An Advanced Alert System using Geo-fencing

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ABSTRACT

The concept of geo-fence can be defined as a virtual boundary for the real world geographical area. These geo-fences can be generated by the users based on their requirements and needs. Geo-fencing is based on the Global Positioning System (GPS) which is a driving force for creating geo-fences on the real world geographical area. Based on all these features a notification can be generated when the user enters or exit and even when they move from one location to other. As per geo-fencing approach these fences are like virtual polygons on the geographical places. These places can include hospitals, school, colleges, offices, temples and so on. Because it deals with location this concept can also be called as the Location Based Service (LBS).

Keyword- *Geo-fencing, geo-notification, Global Positioning System (GPS), Location Based Service (LBS), Short Message Service (SMS).*

1. INTRODUCTION

In the present world the smartphones are omnipresent and almost each and every one knows how to operate it and heavily dependent on it. So by using the smartphone which contains thousands of inbuilt features a concept called geo-fencing can be implemented, where geo-fencing is a feature found in a software application program that is based and relied upon global positioning system (GPS). A geo-fence can be depicted as a virtual barrier. The apps and tools specially designed for the geo-fence monitors the situation when the smartphone or any other special physical objects enter or exit the established fence and they provide alerts to the system administrators. The so called alerts or the notification can be through email, phone calls, Short Message Service or any other way of communication. To execute geo-fencing on the mobile devices three basic techniques required are: (a) Geo-fencing (b) Global Positioning System (c) Any Means of communication like SMS, phone calls or email. With the help of all these basic requirement the geo-fencing is implemented on the smartphones. The execution of geo-fencing on the smartphones is based on matching of the position of the smartphones in the geographical map along with the match of the smartphone position in the geo-fence. The user with the smartphone acts as a client and the system administrator acts as a server and when the transition is detected over a geographical location a notification or alert is sent to the server or the administrator so that they can take appropriate action. So this notification or the alert plays a very important role in the geo-fencing. This paper is organized in following sections (a).Literature survey

(b).The geo-fencing-A location based service (c). The working Representation (d). How GPS helps Geo-fencing (e) Applications

2.   LITERATURE SURVEY

In the work of Al-Suwaidi and Zemerl which was carried out in the year 2009, the problem was solved by development of application named as "Locating Friends and Family Using Mobile Phones with Global Positioning System (GPS)".GPS system can be used for getting any location which includes geographical details such as latitude, longitude and also the altitude values along with the timestamp details. The main architecture behind the above stated application is based on client-server model. The user acts as a client and get registered with the server and all details of the client is stored in the server database. Then also the client periodically sends the location updates to the server which also get updated in the server database, with the help of these location updates the location is tracked and can be used to track friends and family.

In the work of Chandra, Jain and Qadeer a simple approach is used which was implemented on the JAVA enabled devices, with the help of the Short Message Service(SMS) a client can send his/her location to the server or the another client so that they can view the received location on the google maps.

The solution for "transportation information system" was proposed by Anderson, Lusting, Brunette, Borriello and kalko which is based on the concepts GPS and SMS. The client side contains a box like structure which includes GSM modem and a GPS unit. The server contains the database which contains information about the location connected to the GSM phone. When a user wants to know the location of the client it sends the message to the server and server replay to the message by sending the current location of the client thus the location tracking is achieved without the use of internet.

3.   THE GEOFENCING – A LOCATION BASED SERVICE

A Location Based Services can be defined as the services that can be offered to the users through a mobile phone by taking into consideration of its geographical locations and this LBS is heavily dependent on the location of the user of the mobile devices and the first thing of this service is to determine the location of the user in the google maps. The Location Based Service (LBS) can be classified into two types: (1).Push Type Services and (2).Pull Type Services.
1. Push Type Services- If a user receives the information from the service provider without requesting it, then this service is called Push Type Service, for example the LBS advertisement is Push Type Service.
2. Pull Type Services- If a user Intentionally request for a information from the service provider then this service is called Pull Type Service, for example whatsapp request to share location.
Location Based Service(LBS) is a wireless service mainly designed to answer the Where? questions, it means like where is my friend ? , where is college? , where is the restaurant? etc.. to make the LBS more powerful technology it should provide the accurate information and the accurate geographical location on the google maps. There is a wide range of application where the concept of LBS is used are Emergency, Marketing, Location Based Gaming, Location Based tagging, Location sharing.

4.   THE WORKING REPRESENTATION

To create Geo-fence on the mobile devices the user need to be aware of both the current location of the user and proximity of interested location that the user need to move. The latitude and longitudes must be specified to mark the exact location, proximity is adjusted by adding the radius, by specifying all these variables a polygon shaped fence is created on the interested location. This Geo-fence can be circular in shape as shown in the Fig.1 and Fig.2 respectively

Fig.1 A circular Geo-fence   Fig.2 Traffic view

The backbone for geo-fencing is the GPS ,the mobile devices uses the help of GPS to recognize the users current location proximity and the proximity of the interested location of the user and this GPS shows the everything so that the geo-fence stores everything about whether the user in the preferred location ,he moves inside fence or exit the fence each and everything will be recorded in the database so alert is generated when the user enters or exits the boundary an alert or the notification is generated and that informs the server about the client status of location. This is a type of push type notification.
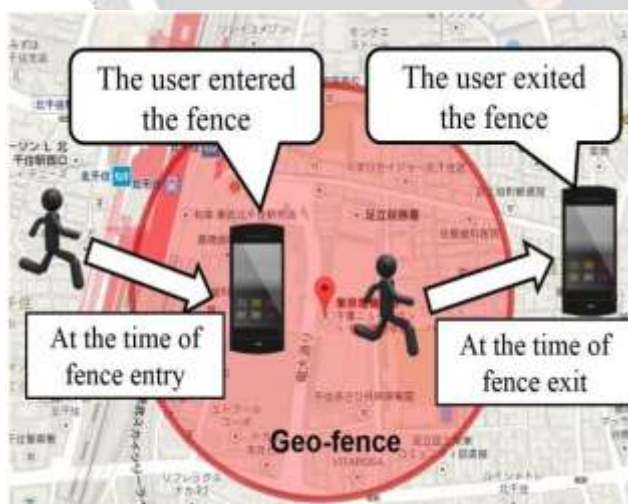

Fig.3

As shown in the Fig.3 when the user enters the fence it will be updated in the server as user is inside the fence and when the user exit the fence it will be updated in the server that user is out of fence and this updates will be in the form of notification or the alerts.

4.1 The Background of geo-fencing:

 GPS- GPS is a built in feature in every smartphone and it is backbone of the concept of geo-fencing and plays a very important role in finding proximity of user location.
 Assisted GPS- Assisted GPS is a A-GPS which supplements the information collected by the GPS satellite with surveyed coordinates of the mobile tower sites to enhance ability of server to calculate the position of device in the google maps.
Cell-ID- Every devices/smartphones on the earth is identified by the network of their respective service provider so this is required which provides a rapid response time.

4.2 Types of Alerts in Geo-fencing:

(1) Static geo-alerts: These are the alerts generated based on geographical position of the smartphone owned by the user with respect to the static or the fixed area. For example: An alert is send to the particular mobile user when a student enters or exit the college.
(2) Dynamic geo-alerts: These are the alerts generated based on geographical position of the smartphones owned by the user with respect to the changing world and will be automatic and operates itself in the client device it means in the smartphone of the user. For example: A smartphone will automatically turned to silent mode when user enters the college and automatically turned to general mode when user exit the college.
(3) One to one alerts: These are the alerts generated based on geographical position of the smartphone owned by the user with respect to the smartphone owned by the other users. For example: User books a cab and the driver of the cab will get alert that cab is booked by respective user along with their details.

5. HOW GPS HELPS GEO-FENCING

Global Positioning System plays a very important role in the geo-fencing, without GPS there is not even imagination of the concept Geo-fencing. Global Positioning System have two parts the GPS satellites and GPS receivers, The GPS satellites rotates around the earth twice a day in its respective precise orbit to collect information and transmit all these collected information to the earth, the GPS receivers takes this information and use it to calculate or find the exact location of the user in the google maps. The GPS receivers not only simply accept the information but also compares the time a signal was transmitted with the time the signal was received by it. And this difference of time explains about how far the satellite is to the GPS receiver. And all these are represented on the electronic map of smartphone. All these activities are currently carried out by the 24 satellites which are orbiting the globe about 20,000 kms around us. They are travelling at a speed of 7,000 miles per hour and making two orbit around earth in less than 24 hours of time. And all these GPS satellites are powered by solar energy with backup batteries as a safety purpose to make them rotate even during the time of solar eclipse. Thus GPS helps the geo-fencing and there is no limit to the size of geo-fence but to maintain accuracy it is better to maintain size of geo-fence radius from minimum of 10 meters to maximum of 200 km.

6. APPLICATIONS

▶ 1. Parenting app: Parent and child should register in the app, then the parent will give the region for the geo-fence. When the child crosses the fence the parent will receive an alert about the crossing of the fence.
▶ 2. Industrial use: Every worker will have the app registered, when they cross the fence created by the industry, the appropriate officer will be alerted.
▶ 3.Customers waiting for package could be notified via text message when the delivery vehicle enters a certain radius of their home
▶ 4.When a person enter into the fence he created, his mobile phone would automatically switch to silent

mode and when he exit the fence the phone will get turned to general mode

7. CONCLUSION

In conclusion this paper was based on a advanced alert system using geo-fencing , the concept of geo-fencing can be used in a various ways and with the help of smartphones which are available with everyone and with the modern growing world GPS and google maps plays a very important role in locating the unknown places, to order food and get it home delivered and along with location sharing and geo-tagging, but this GPS can also be used in geo-fencing to create the virtual boundaries and get alert based on crossing boundaries and automatic alerts to self and automatic activities that takes place in the smartphones with advent of alerts and to make all these to happen a suitable application must be designed that is to be installed on the client device and suitable database must be there at the server side.

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