Implementation of various emergency and Public safety Web Services using GPS in Smartphone

<S.Kalirajan>*[1], <R.Hariharan>*[2], < R.Jambu>*[3]< L.Johnson>*[4], <G.Senthil Kumar>#[5]

[1] Final Year, Department of Information Technology,
SKP Engineering College, Tiruvannamalai, Tamil Nadu
kalirajanselvaraja@gmail.com

[2] Final Year, Department of Information Technology,
SKP Engineering College, Tiruvannamalai, Tamil Nadu
hari2318@gmail.com

[3] Final Year, Department of Information Technology,
SKP Engineering College, Tiruvannamalai, Tamil Nadu
jambulenoo@gmail.com

[4] Final Year, Department of Information Technology,
SKP Engineering College, Tiruvannamalai, Tamil Nadu
rathinajohnson@gmail.com

[5]Assistant Professor, Department of Information Technology,
SKP Engineering College, Tiruvannamalai, Tamil Nadu
gsksuccess@gmail.com

*Abstract— **The use of Smartphone's is being rapidly increasing day by day. In this paper, we propose the implementation of a new Location based services through Google Web Services and Walk Score Transit APIs to give multiple services to the android user such as giving the nearest location of hotels, police station,hospitals,banks and other necessary location based services. Thus providing major services to public safety, emergency and other consumer services that include navigation of maps, location based reminder and advertising. By connecting the GPS to Google web service can allow to perform these various services.***

*Keywords— **Android Mobile Operating System, Security Services, Web Services, GPS***

I. Introduction

The idea of using the mobile handsets and phones is to deliver the valuable services except the basic communication that had been started in the early 1990s when Internet was added in Voice Telephony.

Location-based services or LBS refer to 'a set of applications that exploit the knowledge of the geographical position of a mobile device in order to provide services based on that information.

Location based services provide the mobile clients personalized services according to their current location. They also open a new area for developers, cellular service network operators, and service providers to develop and provide value-added services: advising clients of current traffic conditions, providing routing information, helping the users to find some of the nearby shopping malls.

Location-based services offer many merits to the mobile clients. For the mobile user, the examples of location-based services are:
  1. To determine the nearest service, such as an Bank or Hotels
  2. Receiving alerts, such as notification of Sale in Shopping Mall or news of Traffic Jam nearby.
  3. Receiving the location of the stolen phone.

Location based Services can be classified in 3 categories:

A. Public Safety / Emergency Services :

The location of the client can be determined by the mobile carrier hence it finds great use during Emergency since it can be used during the emergency to locate the mobile clients.

B. Consumer Services:

Now days, smart phones like provides a set of location based applications and services which helps the users to access the multiple services based on the user location.

1) *Maps Navigation-* The users can use the Google Maps to get to the particular location or to trace the route between any two locations. *For example-* Trace the route between certain two destinations.

2) *Marketing/Advertising-* Many corporate companies advertise their items based on the location of the clients. For Example – Sale in Shopping Mall near to your location.

3) *Location based Reminders-* The phones can be used to set as the reminder based on the location. For example-Setting the Location based Alarm while traveling in the train.

There are two methodologies to implement Location Based Service:

1. To process location data in a server and to forward the generated response to the clients.

2. To find location data for a mobile device-based application that can use it directly.

To discover the position of the mobile, LBS must use the positioning methods in real time. The accuracy of this methodology depends on the approach used. Locations can be represented in various terms or as text descriptions.

A *spatial location can* be represented in the used latitude-longitude-altitude coordinate system. Latitude is defined as 0 to 90 degrees north or south of the equator and longitude as 0 to 180 degrees east or west of the prime meridian, that passes through Greenwich, England in which the Altitude is represented in meters above sea level.

A text description is usually defined as a street location, including city, pin code.

The location of the device can be retrieved by-

 1) Mobile Phone Service Provider Network- The current cell ID is used to locate the Base Transceiver Station (BTS) that the mobile phone is interacting with and the location of that BTS. It is the most basic method for this purpose as it uses the location of the radio base station that the cell phone is connected to the user.

A GSM cell may be anywhere from 2 to 20 kilometers in diameter. Other approaches used along with cell ID can achieve location granularity within 150 meters. The granularity of location information is poor due to Wide Cell Range. The advantage is that no additional cost is combined to the handset or to the network to enable this service.

 *2) Satellites-*The Global Positioning System (GPS) uses a constellation of 24 satellites orbiting the earth. GPS finds the user position by calculating differences in the times the signals, from different satellites, take to reach the receiver. GPS signals are decoded, so the smart phone must have in-built GPS receiver.

Assisted-GPS (A-GPS) is the new technology for smart phones that integrates the mobile network with the GPS to give a better accuracy of 5 to 10 meters. This fixes the position within seconds, has better coverage and can, in some cases, be used inside the buildings, consumes less battery power and requires fewer satellites.

The granularity of location information is most accurate (Latitudes and Longitudes).The disadvantage is cost of A-GPS enabled handsets for the user.

II. SYSTEM MODULES

In the last few years, the smart phones have taken over the market of Nokia based Symbian Phones in India. And these smart phones come equipped with A-GPS functionality which provides the spatial coordinates of the user location.

Android's Network Location Provider determines user location using cell tower and Wi-Fi signals, providing location information in a way that works indoor and outdoor, responds faster, and uses less battery power.

Assisted GPS, also known as A -GPS or AGPS, improves the performance of standard GPS in devices connected to the wireless network. A-GPS enhances the location granularity of cell phones (and other connected devices) in two ways:

1. By helping in finding a faster "time to first fix" (TTFF). GPS acquires and stores information about the location of satellites via the cellular network hence the information does not need to be downloaded via satellite.

2. by helping position mobile device when GPS signals are not strong or not present. GPS satellite signals may be impeded by tall towers, and they do not penetrate building interiors well. A-GPS uses proximity to cellular towers to calculate location when GPS signals are unavailable.

It addresses signal and wireless network problems by using assistance from other services. Such a technology in our smart phones can assist in various ways like tracking current location, etc..

 A. Android Location API:
 These are the different classes present under Location API package to retrieve the Location information of the user.

 1) *Location Manager*- The class provides access to the location service. It also provides facility to get the best Location Provider as per the criteria.

 2) *Location Provider*- It's an abstract super class for location providers. A location provider provides periodic reports on the geographical location of the device.

 3) *Location Listener-* This class provides callback methods which are called when location gets changed. The listener object has to be registered with the location manager.

 4) *Criteria*- The class provides the application to choose suitable Location Provider by providing access to set of required properties of the Location Provider.

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 Android also provide an API to access the Google maps. So with the help of the google maps and the location APIs the application can show required places to the user on the map.

 B. Google Places API:
 The Google Places API is a service that returns data about Places defined within this Web Service as, spatial

locations, or preferred points of interest using HTTP requests. Place response specifies locations as latitude/longitude coordinates.

The four types of requests are available with the Google Places API-

There are 4 fundamental Place services available:

1) *Place Searches* - It returns an array of nearby Places based on a location defined by the user.

2) *Place Details* - It returns more specific data about a user defined Place.

3) *Place Check-ins -* It allows the request that a person has checked in to a Place. Check-ins is used to gauge a Place's popularity; frequent check-ins will boost a place's priority in application's Place Search responses.

4) *Place Reports -* It allows the users to add new locations to the Place service, and to delete Places that the application has added to the database.

The Google Places API has the following limitations on the query processing:
Users are allowed only 1000 requests per 24 hour period which are having the API Key. Clients who have also validated their identity through the APIs console are allowed 100 000 requests for 24 hours period. A credit card is required for authentication.

C.Public Transport API:

The Public Transit API from Walk Score gives the Transit Score for any location listed with in its database and provides convenient access to nearby public transit stops.

We can use the Public Transit Services to:
   -To Add Transit Score to the application.
   -To View public transit stoppages on a map
   -To view the details about nearby transportation routes.

D.Stop Search API:
The stop search API call gives the data about the stoppages of the public transport near a given location. This call returns 16 stops that service unique routes near the user defined location. We can say, each stop must contain a unique route.Services. The different kinds of constraint include:

1) *Technology Constraints-*For LBS to be operational on a large scale, mapping under the geographical information system (GIS) needs to be more comprehensive than it is today. This raises significant challenges in for improving the breadth and the depth of the existing coverage of GIS. The most important factor in enabling the growth of LBS is wide availability of cheap GPS enabled handsets. GPS enabled handsets are being manufactured now days. The issue of cost remains to be tackled, since these phones are still all high-end units.

2) **Infrastructure Constraints-**One of the main problems is the lack of spread of the wireless network into the countryside. In developing country like India, the wireless technology is in very nascent stage. In metro cities and areas, the problem of network congestion is also an important issue. The percentage of service operators not meeting the congestion rate benchmarks has risen substantially.

3) **Market failure-**One of the main constraints to the provision of value added services, in general, and LBS in particular, is the market structure of the mobile industry and the failure to unleash the forces of competition. A key essential need for LBS provision needs cross-network connections to be seamless, and the current practices go against a cooperative attitude for LBS provision.

III. CONCLUSIONS

Mostly suited for mobile devices, A-GPS takes assistance from GPRS and at times, the service provider network information, to pin-point the current location accurately. Moreover the amount of CPU and programming required for a GPS phone is reduced by diverting most of the work to the assistance server instead.

A typical A- GPS enabled cell phone uses GPRS or other such Internet based data connection to build a contact with the assistance server for A-GPS. As this technique does not take into account the cell phone service provider network completely, we only pay for the GPRS usage charges and nothing else. The only down-side to this technology is that an A-GPS server cannot utilize any of the three standby satellites available for GPS connections.

AGPS minimizes the amount of memory and hardware that must be integrated into mobile devices in order to provide GPS-quality device locating ability as required by mobile devices. This keeps the mobile device simple and allows longer battery time.
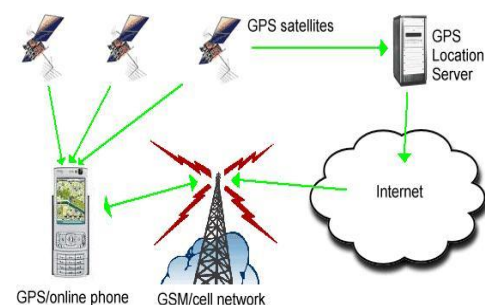
GPS is real-time solution provider whereas AGPS is not. The network usage is required every time we move out of the service area. It is useful only for locating a particular place in small area. There is no privacy in GPS and A-GPS since the Assistance server knows the location of the device.There needs to be communication over the wireless for processing of GPS information so this could be expensive.

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