Mode Manager: A GPS/Cellular Network based Context aware application

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Abstract

The next generation of computing belongs to context aware applications. These applications running in the background are invisible and calm. With advances in mobile networks and hi-speed connectivity it becomes a lot easier to track a user and identify his context. The location of a user can be tracked either with the help of GPS or by cellular network service provider. Our application aims to identify the user location and accordingly switch the mode of user's smart device.

Keywords: *Location Based Service, Context-aware Application, ubiquitous application, GPS, cellular networks, Android OS, Mode manager.*

1. Introduction

The first wave in computing started in the early 40's and continued till the late 70's. It was an era wherein one computer served multiple users. The second wave commencing in 80's, peaked in the current times and still reigning is the personal computer wave (one computer serving one user). The third wave is that of context aware applications several computers serving each person everywhere in the world. Some computer scientists had suggested that "intelligent agents" will be the words that will describe the third wave of computing, these agents will serve every need of the human. But, the defining words will be 'calm', 'invisible' and 'connected'. [1]

The third wave of computing is context-aware computing or due to its ubiquity (present everywhere) can be called ubiquitous computing. All the context-aware applications providing Location Based Service (LBS) have three fundamental parameters common to serve the user – location, time and movement. Besides, a few other parameters (user profile, etc.) vary according to the service being provided by the application.

Position and location of user are two different concepts. A real world LBS is the fleet management service developed for Athens Metropolitan area to track position of vehicles and divert them according to the condition of traffic ahead of them. The position of a vehicle is tracked with the help of GPS tracking device attached to the vehicle. Position is the latitude and longitude (x and y co-ordinate relative to earth). But position itself cannot determine the complete context. We also need to know the traffic ahead of us within 5-10km of radius of our current position. This radius is called as reach. Position and reach together are called location of the user. [2]
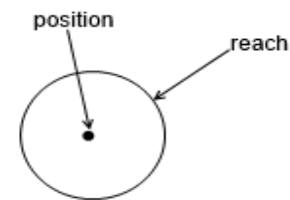
Location=position+reach

Figure 1 Concept of position, reach and location

The GSM alliance services working group have suggested the following areas for development of Location Based Services:
Emergency Services, Emergency Alert Services, Home-zone billing, Fleet Management, Asset Management, Person Tracking, Pet Tracking, Traffic Congestion Reporting, Routing to Nearest Enterprise, Roadside Assistance, Navigation, City Sightseeing, Localized Advertising, Mobile Yellow Pages, Network Planning and Dynamic Net.[3]

Time- the fundamental parameter of LBS is important in decision making based on user location. In fleet management as the time proceeds the traffic may resolve and the vehicle can again traverse the road that was previously blocked.

Similarly, movement of the user is the other important aspect of LBS. Direction of user's movement relative to previous position, angle of the user to the initial position, distance covered and the time taken to cover the distance. To track user location we use GPS or in certain rough cases we do it with the help of cellular networks.

The Mode Manager application that we have developed continuously keeps a tab on user position, the moment a user of this application enters a certain zone (silent zone, inside an aircraft, etc) the mode of a smart device switches accordingly.
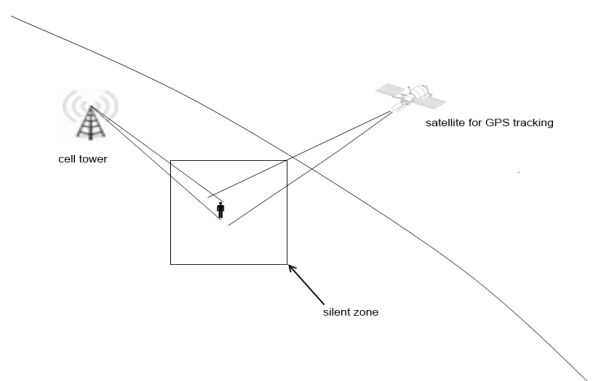

Figure 2 Track user location.

2. Implementation

The application aims to make smart devices aware of their surroundings. Almost all the smart devices are equipped with GPS (Global Positioning System). GPS is a space based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the earth where there is unobstructed line of sight to four or more GPS satellites.

Some smart devices do not have GPS access. The location is tracked with the help of cellular network provider. Our application is developed for the Android OS. Our application compares the current location of the user with Google maps and identifies whether the user is in a silent zone viz. a hospital, school, etc. and

notifies him/her about it and switches the mode of the smart device to silent.
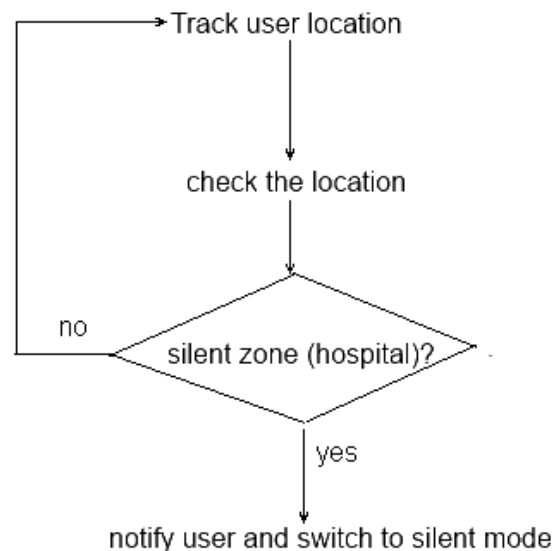

Figure 3 Overview of the application

The application runs as a background service and thus does not affect the normal functioning of the device. The user is notified of the change in mode. The user can also alter the settings and accordingly permit the application to make changes.

The Android APIs used in the development of the application are GPS tracker (to track using GPS), Audio manager to manage the mode of device, user permissions to track location with the help of cellular network provider, use of GPS and switching mode. Besides, Google maps provide exact location of hospitals and educational institutions, using their latitudes and longitudes we can create a database of silent zone locations and accordingly switch the mode using the mode manager application all around the globe.

The user can also customize the application by adding locations to the list of already existing locations to switch the mode of smart devices accordingly. Thus, in office if a user wants to add a location of meeting room as silent area, the user can mark it in the application and thereon the application will update its database and take care of the mode.
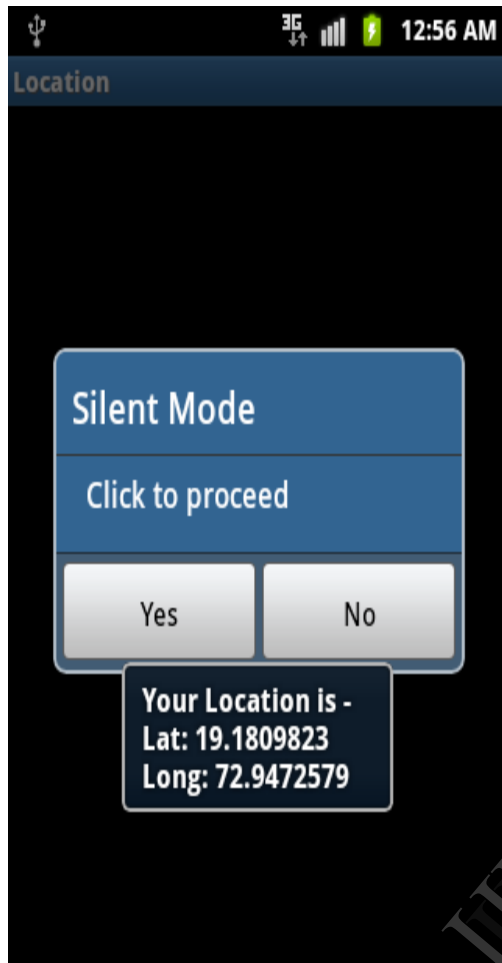
Figure 4 Snapshot of the Application.

5. References

[1] Open House by Mark Weiser Principal Scientist, Xerox PARC March 1996.

[2] The Use of Ontologies in Location-based Services: The Space and Time Ontology in Protégé Dieter Pfoser and Nectaria Tryfona.

[3] The GSM Alliance Services Working Group. http://www.gsmworld.com/about/structure/serg.shtml as of Dec. 2003.

3. Future Scope

The application can be integrated with the Android OS and can have a repository of locations around the world. The smart devices can switch the mode accordingly as they move from one location to other around the globe.

Hospitals, educational institutions, meeting rooms, movie theatres, holy places, inside an aircraft, etc. are all the places that can be tracked and action taken by mode manager application.

4. Limitations

As the application continuously runs in the background, tracking user location with the help of GPS and cellular network, there is a problem of battery drain.

At certain places where range of cellular networks and GPS couldn't reach, the application fails.