

# The University Consortium for Geographic Information Science

## Research Priorities



### LOCATION-BASED SERVICES - GIS FOR PERSONAL PRODUCTIVITY

#### THE PRIORITY

Develop a series of concepts, data structures, and analytical tools to provide efficient and accurate location-based services that enhance personal productivity and quality of life.

#### DESCRIPTION OF RESEARCH CHALLENGE

It is widely believed that about 80 percent of public and private decisions are related to some sort of locational consideration, leaving only few areas that are not affected by geographical considerations. The Internet puts an unprecedented amount of geographic information of all kinds at a user's fingertips, information that can be used for personal activities in a large variety of ways.

Location-based services (LBS) - sometimes called location-based mobile services (LBMS) - are an emerging technology combining information technology, GIS, and ITS. An enormous market can be foreseen in this field, including the market for tracking, route-finding and guiding, notification and alert services. This is expected to reach \$15 billion per year by 2005 (see <http://www.isotc211.org/> for additional details).

LBS combine hardware devices and wireless communication networks with geographic information and software applications to provide location-related guidance for customers. It differs from mobile position determination systems, such as global positioning systems (GPS), in that LBS provide much broader application-oriented location services, such as the following:

"You are about to join a ten-kilometer traffic queue, turn right on Washington Street, 1 km ahead."

"Help, I'm having a heart attack!" or "Help, my car has broken down!"

"I need to buy a dozen roses and a birthday cake. Where can I buy the least expensive ones while spending the minimum amount of time on my way home from the office?"

A typical example using LBS to facilitate or improve personal navigation would include the following:

- Entering address to desired destination (Geocoding).
- Subscriber wishes to start from their current position and add one stop along the way (Gateway).
- Determining the route (Route Determination).

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The UCGIS is a non-profit organization of universities and other research institutions dedicated to advancing the understanding of geographic processes and spatial relationships through improved theory, methods, technology, and data.

- Presenting route summary to subscriber.
- Presenting turn-by-turn directions to subscriber.
- Subscriber wants to see a map overview with the route shown (Presentation).
- Subscriber is now in transit and wants to see maneuvers (Gateway and Presentation).

## IMPORTANCE OF RESEARCH CHALLENGE

GIS has been mostly used for the institutional purposes in the past. Now, the rapidly evolving wireless technology makes it possible to utilize GIS for personal productivity such as finding the best routes to go to the destination, finding points of interest, finding friends, finding the current traffic conditions, and other wide variety of convenience (concierge) services for entertainment, leisure, sports, shopping, travel, local information, community interest, health, education, banking, hobbies, services, and so on.

## EMINENT RESEARCH QUESTIONS

While the LBS market seems to be rapidly emerging, there are many basic research issues to be addressed. The following list highlights some of the issues that need to be researched for providing efficient and accurate location-based services for personal productivity:

- Utilization of the real time data in its appropriate spatio-temporal context in GIS
- Development of spatio-temporal topology in GIS
- Development of efficient means to handle large data sets for LBS
- Interoperability among content providers and interface standardization for efficient request-response services
- Development of heuristic solution algorithms for LBS
- Development of alternative theories for utilizing population data versus sample data in GIS
- Efficient and cost-effective means to collect real-time traffic data.

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