Location-Based Services (LBS)

SUMMARY:

Introduction

Location-based services are services where knowledge of the end users' location is used to provide "relevant, timely, and engaging content and information." There are a few different methods of retrieving this information. Cell tower triangulation is used for low resolution tracking, whereas higher resolution tracking can involve GPS and other systems. This information can then be used to provide users with specific services and data to make their experience a better one.

Opportunities

The users' needs and activities constantly change depending on their location. Once the infrastructure is in place, a lot of different services can be offered. Examples of such services could be GPS/navigation information, targeted commercials and event notifications (e.g. in shopping malls or commercial streets), specialized services like golf or fishing assistants, and so on. The service should be worth compromising the users' location to be effective and useful.

Challenges

The biggest challenge is obtaining accurate location information. This is tough to do currently due to the limited infrastructure setup. Only a handful of phones come equipped with GPS, and not all carriers support it—even then, tracking location indoors can be quite difficult due. Privacy is another issue, where users might feel reluctant to give away their location information. This could also be seen as intrusive—for example, if users are bombarded with commercials and sale notifications every time they drive by a mall.

Further Research Areas

Can there be cheaper, faster alternatives to GPS and similar methods? How can such services be personalized so that it offers users an incentive to sign up for them?

FULL WRITE-UP:

Users' needs and activities constantly change depending on their location. This information can be used to provide users with a very unique experience, depending on where they are. For example, fishermen can use LBS to obtain sonar information to find out where there is an abundance of fish; business owners can use LBS to track their fleets; tourists can use LBS to familiarize themselves with a place; and so on.

Demand drivers for LBS include emergence of broadband wireless networks like UMTS, 4G, and so on. The evolution of more sophisticated devices also increases the need for better, richer services—previously disparate devices are now integrated into a single device (e.g. GPS, mobile phones, and computers).

Methods of Retrieving Location Information

Cell triangulation

Cell triangulation is currently the only way of knowing users' locations. It uses information from cell broadcast towers to determine the location of a user. This method is usually accurate to about 100m, although the error could increase in remote locations due to the presence of fewer towers. Primary users of this type of location information are the carriers and emergency services—Federal E911 protocol states that any 9-1-1 caller's location must be transmitted to emergency services.

GPS/aGPS

Global Positioning System comprises a transceiver embedded into a device and satellites that can communicate with this transceiver. It functions just like cell triangulation, except it is more accurate because satellites are capable of better communication and calculation than towers. aGPS uses the GPS system, but it also involves a third facet—that of a land-based computer system. These computers act as intermediaries and take on the processing load off the users' devices. This allows for faster calculation of location information. This is very relevant in providing LBS as mobile phones have limited resources. In the outdoors, GPS is able to trace location to an accuracy of 5m.

Hybrid

This method involves using two or more methods and networks in tandem. This is currently used by military primarily to guide missiles, which need to be delivered with pinpoint precision. This technology is fairly expensive and unobtainable by civilians because of its sophistication.

Possibilities of Location-Based Services

"Where am I?" type of services

These kinds of services would include navigation information, maps of the immediate area, and directory services like finding a nearby restaurant, movie theater, or gas station.

Point-of-need services

These services would include targeted commercials (e.g. a shop within a mall may advertise its monthly special when users walk by) and any other service that takes advantage of the users' location context to provide them with services.

M-tourism

This is a unique concept that would act as a guide for tourists, be it a new city or even a museum. A virtual tour with interesting sites/landmarks can allow tourists to explore for themselves and give them more flexibility.

Niche/Specialized services

Such services would be targeted at specific users. For example, golfers could get course information, fishermen could get sonar and GPS location of fishing hotspots.

Industrial applications

Various aspects of industry like fleet tracking (GPS-enabled devices on trucks), asset management (embedded GPS transceivers on business computers), or security (enhanced response time for emergencies) can be handled using LBS.

Project management

Work flow can be streamlined by reducing human errors. For example, the Pentagon reconstruction program [1] uses location information to provide point-of-location updates like what work needs to be done in the room, what needs to be checked and so on. Employees in Japan often use LBS to familiarize themselves with a new work locations.

Carrier applications

Carriers, too, can benefit from LBS. They can manage cells more efficiently by using accurate location information, which would make cell handoffs much easier.

Other Considerations

Current infrastructure is limited and cannot handle increasing number of LBS customers. Although infrastructure setup is a one-time cost, it is huge and small carriers may be unable to handle it.

Privacy of information would be the biggest consumer concern. A good system would be as unintrusive as possible, while providing users with useful information. Commercials and mass advertising would make LBS less appealing to customers.

Personalization of services is another feature that would make LBS highly desirable. An option for personalization could be creation of personas, which would store user preferences. This would reduce the intrusiveness of the service.

REFERENCES:

1. **Rao, Bharat et. al.(2003).** *Evolution of Mobile Location-Based Services*, Communications of the ACM.
2. **Grajski, Kamil &Kirk, Ellen (2003).** *Towards a Mobile Multimedia Age – Location-Based Services: A Case Study*, Wireless Personal Communications. IEEE Xplore.
3. **Barkuus, Louise & Dey, Anind (2003).** *Location-Based Services for Mobile Telephony: a Study of Users' Privacy Concerns*, INTERACT 9th IFIP TC13 Int'l Conference on HCI. Intel Research, Berkeley.
4. **Wang, Peter; Wylie-Green, Marilynn & Malkawi, Maged (2001).** *E-911 mobile location and location-based technologies*, Proceedings of SPIE Vol. 4586. IEEE Xplore.
5. **Schmidt-Belz, Barbara; Achim, Nick; Poslad Stefan & Zipf, Alex.** *Personalised and Location-based Mobile Tourism Services*. Inspec.