Trendsetter:Location Service using Android

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Abstract: **Initially mobile phones were developed only for voice communication but now days the scenario has changed, voice communication is just one aspect of a mobile phone. There are other aspects which are major focus of interest. Two such major factors are web browser and GPS services. Both of these functionalities are already implemented but are only in the hands of manufacturers not in the hands of users because of proprietary issues, the system does not allow the user to access the mobile hardware directly. But now, after the release of android based open source mobile phone a user can access the hardware directly and design customized native applications to develop Web and GPS enabled services and can program the other hardware components like camera etc. In this paper we will discuss the amazing application of GPS services to predict trends among all our connection and make useful analysis.**

Keywords : Android, LBS, GPS, Google Maps

I. INTRODUCTION

With the development of the information era, people hope to access data anywhere and anytime. To meet this urgent requirement, mobile computing is researched as the ultimate combination of computing and mobile communication technology. Mobile communication gradually changes its trends from simple voice communications to complex data communications. Short messages and mobile internet business have been widely used in China, which are the best cases [1].

II. SIGNIFICANCE AND APPLICATIONS of LOCATION BASED SERVICES

LBS (Location Based Services)

Location Based Service (LBS) is a platform that provides information services based on the current or a known location, supported by the electronic map platform. The location information (latitude and longitude coordinates) of mobile end user can be obtained through the mobile communication network or the Global Navigation Satellite Systems (GNSS) [3]. The research focusing on LBS is vast and a number of these services have been implemented and tested. Tourist information systems are ideal examples for such applications, for example, Tourist Guide project [5], CyberGuide project [6] and PinPoint Tourist Guide [7]. These systems offer information to tourists taking into account their current locations.

Location Based Services (LBSs) provide personalized services to the subscribers based on their current position using Global Navigation Satellite System (GNSS), Geographic Information System (GIS) and Wireless Communication (WC) technologies. LBS offers modern world the tool for efficient management and continuous control. More and more people involve LBS in their industry and day to day life to better achieve their goals. The increasing demand for commercial LBS has driven scientists to focus on more accurate positioning solutions. It employs accurate, real-time positioning to connect users to points of interest and advises them of the current conditions such as traffic and weather conditions, or provides routing and tracking information using wireless devices. It is important to integrate the mobile computing technology and the GIS technology in order to meet the needs of LBS, which is considered one of the most promising applications of GIS[10].

Location-based service (LBS) provides a user with contents customized by the user's current location, such as the nearest restaurants/hotels/clinics, which are retrieved from a spatial database stored remotely in the LBS server. LBS not only serves individual mobile users, but also plays an important role in public safety, transportation, emergency response, and disaster management. With an increasing number of mobile devices featuring built-in Global Positioning System (GPS) technology, LBS has experienced rapid growth in the past few years.

Context Aware Games

Context Awareness is another variation of LBS specially used in games. For example in a game if playing environment and circumstances are generated according to the profile of current operator then the game becomes more interesting and attractive. This is an example of CAS based system. Often it is used interchangeably with LBS but actually it is somewhat different from LBS. Context Awareness is a concept of performing operations depending upon the contrast. If the contrast is a location then this is said to LBS. CAS can bring benefits in game. And with the advancement in the mobile games CAS is a

good and attractive feature to make the game more interesting and attractive. In this article we will use the CAS only for location contrast.

Use of Location Based CAS in Games

1. Though CAS is not a new technology currently, however, applying CAS in games is still new. Young people prefer new things and will try new things, thus, CAS provides this chance. In the same way, CAS in mobile phone serious game is still new, and this new element can arise people's desire in engaging.

2. CAS game can bring new experiences in game. CAS game can bring some 'accidents', for instance, when players go to certain places, they will meet enemies while they move to others, they may get some ammos. In order to finish the game or meet the game scenario, players have to move everywhere; and tradition mobile phone game cannot provide this experience.
3. In the same way, LBS can make mobile phone serious game more realistic. For instance, a LBS serious game requires players get 'flats' along the road guided by digital map. When players engage, they can learn how to identify directions.
4. Thirdly, LBS game provides new development opportunities. The competition among developers is sharp. CAS can be a new element in mobile phone game and extend the game development scope. CAS provides new opportunities for some existing developers or new entrants to rise.
5. LBS game provides one more opportunity for developers to create new kinds of mobile phone game.

Location Tracking Services

Location-tracking service is the second occasion of LBS application. The Location-tracking service system for the children or the elderly has been developed for safety purpose [8]. Besides, CyberMinder is an intelligent reminding service, which allows the user to define complex conditions. Whenever a combined condition is fulfilled, the system generates a message box alert with voice. For example, day is through Monday to Friday, time is 8 AM, and location is "home", all conditions above are fulfilled will generates a reminder "It time to go to work"[9].

Other Applications of LBS

LBS is a concept that can be utilized widely. LBS can be applied in public and safety industry, such as emergency service in medical [11]; tracking industry[8], such as fleet management; personalization information industry, such as query the nearest restaurant; navigation industry, such as digital map; payment and so on. It can be particularly powerful when combined with other user profile information to offer personalized and location sensitive responses to customers, this form is called the context aware system. Some instances can be described below.

Emergency, Safety and Medical/Health Services: many governments are moving to require cellular operators to develop the capability to automatically identify subscribers' locations in the event of an emergency. This data would then be forwarded to the appropriate public safety answering point to coordinate the dispatch of emergency personnel.

Information Services: a query about local theaters might be extended to focus only on those playing a specific movie. Or, rather than look for particular types of businesses, a customer may input a specific product, and ask for all businesses in the area that carry it. If the database includes other product information, such as prices and other terms, then real time comparison shopping may be feasible en route or even inside
stores.

Navigation/Routing: in addition to identifying the location of various destinations, LBS can also be employed to guide users along the best routes. If integrated with real time traffic data, such route guide services may also make routes contingent on current traffic conditions.

Tracking: last minute delivery changes can be made based on truck inventory and location , enhancing efficiency and customer service. Tracking can also be combined with navigation services to help with route optimization for deliveries.

Architecture of LBS Systems

In (a) Pull-based model, a Location Proxy sits between client application and LBS application. When the client initiates LBS request to the LBS application, his/her location information is attached to the request by Location Proxy and then forwarded to LBS application. In this case, location aware service is delivered while the client pulls the information from services. Usually Location Proxy is integrated into a middleware infrastructure upon which service is deployed, such as IBM Websphere Everyplace Suite. This model facilitates LBS developer in building and deploying LBS applications in the sense that the location retrieving is
transparent and existing application could be converted to location-aware ones easily.

In (b) Poll-based model, LBS application actively sends location request via well defined or industry standard location interface to location server (LS), which is responsible for getting the location of requested client. In this model, LBS application keeps polling LS or queries LS on demand in order to answer questions from client. The advantage of this model is that more advanced location functionaries (such as periodic location report supported by LIF and WAP) could be supported and a standard location interface makes widely distributed location

aware computing (e.g., location Web Service) possible.

In (c) Push-based model, the LBS application pushes location-aware information to client according to the user preference by tracking the position of mobile users. Push model enables the scenario of delivering right information to right people on right time at right location.

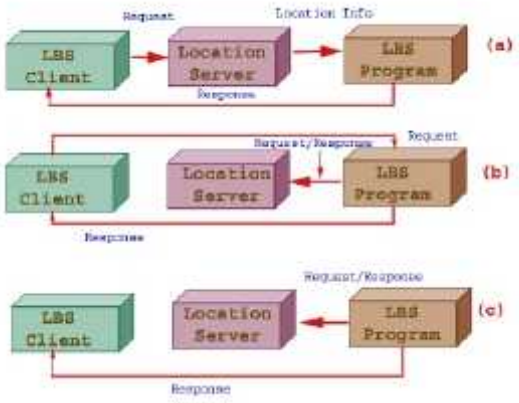

Fig 1: Three Models of LBS Services

IV. ANDROID AND ITS POWERFUL FEATURES

Android is the first open source mobile application platform that has the potential to make significant inroads in many markets.

Android has powerful APIs, excellent documentation, a thriving developer community, and no development or distribution costs. As mobile devices continue to increase in popularity, this is an exciting opportunity to create innovative mobile phone applications no matter what your development background.

Android sits alongside a new wave of mobile operating systems designed for increasingly powerful mobile hardware. Windows Mobile and Apple's iPhone now provide a richer, simplified development environment for mobile applications. However, unlike Android, they're built on proprietary operating systems that often prioritize native applications over those created by third parties and restrict communication among applications and native phone data. Android offers new possibilities for mobile applications by offering an open development environment built on an open source Linux kernel. Hardware access is available to all applications through a series of API libraries, and application interaction, while carefully controlled, is fully supported. In Android, all applications have equal standing. Third-party and native Android applications are written using the same APIs and are executed on the same run time. Users can remove and replace any native application with a third-party developer alternative; even the dialer and home screens can be replaced.

Android vs. The feature-phones

The overwhelming majority of cell phones on the market are the consumer "flip phones" and "feature phones". These are the phones consumers get when they walk into the retailer and ask what can be had for "free", or the "I just want a phone" customer. This customer's primary interest is in a phone for voice communications and perhaps an address book and maybe even a camera. Many of these phones have more capabilities such as mobile web browsing, but due to a relatively limited user experience, these features are not employed heavily. The one exception to that is text messaging which is a dominant application, no matter what the classification of device. Another increasingly in-demand category is location based services. Android's challenge is to scale down to this market. Some of the bells and whistles in Android can be left out to "fit" into lower end hardware. One of the big functionality gaps on these lower-end phones is the web experience. Part of this is due to screen size, but equally challenging is the browser technology itself which often struggles to match the rich web experience of the desktop computer. Android features the market-leading Web Kit browser engine, which brings desktop compatible browsing to the mobile arena. Following figure demonstrates the Web Kit in action on Android. If this can be effectively scaled down to the feature phones, it would go a long way towards penetrating this end of the market.

Fig 2: Inbuilt Web Kit in Android

Google Maps and Geocoding Support

Native map support lets you create a range of map-based applications that leverage the mobility of Android devices. Android lets you create activities that include interactive Google Maps as part of your user interface with full access to maps that you can control programmatically and annotate using Android's rich graphics library. Android's location-based services manage technologies like GPS and Google's GSM cell-based location technology to determine the device's current position. These services enforce an

abstraction from specific location-detecting technology and let you specify minimum requirements (e.g., accuracy or cost) rather than choosing a particular technology. It also means that your location-based applications will work no matter what technology the host handset supports. To combine maps with locations, Android includes an API for forward and reverse geocoding that lets you find map coordinates for an address, and the address of a map position.

Fig 3: Android Supports Satellite and Map View

V. LBS PROGRAMMING IN ANDROID

Android provides access to the following components to facilitate the implementation of LBS services;

1. Location Manager
2. Location Provider
3. Geocoding
4. Google-Map

Location Manager

LocationManager class of android is present to manages all other components needed to establish a LBS system.

Location Provider

Location provider represents the technology to determine the physical location i.e. to handle GIS. *LocationProvider* component of Android application is a present to facilitate the determination of available provider and selection of suitable one.

Finding the List of Available Location Provider

To get a list of names for all the providers available on the device, call getProviders, using a Boolean to indicate if you want all, or only the enabled, providers to be returned:

```
boolean enabledOnly = true;
List  providers = locationManager.getProviders(enabledOnly);
```

In addition to this GPS provider and Network provider can be accessed directly by using the static variables defined in the LocationManager class:

```
LocationManager.GPS_PROVIDER
LocationManager.NETWORK_PROVIDER
```

Furthermore for finding the provider on the basis of some criteria we can use the criteria class and then can find the best provider for defined criteria using the BestProvider Method as shown is the following code snaps:

```
Criteria criteria = new Criteria();
criteria.setAccuracy(Criteria.ACCURACY_COARSE);
criteria.setPowerRequirement(Criteria.POWER_LOW);
// more criteria here
String bestProvider = locationManager.getBestProvider(criteria, true);
```

If more than one provider is available fulfilling the given criteria then the one with best performance is returned. On the other hand if no provider is found for the defined criteria then criteria are loosened in order Power use, Accuracy, Ability to return bearing, speed, and altitude.

Geocoding

Reverse geocoding provides a way to convert geographical coordinates (longitude, latitude) into street address and forward geocoding provides a mean to get geographical coordinated from street address.

For forward geocoding we use getLatitude() and getLongitude() method as shown is the following code block

```
double latitude = location.getLatitude();
double longitude = location.getLongitude();
```

For reverse geocoding we use getFromLocation method with geocoder variable as shown is the following code block

```
//geocod is geocoder variable
addresses = geocod.getFromLocation(latitude, longitude, 10);
```

Google Map in Android

Android provides a number of objects to handle maps in LBS system like MapView which displays the map. To handle this a MapActivity class is there. To annotate map it provides the overlays class. Even it provides canvas by which one can easily create and display multiple layers over the map. Moreover, sufficient provisions are there to zoom the map, localize the map by means of MapController.

Following code-line shows the Map Handling in Android:

```
<com.google.android.maps.MapView
android:id="@+id/map_view"
//specify different attributes
/>

// map controller
```

```
MapController mapController = myMapView.getController();
mapController.setCenter(point);
mapController.setZoom(1);

//List of present overlays

List<Overlay> overlays = mapView.getOverlays();

// adding a new overlays
MyOverlay myOverlay = new MyOverlay();
overlays.add(myOverlay);
mapView.postInvalidate();
```

Following figure shows a map on android set with overlays:

Fig 4:Map on Android with Overlays

VI. K-MEANS ALGORITHM

In data mining, *k*-means clustering is a method of cluster analysis which aims to partition *n* observations into *k* clusters in which each observation belongs to the cluster with the nearest mean. This results in a partitioning of the data space into Voronoi cells. The problem is computationally difficult (NP-hard), however there are efficient heuristic algorithms that arecommonly employed and converge quickly to a local optimum.

These are usually similar to the expectation-maximization algorithm for mixtures of Gaussian distributions via an iterative refinement approach employed by both algorithms. Additionally, they both use cluster centers to model the data,however *k*-means clustering tends to find clusters of comparable spatial extent, while the expectation-maximization mechanism allows clusters to have different shapes.

Now to implement trendsetter we would need to record geo-data of a device on a database server. When requested our algorithm will generate results specific to each user. The overall result will depend upon number of person connected with application as well as overall frequency distribution of hotspots. It will lead to convenience for users as in making better decisions as well as help identify quality services. Our app will display a list of top 5 search result for each search keyword based on results generated by logic servers.

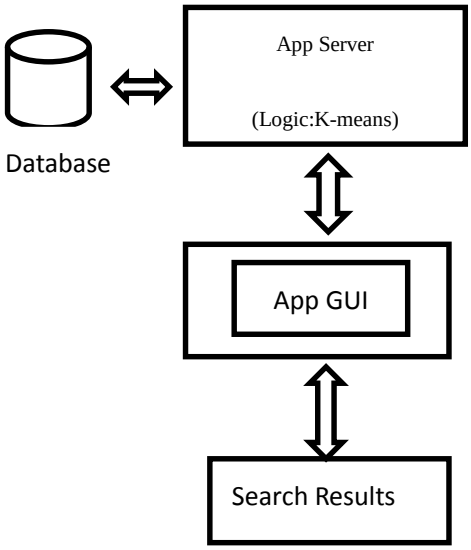

Fig 5: Block model of Trendsetter

VII. CONCLUSION

As we have seen so far today mobile devices are playing a major role in every person's life. Loads of data are shared over internet via mobile applicatios. After the advent of Android OS, millions of apps have been designed providing various functionalities to users. Google maps have already been providing various geo services as in location tracker, distance finder, traffic analyser, route prediction,etc. We are extending its

features by applying trendsetter along with it. It will ease users decisions dilemma via great extent as it will show results based on user's various connections and contacts. It could be easily integrated with existing social networking sites to get contacts as well as more geo data in order to improve the results. Another addded feature could be friend finder which will locate friends in proximity and provide ease to connect with them.

Possibilities are endless with open source as each developer is leaving a legacy behind for another to develop even better applications. As we'll progress one could easily develop an smart app with minimal coding knowledge. Android comes bundled with lakhs of pre-written classes which just need to be implemented. So anyone with a great idea in their mind could make great apps with least effort and contribute to open source world.

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