

Android Location based Services

Prof. Nilima Walde¹, Pravindra Singh Khatri², Dheeraj Mehta³, A V Avinash⁴

Information Technology Department, Army Institute of Technology, Pune, India^{1,2,3,4}

Abstract: Location based Services offer many advantages to the mobile users to retrieve the information about their current location and process that data to get more useful information near to their location. With the help of A-GPS in phones and through Web Services using GPRS, Location based Services can be implemented on Android based smart phones to provide these value-added services: advising clients of current traffic conditions, providing routing information, helping them find nearby hotels. In this paper, we propose the implementation of Location based services through Google Web Services and Walk Score Transit APIs on Android Phones to give multiple services to the user based on their Location.

Keywords: Android Mobile Operating System, Location Based Services, Web Services, A-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 [1] 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 (LBS) 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 . Location-based services offer many merits to the mobile clients.

For the mobile user, the examples of location based services [2] are:

1. To determine the nearest business or 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. Friend finder or receiving the location of the stolen phone.

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

II. RELATED WORK

2.1 Android

Android is an operating system based on the Linux Kernel and designed primarily for touch screen mobile devices such as smart phones and tablet computers. Initially developed by Android, Inc., which Google backed financially and later bought in 2005. Location-based services or LBS [1] 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.' They also open a new area for developers, cellular service network operators, and service providers to develop and provide value-added services .

Location-based services (LBS) 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.

Location-based services offer many merits to the mobile clients Android was unveiled in 2007 along with the founding of the Open Handset Alliance—a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. The first publicly available smart phone running Android, the HTC Dream, was released on October 22, 2008. The user interface of Android is based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching and reverse pinching to manipulate on-screen objects.

2.2. Versions of Android

1	Android	beta	
2	Android	1.0	
3	Android	1.1	
4	Android	1.5	
5	Android	1.6	Donut
6	Android	2.0/2.1	Eclair
7	Android	2.2.x	Froyo
8	Android 2.3.x	Gingerbread	
9	Android 3.x	Honeycomb	
10	Android 4.0.x	Ice Cream	Sandwich
11	Android 4.1.x	Jelly Bean	

2.3. Global Positioning System (Gps)

Since the Global Positioning System (GPS) was declared fully operational by the United States Department of Defense in 1995, it has seen widespread use by both military and civilian applications . This was the first system that allowed anyone with a GPS-capable device to near-instantly determine his location on the earth without special training or knowledge. In the most basic sense, a GPS device answers the question 'Where am I ?' using absolute coordinates (latitude, longitude, and usually elevation).

In order to compute position, a GPS device listens for and locks on to at least 4 satellite signals. For civilian use, these signals are broadcast on the L1 (1575.42 MHz) frequency, and use a special modulation method to ensure that signals from various satellites do not interfere with

each other even though they are on the same frequency . Each satellite broadcasts its specific absolute position as well as a carefully calibrated time signal. All satellites in the constellation continually calibrate their clocks among each other so that they all are running on precisely the same time. Depending on the relative distances of the satellites, the signals are received by the GPS device . Using 3 signals, the device can determine the distance of each of the 3 satellites and compute its position relative to the satellites as shown in Figure 2.1. It then uses the satellites broadcasted absolute positions to determine its own absolute position (latitude, longitude, and altitude).

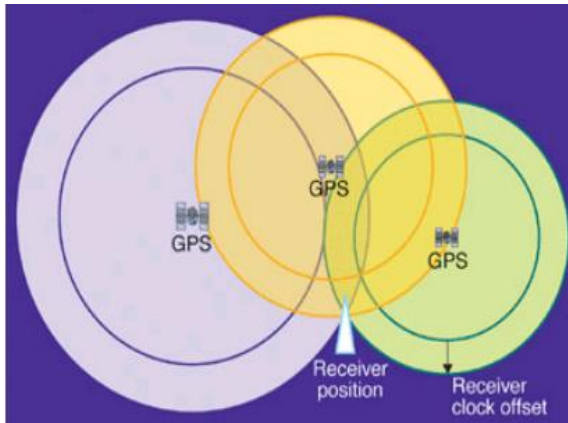


Figure 1: A GPS device determines its position based on the relative time delays of signals received from GPS satellites

2.4. Components of LBS

Location-Based services (LBSs) comprise the automatic tailoring of information and services based on current location of the user. The availability of various wireless interfaces such as Bluetooth , RFID, Wi-Fi etc. and external positioning technology like GPS in most of the mobile devices motivates the researchers and telecom operators to work in the field of providing LBSs to mobile users.

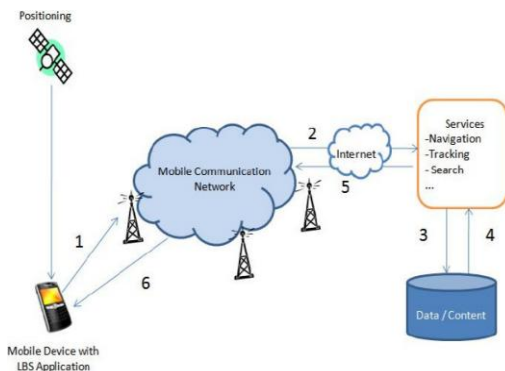


Figure 2. LBS components and Service Process

Location-Based Services (LBSs) comprise the automatic tailoring of information and services based on current location of the user. The availability of various wireless interfaces such as Bluetooth , RFID, Wi-Fi etc. and external positioning technology like GPS in most of the mobile devices motivates the researchers and telecom

operators to work in the field of providing LBSs to mobile users.

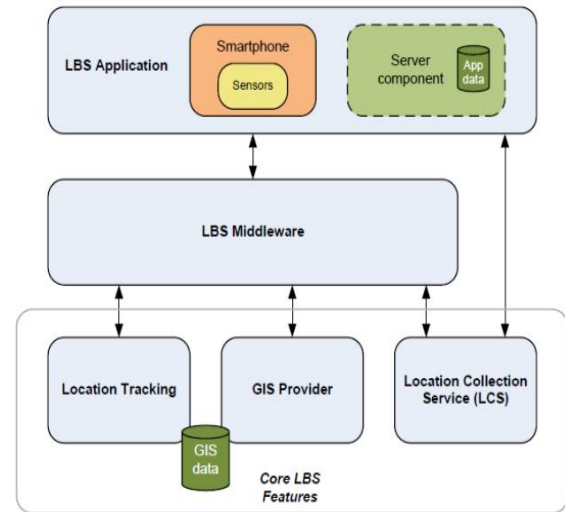


Figure 3. Components of LBS

Layer	Function	Examples
Application	Providing or determining application-specific data	Urbanspoon
Mapping	Rendering a user's current location and other points of interest on a map	Google Maps API, Microsoft Live Maps
Geocoding	Converting a civic address (street address) into geographic coordinates (latitude & longitude) ⁹ or vice versa	Yahoo Maps API, geocoder.us, Google Maps API
Geolocation	Determining a user's location based on observed information such as wireless access point or cell tower identifiers	Skyhook, Google Gears API

Figure 4. Description of layers in LBS

III. METHODOLOGY / SYSTEM MODEL

Location-based service is another key functionality that gets used in smart phone applications. It is often combined with maps to give a good experience to the user about their location.

Android support LBS Application Programming Interfaces (APIs)[7]. Location service allows finding out the device current location. The application can request for periodic update of the device location information. The application can also register a intent receiver for proximity alerts like when the device is entering and existing from an area of given longitude, latitude and radius.

3.1 Android Location API

These are the different classes under Location API package to retrieve the Location information of the user :- Location Manager - The class provides access to the location service. It also provides facility to get the best Location Provider as per the criteria.

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

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.

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

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.

3.2. Services

We developed the mobile application on Android covering all the mentioned APIs and the application was tested using Samsung Galaxy S handset (which is A-GPS enabled handset).

Android Version – 2.1 (Eclair)

Android Permissions –

android.permission.INTERNET
android.permission.ACCESS_FINE_LOCATION
android.permission.ACCESS_COARSE_LOCATION

There are 2 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.

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.

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. The most important factor in enabling the growth of LBS is wide availability of cheap GPS enabled handsets. 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.

IV. PERFORMANCE ANALYSIS

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/health hazard to locate the mobile clients.

b) Consumer Services

Now days, smart phones like (Android, Blackberry and iPhone) provide 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.
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.

1. Location based Reminders- The phones can be used to set as the reminder based on the location.

For e.g. - Setting the Location based Alarm while travelling in the train.

There are two methodologies to implement LBS :-

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.

V. CONCLUSION

There are various constraints to implement Location Based Services. The different kinds of constraints include :-

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.

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.

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.

REFERENCES

- [1] Location Based Services on Mobile in India For IAMAI - Version: 14 April 2008 http://www.iamai.in/Upload/policy/LBS_Draft_Indicus.pdf.
- [2] J2ME and Location based Services By Qusay H. Mahmoud - March 2004 <http://developers.sun.com/mobility/apis/articles>

- [3] Location Based Services By Valerie Bennett
<http://www.ibm.com/developerworks/ibm/library/i-lbs>
- [4] Android Wireless Application Development By Shane Condor and Lauren Darcy.
- [5] GPS Signal Acquisition and Tracking – An Approach towards Development of Software based GPS Receiver By Dinesh Manandhar, Yongcheol Suh, Ryosuke Shibasaki
- [6] ebServices.org Home Page <http://www.webservices.org>
- [7] Location Manager APIs– Android Developer
<http://developer.android.com/reference/android/location/.html>
- [8] Google Places API
<http://code.google.com/apis/maps/documentation>.
- [9] Google Maps API
<http://code.google.com/apis/maps/documentation/imageapis/index.html>.
- [10] Walk Score Transit API
<http://www.walkscore.com/professional/public-transitapi.php>
- [11] Google Geo Coding APIs
<http://code.google.com/apis/maps/documentation/geocoding>.
- [12] Location Management for Mobile Devices Erik Wilde (School of Information, UC Berkeley) - February 2008
<http://dret.net/netdret/docs/wilde-irep08-016-bilelocation.pdf>