Modelling a Web Based Services for GIS Computing

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Abstract— A suitable model is presented in this paper for tracking and displaying of data about mobile objects in Web based Geographic Information Systems (Web GIS) and Location Based Services (LBS) applications. The application of network analysis is modeled and demonstrated by using the web services. GIS, LBS, end user, internet, web server and Geodatabase are major components in the model design. The component nature of the framework makes it flexible, scalable and extendible to satisfy specific application requirements. The proposed model presents the methods for delivering efficient and fast location services to its service user through a common interface.

Keywords— Earth Observation Systems, GIS, LBS, Location Modelling.

I. INTRODUCTION

Nowadays the internet technology and modern digital devices has brought significant change in the style and traditional way of operation. Web technology made a unique platform for sharing the information. Today modern digital electronic devices have high computing capabilities and can produce huge data. Satellite imagery or any Earth Observation Systems are examples which produce huge data. But converting raw data into usable and compatible format with unique standard needs portable tools and efficient techniques. There are varieties of computing devices used to browse the data in different format ranging from Personal Digital Device, Mobile, handled Personal computers etc. Combination of all these technologies has made it possible to share real time data produced by the sensor based systems at one location and shared by multiple users from geographically distributed locations. The concept of cloud computing and ubiquitous computing introduced the complexity in design the architectures which provides access to the services and data at any time anywhere. Web based solution allows user to use application and satisfies his need.

Web GIS and LBS application architectures are service-oriented and represent integration and chaining of various geospatial data and processing services distributed over the wired/wireless Web [1, 2].

To enable fast and effective development of Web GIS and LBS applications that satisfy specific user requirements there is a need for the set of geospatial data and processing services organized within the framework that represent the Web GIS and LBS application development [2, 3]. Such model must use modern GML based data description technologies for geospatial data representation and exchange between distributed framework and application services intended for storing, processing, analyzing and displaying data on distributed, heterogeneous platforms. LBS applications are inherently based on mobile objects and management of their continuously changing location data. Thus the framework for LBS applications development must include specific services dedicated to management, storing, presentation and exchange of data about mobile objects.

II. CHALLENGES IN LOCATION-BASED SERVICES

LBS continue to be hot topics in GIS are LBS related services. In this section, we try to assess how the modeling issues briefed a series of long-term research challenges of geographic information system. Thus, LBS have the following challenges:

The research issue is more challenging for LBS, because unlike other GIS applications where users’ locations are not of particular concern, LBS are targeted to the users with constantly changing locations. Another UCGIS research priority, spatial data acquisition and integration is also directly relevant to LBS.

As a matter of fact, spatial data acquisition and integration is an integral part of data processing and modeling in LBS. Moreover, LBS applications often have unique requirements for data collection, integration, and accuracy analysis. Particularly, the issue of uncertainty of geographic information is closely linked to the data processing and modeling in LBS.

The challenge of visualization is closely linked to data modeling, and how geographic information is perceived, either via visual display or audio broadcasting. Due to the size constraint of mobile devices, graphic information should be represented in a simplified way but without loss of overall information.
III. THE LITERATURE SURVEY

In 1997 Brown et al. [5] explained that context-aware applications can be divided into continuous and discrete. Continuous context-aware applications are more challenging than the discrete however most applications can be described as discrete. Continuous context aware applications provide associated information in the overlapped contexts. Dey and Abowd 2000 [6] defined context as any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves. Burrell et al. 2002 [7] designed a context-aware application for a college campus area to inform visitors about activities going on in the environment. The campus application is location sensitive and enables user feedback for the content. Prekop and Burnett 2003 [8] proposed that simply defining context is not enough to be able to use the concept of context to develop context-aware applications. They described a conceptual model of activity centric context capable of supporting complex, cognitive activities. According to the activity-centric theory, the context that is based on activity is specialized from a higher level, more generic context. Dey and Makoff 2005 [9] described an architecture that supports the building of context-aware services that assume context is ambiguous and allows for mediation of ambiguity by mobile users in aware environments. Grossniklaus et al. 2006 [10] proposed a method that combines a GPS sensor and a Bluetooth digital pen to provide LBS in mobile environments based on interaction with printed maps. Simon et al. 2006 [11] developed a spatially aware mobile phone for LBS. The module includes differential GPS, a compass, and 2 axis tilt sensor in a self-contained Bluetooth unit. Winter and Nittel 2006 [12] designed a model for shared ride trip planning in ad-hoc mobile geosensor networks. The system searches for available shared ride opportunities with geosensor and derives optimal shared ride travelling.

In 2006 [13] Bin Jiang et al. proposed a strives to capture the current developments in LBS, an emerging and fast developing Weld cutting across the boundaries of geospatial, mobile, and information technologies. In 2007 [14] O. Akcay at al. proposed the visualization of the spatial data that are relevant to the mobile user is examined. To provide relevancy, relevance theories is reviewed and the manifestations of the relevance are adapted to the visualization of the spatial data. In the ubiquitous computing, sensor and computer that are invisible to the user are able to determine the current environmental situation. With the advantages of the ubiquitous computing, a context model that is composed in a semantic language can be implemented to provide relevancy. Akcay at al. developed a new context model that includes dimensions of the relevance for the visualization. Specifically, OWL-DL specifications have the capability of the reasoning for the description logic.

Some issues to identify are: I have seen from the previous literature that increasing efforts have been made by both geospatial scientists and computer scientists towards the advancement of LBS. I have also seen a series of issues and challenges imposed on LBS research from both technological and societal perspectives. The need and importance of many GIS research topics find more justifications with LBS. Meanwhile these research topics also see new challenges with LBS. More cross-disciplinary endeavours are anticipated in the future particularly at the intersection of information technology, geospatial technology, and increasing awareness of social impacts of the technologies.

IV. PROPOSED MODEL

The starting goal of our research was to create the model that is completely capable of supporting development of GIS applications in the Web environment that include integration, management, querying, analysis and visualization of geospatial data [15]. A location-based service is a specialized, multi-tiered internet GIS application delivered across the wireless Web to the mobile users [16]. The location of the mobile devices in people’s hands or built in vehicles can be determined by using GPS, or mobile network triangulation. Their location is transmitted to the LBS server through the wireless communication interface, from the device itself, or from a mobile positioning center of the mobile network. At the LBS server, the data is processed and services, based on such data, are provided to users. Mobile users may be also represented as the mobile objects registered at the server and tracked by others.
Considering the location–based service applications we focus on the mobile objects with point geometry, whose size and shape are of no importance. Many components of the multi–tiered LBS architecture may use many mobile object data models for representation and management.

Thus within the LBS application components, an object oriented data model is implemented, while within the database system, relational or object relational data model is implemented.

To enable data communication between many application components, possibly implemented as Web services and distributed over the Internet, mapping between the different data models must be applied. With the advent of XML–based technologies in data transfer and exchange, it is reasonable to couple different data models by using a uniform representation of the mobile point objects.

For the XML–based representation of the geographic features, OGC proposed an XML–based specification called GML [17]. The GML definition must be extended for representing continuously changing properties of mobile objects.

The proposed model could result the following:
- Provide a reliable performance;
- Enable users to display information easily;
- Provide flexibility especially with other GIS services;
- Provide mapping services based on the Geographic database;
- Deals with different users based on the client;
- Works together with other services based on the application server
- Allow to add on other services based on the services

V. CONCLUSION

In this work we have discuss the challenges in location-based services and propose our model, which makes it possible to obtain information from various sources. Our work on progress is to define the user profiles language specification and investigate how to apply it into query optimization. On the other hand, we will experiment the extraction of spatial data from diverse data sources to create a spatial information repository using XML and GML (Geography Markup Language). The LBS model can help user to find hospitals, person, school, gas filling station or any other facility of interest indicated by user within certain range.

REFERENCES