Android Application for Attendance Monitoring System using Biometric Overview and Survey

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***Abstract*—** Managing the attendance of employees during work is a difficult task and it becomes more difficult during the report generation phase, because the process of marking attendance and maintaining the data is not automated and manual computation and calculation produces errors and wastes a lot of time. Queuing in front of the fingerprint scanner is tedious task and also the employees who work outside the office cannot mark their attendance. For this reason, the expansion of Attendance Monitoring System (AMS) using android is proposed so that employees can mark attendance through mobile, higher authorities can directly access the reports and monitor the system on their personal mobile anywhere. The system aims to improve the accuracy as compared to using paper-based approach. Moreover, the proposed technique provides an ease on touch way for generating reports, sending leave request, responding to leave request and marking attendance based on Global Position System (GPS) plus fingerprint.

Keywords-*Fingerprint, AMS, Lens, Camera, Android Application, GPS*

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I. INTRODUCTION

The existing method involves the use of sheets of paper or registers in taking attendance of employees. This approach of taking attendance is thus time consuming and hence, there is a need of an automated and reliable system. We proposed online attendance system on our own mobile devices and is integrated with the GPS system. Employees can put their thumb on his/her camera of mobile device with lens. Images in the database matches with the current fingerprint image and gets his/her unique identification number with the punch-in time, GPS location and date and saves it to database of the organization. The AMS will also be used to generate reports of all the employees. Employee can send leave request to his/her respective HR and the HR can give response to that employee as whether it can be accepted or rejected.

II. RELATED WORK

A. *Biometrics System*

The origin of the word biometrics comes from the ancient Greek words: bios – life and metros – measure [1]. Biometrics is the technology which is merely used to uniquely identify individuals based on their chemical, physical or behavioral property. Any human physiological also behavioral characteristic can be used as a biometric characteristic only if it satisfies the following requirements:

- Universality: each person should have the characteristic
- Distinctiveness: any two persons should be different by means of characteristic
- Permanence: the characteristic should be invariant over a interval of time
- Collectability: the characteristic can be measured quantitatively.

However, in a convenient biometric system, there are a number of issues that we should be considered, including:

- Acceptability: indicates the scope to which people are enthusiastic to accept the use of a particular biometric identifier (characteristic) in their day to day life.
- Circumvention: reflects how easily the system can be fooled using deceptive methods.
- Performance: refers to the accuracy, achievable identification and speed, the resources required to achieve the desired recognition, as well as the operational and environmental factors that influence accuracy and the speed.

A practical biometric system should meet the precise recognition speed, accuracy, and resource requirements, be safe to the users, be accepted by the intended population, and be adequately robust to various fraudulent methods and attacks to the system.

TABLE I. COMPARION OF VARIOUS BIOMETRICS TECHNOLOGIES BASED ON A PERCEPTION. HIGH, MEDIAM AND LOW IS REPERSENTED BY H, M AND L RESPECTIVELY

Biometric Identifier	Acceptability	Circumvention	Collectability	Distinctiveness	Performance	Permanence	Universality
DNA	L	L	L	H	H	H	H
Ear	H	M	M	M	M	H	M
Face	H	H	H	L	L	M	H
Facial Thermogram	H	L	H	H	M	L	H
Fingerprint	M	M	M	H	H	H	M
Gait	H	M	H	L	L	L	M
Hand Geometry	M	M	H	M	M	M	M
Hand Vein	M	L	M	M	M	M	M
Iris	L	L	M	H	H	H	H
Keystroke	M	M	M	L	L	L	L
Odor	M	L	L	H	L	H	H
Palmprint	M	M	M	H	H	H	M
Retina	L	L	L	H	H	M	H
Signature	H	H	H	L	L	L	L
Voice	H	H	M	L	L	L	M

B. *AMS using Fingerprint*

Fingerprints are the most extensively used biometric feature for personal identification and authentication in the field of biometric identification [2]. The human fingerprint characteristic has been widely used in various aspect of life for different purposes, mostly in attendance system of employees [3]. The main aim of this paper is to develop an accurate, efficient and fast automatic attendance system using fingerprint verification technique. The result shows that fingerprint biometric identifier was found appropriate for attendance management system of employees in the organization.

The sensed data might be noisy or unclear. A fingerprint with a scar is the example of noisy data Noisy biometric data may be imperfectly matched with templates in the database which is resulting in a user being incorrectly rejected.

C. *Android based AMS*

In today's world of E-learning, video conferencing and webinars, it is necessary to develop an automated system for student tracking [4]. As Figure.1 shows Android is most popularly used.

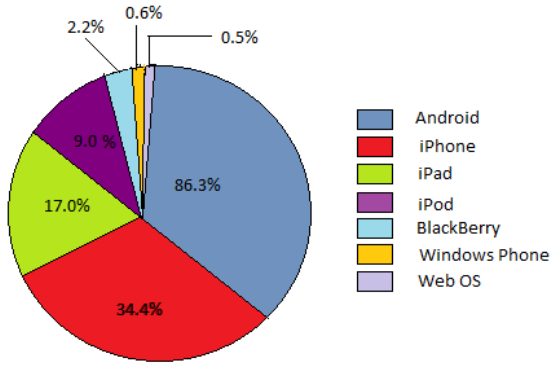


Figure 1. Android share in Market

In this paper, author describes a proposed android application suite for student tracking system. According to Kunal Vilas Chaudhari, this system enhances the time factor efficiency. It develops an ease to integrate all the factors easily and easy to implement. This system is beneficial to reduce the manual human work load and High availability and Integration. Less Paper work required to be done.

This system is unable to handle the false proxy attendance. Also it has less availability because students cannot access their attendance easily. The system is less integrated as it does not hold together the different participants in system such as teachers,students, etc.

D. *GPS based AMS*

Every organization has a specific location, which is determined by the GPS [5]. If the location of an organization and the location of employee is the same (Approx), then it should be indicate that, the employee is in the organization.
The foremost location technology is the GPS which is commonly used to provide real-time directions and traffic information [6]. This paper proposes a method for indoor location that uses the results of trilateration of Wi-Fi signal strength to learn what is expected at particular locations. It discusses why indoor location is needed, and the reasons for using the Wi-Fi networks as the basis of the location process. It also describes the problems with trilateration using radio signals, and by introducing some proposals to improve the precision of the trilateration algorithm.

E. *Fingerprint enabled Mobile Devices*

In proposed system, firstly there is need of user registration with application [7]. The user will have to provide credentials with his fingerprints and the fingerprint of the user to grant his access to information. After registering one just has to authenticate using fingerprint if the fingerprint matched with the fingerprints that are stored in database and the required information is displayed in this way, to log in to the application, the user need not remember any password in order.

In [8], author proposed a selective attention algorithm which increases the reliability of biometrics security system based on fingerprint recognition which help to detect the most sensitive to damage areas, and add it as step of fingerprint analyses for the fingerprint recognition procedures. Author also proposed a new algorithm, which does not require complex hardware system

III. PRAPOSED SYSTEM

Employee authentication is one of the major factors in AMS. All the personal details of the employees and HR are recorded on the organization's database.

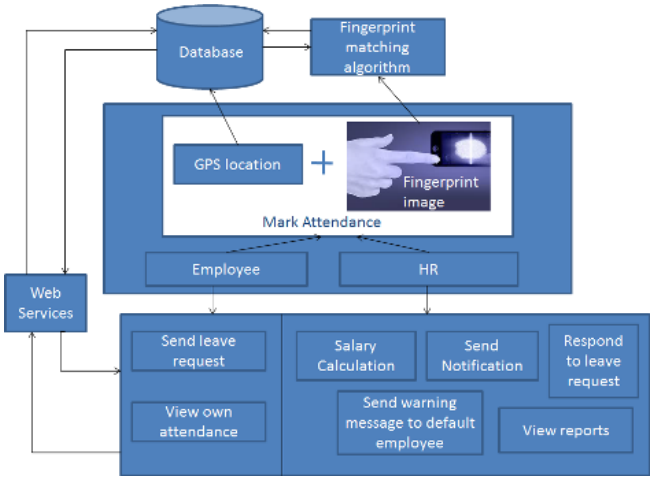


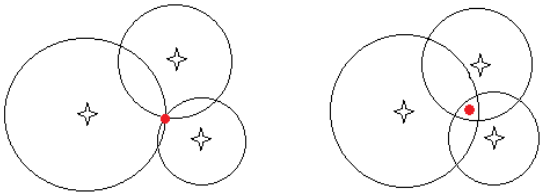
Figure 2. Architecture System

The employee will put his/her thumb on camera with lens and image will be captured. That fingerprint-image gets matched with the images in the database. If matching is successful, the application sends the id, punch-in time, date and location to the organization's database. The database stores the daily punches of all the employees. In case of the HR, a separate screen would be displayed which would have certain options to view employees attendance report and send warning message to the employee at the end of the month, in case the employee has not worked for the specific number of the hours. The interfacing between the android app and the organization's database will be done using the IP address. The reports will be generated based on the punches stored in the database, the number of hours worked, etc. The leave request can be accepted/rejected based on the number of the hours worked by the employee, the number of absent days and the number of leaves remaining.

- Working of GPS

A. *Trilateration Algorithm*

In geometry, trilateration is the process of determining relative or absolute locations of points by measurement of distances, using the geometry of spheres, circles or triangles. It Uses 3 or more probable locations are known- E.g. LBS, Wi-Fi Tracking etc. to calculate exact location.



a)perfect information b)imperfect information

Figure 3. Position estimated by trilateration

B. *Haversine Method*

Also to calculate distance between two locations we will use haversine formula. For any two points on a sphere, the haversine of the central angle between those points is given below. It is a more general trigonometry, the law of haversine, relating the angles and sides of spherical triangles.

The haversine formula for any two points on a sphere by central angle between them is given

$haversin\ (d/r)=haversin(\theta_2-\theta_1)+cos(\theta_1)cos(\theta_2)haversin(\lambda_2-\lambda_1)$

Where,

- *haversin* is the haversine function:
  $haversin(\alpha) = sin^2(\alpha/2)=(1-cos(\alpha))/2$
- *d* is the distance between the two points (along a great circle of the sphere;)
- *r* is the radius of the sphere,
- θ_1, θ_2: latitude of point 1 and latitude of point 2
- λ_1, λ_2: longitude of point 1 and longitude of point 2

IV. CONCLUSION

We have proposed Attendance Monitoring System (AMS), which is based on Android Application and Global Position System (GPS), for monitoring attendance of the employees using android platform. It will show improvement in rapidity as compared to desktop based Biometric Time Attendance software. Moreover, the proposed technique provides an easy way for generating reports from anywhere. An Android based mobile application for Attendance Monitoring is presented. It offers reliability, saves time and ease in control. It can be used as a base for creating similar applications for tracking attendance in organizations, offices or any workplace.

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