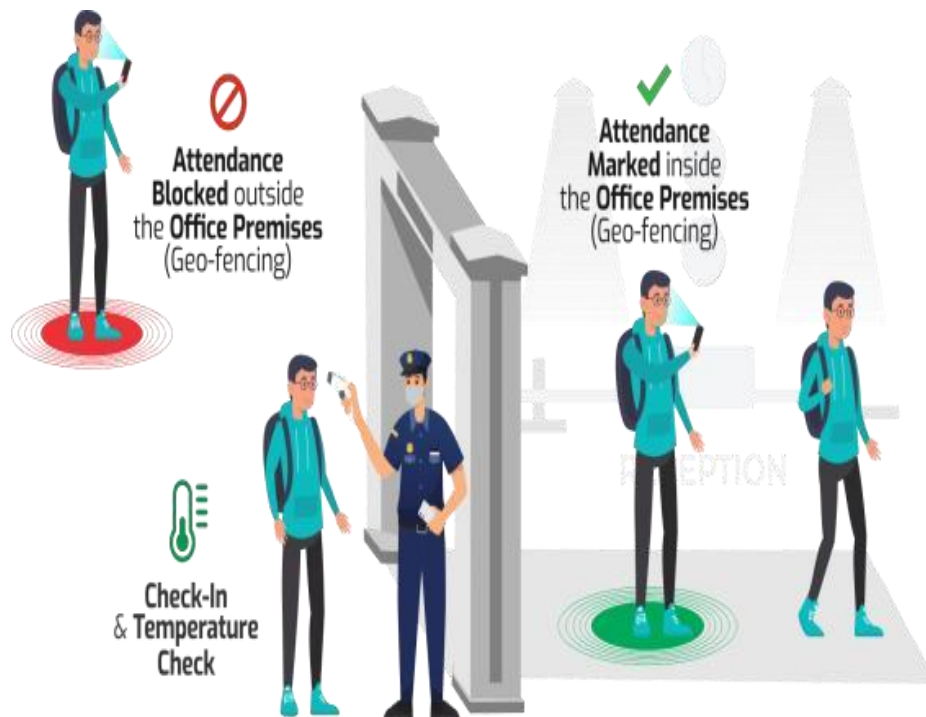


Fig. 4.8 Architecture Outline

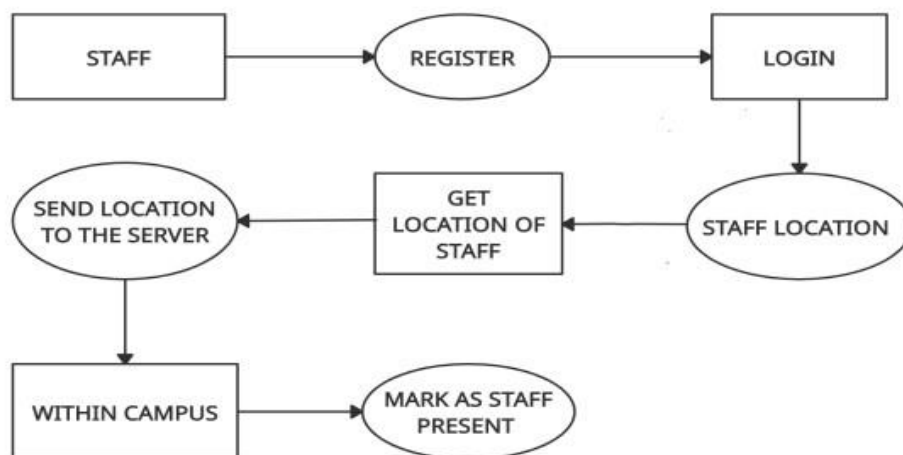


Fig. 4.9 Data Flow Diagram

4.7 METHODOLOGY

4.7.1 STAFF ATTENDANCE

When an institution has remote personnel, the conventional web-dependent, biometric time and attendance system barely help them in registering their attendance at their specific location in the exact period of time. With Geo-Mark, a particular employee can now record their attendance through a GPS enabled smartphone. The admin application annexes the staff's attendance with the exact date, time and location coordinates. The admin affords instinctive apps for Android devices and is one of the safest and most secure way of managing the attendance.

4.7.2 ADMIN TRACKER

Geo-Mark works well for staff where they will be able to record their attendance at their college campus and then move on with their duties simultaneously stamping their attendance at a specific location through their smartphone. Geo-Mark tracks a college visit of the on field employees by apprehending the Geo-information location along with their in-time/out-time logs. This attendance material is also automatically combined with payroll figures which makes it affluent for the system to precisely estimate the income depending upon the staff attendance which includes the working hours.

4.7.3 ADMIN REVIEW

The admin will arrange the attendance workflows where the staff gets to authenticate the time sheets of their crew and draft their everyday attendance. Since the entire in-time / out-time logs are captured by computerized methods, the admin can once again analyze the staff attendance and then endorse it. He can also get to add his/her comments on any staff's attendance log that is unenforceable. In addition to this, the faculty can also retrieve their own attendance information with data like date, time and position on this application.

4.7.4 ADMIN CUSTOMIZATION

The admin is able to constitute GPS based attendance marking for every staff or let alone a set of staff at attendance pattern point. In accordance with this, it excludes fabricated attendance log by a secluded staff as this application acquires the whereabouts in the specific period.

4.7.5 GEO-SWIPE REPORTS

With this application, everyday accounts are accessible at admin level to increase the performance due diligence to evaluate the functioning and throughput of college staff. The time and work saved collectively included with data precision directs to improved efficiency and increased revenues. An effectual attendance administration is the most fundamental requirement for any institution.

4.8 WORKFLOW

The application starts with the user entering in the details and his initial face scan if they are a new user, or else they can straight away login using their credentials they entered while creating their account. Once logged in, the application checks the current location using the built in GPS system of the mobile phone and then calculates the distance compared to the pre entered co-ordinates of the campus. If the user is found to be within the prescribed area or campus, he/she is eligible to mark the attendance, or else the check-in button will be disabled until they get back into the campus area. Once checked-in the user can view their attendance percentage till the date all the way from their first day of joining. This parameter can be changed to a

monthly view or weekly, as per the requirement of the institution. The attendance for the same is calculated using a virtual calendar created in our database. The calendar can be modified as per the requirements of the institution to feed in the working days and the days which maybe marked as holidays. Accordingly the attendance of each user is recorded.

CHAPTER 5

5. CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION

In this project, we present a method which can change the ancient physical methods by using the correct and efficient method for recording the attendance of each faculty. The techniques are trustworthy, attainable and safe enough for use. This method doesn't need any definite hardware and can be done by means of a camera and a gps enabled smartphone. This mobile application represents a faster and more efficient method to register the workdays of our institution faculties. It converts the smartphone to a biometric device allowing to register the workday enters and the workday exists being at any place inside of the university campus. With the aim of assessing its performance, we have carried out some experiments measuring the features accuracy and work days registration time performed by GeoMark. Creating a smart attendance system with less time consumption and with a more optimized procedure provides with enough productivity for the development of the institution.

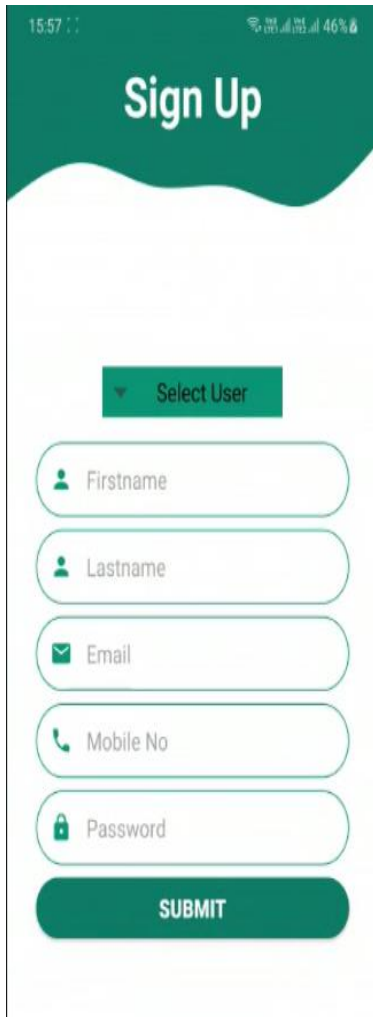
5.2 FUTURE SCOPE

In future, this approach can be upgraded in such a way it keeps tracking the position of the faculties throughout the day. It can also be implemented for student's attendance with a larger database. In the future work, extensive experiments on more users under will be done to guarantee the performance accuracy of our application. Furthermore, we will implement machine learning algorithms (deep neural networks) embedded in the same application avoiding the requirement of internet access to update in the database.

CHAPTER 6

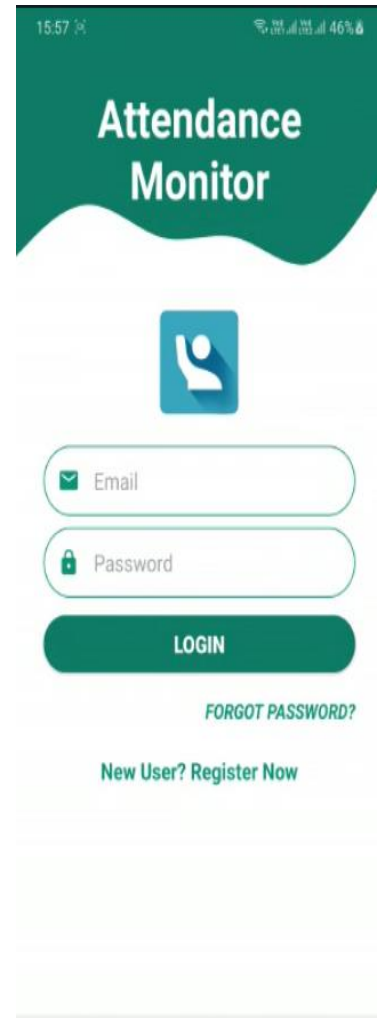
6. RESULTS AND DISCUSSION

6.1 SCREENSHOTS OF APPLICATION



The 'Sign Up' screen features a green header with the title 'Sign Up'. Below the header is a 'Select User' button. The form consists of five input fields: 'Firstname', 'Lastname', 'Email', 'Mobile No', and 'Password', each with a corresponding icon. A green 'SUBMIT' button is at the bottom.

Fig.6.1 New User Page



The 'Attendance Monitor' login screen has a green header with the title 'Attendance Monitor'. Below the header is a blue icon of a person. The form includes 'Email' and 'Password' input fields, each with an icon. A green 'LOGIN' button is positioned below the fields. At the bottom, there are links for 'FORGOT PASSWORD?' and 'New User? Register Now'.

Fig.6.2 Login Page

15:57 46%

Sign Up

▼ Select User

▼ Admin

▼ Staff

Person

First Name

Person

Lastname

Envelope

Email

Phone

Mobile No

Lock

Password

SUBMIT

Fig.6.3 User Selection

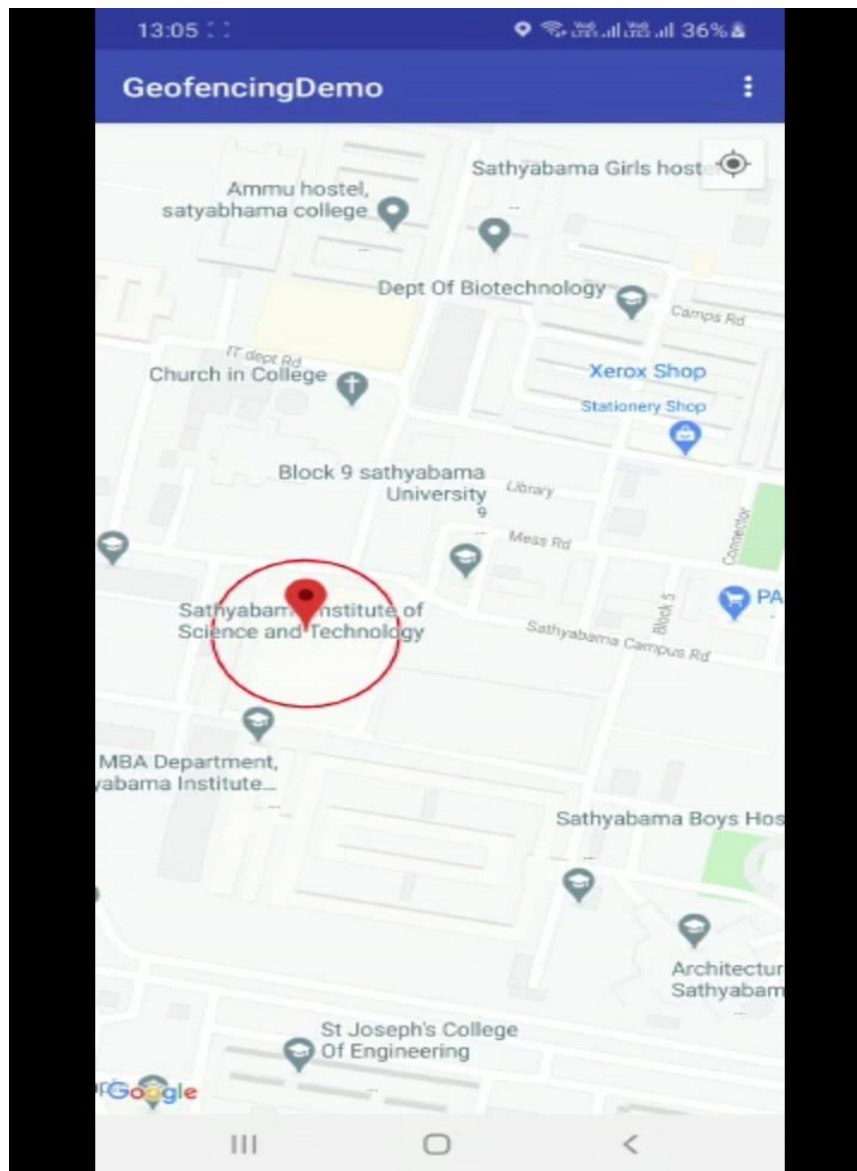


Fig.6.4 Geofencing Tracker

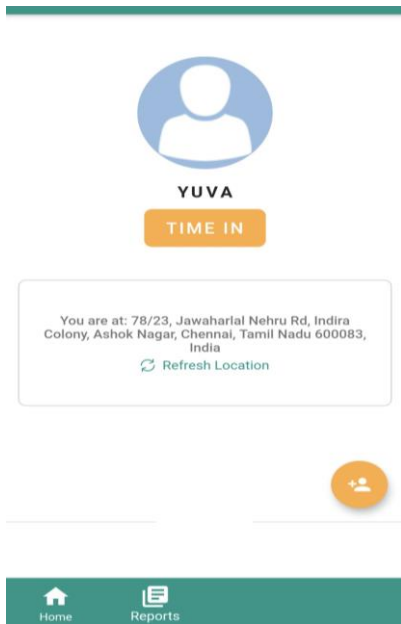


Fig.6.5 In-time

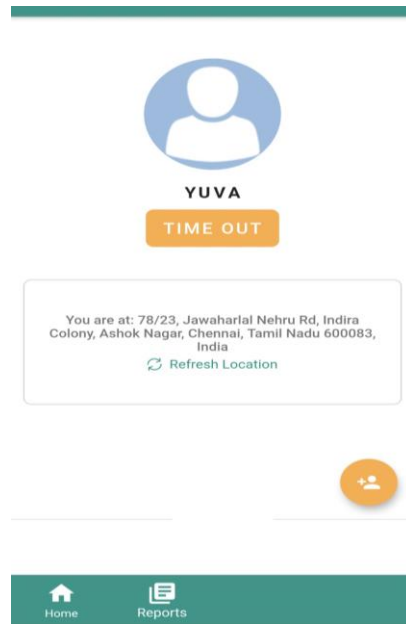


Fig.6.6 Out-time

Daily Attendance		
Present		
Name	Time In	Time Out
Yuva Time In: 78/23, Jawaharlal Nehru Rd, Indira Colon Time Out: 78/23, Jawaharlal Nehru Rd, Indira Colon	11:25 	11:30 

Fig.6.7 User Report

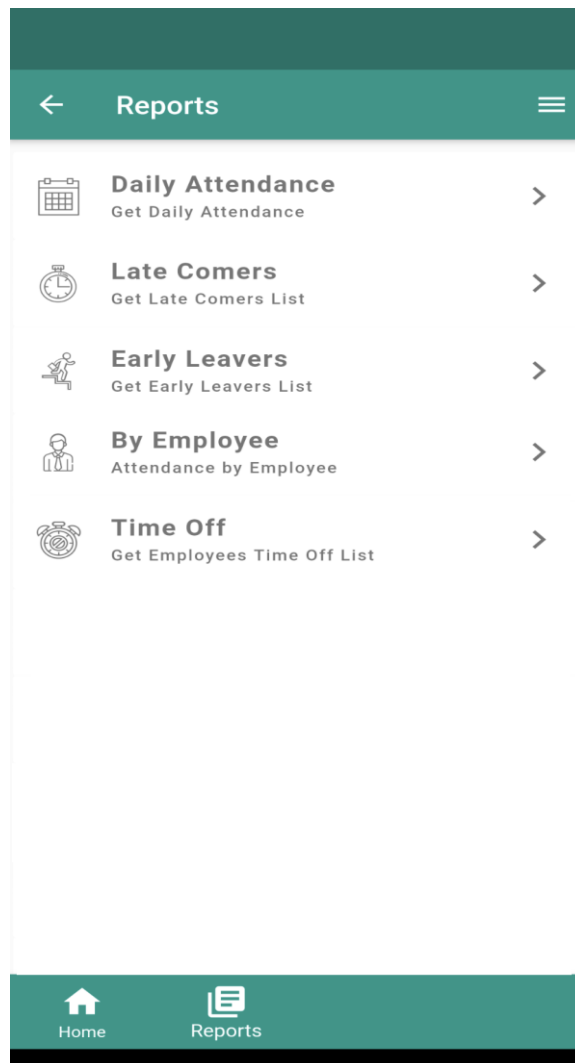


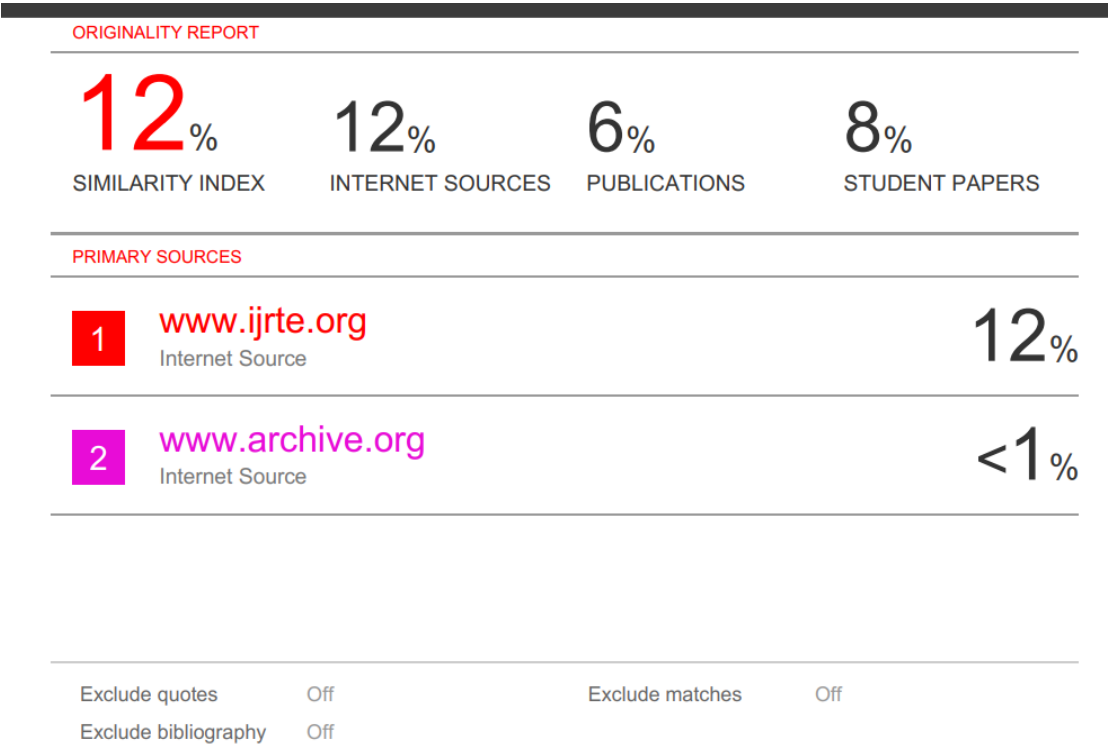
Fig.6.8 Admin Report

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PAPER PUBLICATION

1. PLAIGARISM REPORT



2. ACCEPTANCE LETTER

	5th International Conference on Intelligent Computing and Control Systems ICICCS 2021 May 06 - 08, 2021 iciccs.com/2021/ iccs.conf19@gmail.com	
<i>Letter of Acceptance</i>		
TO		
Akshaya.V, Dr. V. Maria Anu, Deebika. S Department of IT, Sathyabama Institute of Science and Technology India.		
Paper ID- ICICCS067		
Subject: Acceptance to the International Conference on Intelligent Computing and Control Systems [ICICCS 2021], 06-08, May 2021, Madurai, India.		
Dear Author,		
We are happy to inform you that your paper titled “CONTACTLESS ATTENDANCE USING GEO-FENCING AND FACIAL RECOGNITION” has been accepted for the oral presentation at the International Conference on Intelligent Computing and Control Systems [ICICCS 2021] to be held on 6 – 8, May 2021 at Vaigai College of Engineering, Madurai, Tamil Nadu, India.		
With the evident of its previous publications, ICICCS 2021 is also dedicated for the publication in IEEE Xplore Digital library. As a result of the peer review process, the technical conference program committee is pleased to inform you that your paper is shortlisted and accepted for the presentation in conference event and formally accepted for inclusion in IEEE Xplore. We appreciate if you could submit the final version of manuscript at your earliest convenience, in order to ensure a novel and timely publication of your research paper.		
Once again, on behalf of the conference committee we extend our warm gratitude to welcome you at our conference site.		
Yours' Sincerely,		
		
Prof. P. Sugumaran Vice Principal, Vaigai College of Engineering, Madurai, India.		
Our Previous Publications ICICCS 2020 Publication Link ICICCS 2019 Publication Link ICICCS 2018 Publication Link ICICCS 2017 Publication Link		Proceedings by 

