Mobile Geographic Information Services

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ABSTRACT

The birth of mobile geographic information service (GIS) is introduced first, which is coming from the value-added service requirements in third generation (3G) telecommunications and functionally supported by geographic information system technologies. Then the history of mobile geographic services coming from mobile GIS (MGIS) is introduced. The present turning inside-out model of mobile geographic information service is discussed. The future developing trends of mobile geographic information services supported by ubiquitous computing research is proposed. The overview of mobile geographic information service is summarized in the conclusion, and the relationships and fusions between location-based services (LBS) and mobile geographic information services are discussed.

INTRODUCTION

The geographic information system (GIS) is the most active technology in geographic science and earth science. With the development of computer and network software and hardware, especially Internet building, GIS has got a lot of new features to fit Web applications. GIS technology integrates common database operations such as query and statistical analysis with unique visualization and geographic analysis benefits offered by maps. GIS usually provides a number of tools for people to get more useful geographic information. Now GIS not only serves as a spatial data management system but also plays an important role in many geo-based application fields.

Recently, with the new challenge in work and life, personal computers can not meet the demand of people in many situations. Not only the individuals but also enterprise customers hope to access the information under the mobile environment.

The third generation mobile phone is an extraordinary story of emerging technology. The transition from "2G" to "3G" will revolutionize our concept of the mobile phone by bringing personal bandwidth and applications previously associated only with fixed networks (http://www.csc.com/features/2001/34.shtml).

On the other hand, expanding wireless coverage, more reliable connections, reduced network latency, higher data transfer bandwidth, cheap and accurate positioning technologies, and widespread adoption of mobile telephones and other mobile devices are the key enablers of mobile geographic information services.

FROM MOBILE GIS TO MOBILE GEOGRAPHIC INFORMATION SERVICES

Since 1990, geospatial information technologies and mobile wireless Internet have been rapidly developed. It is easy to see that the integration of geospatial information and mobile Internet is inevitable, which is simultaneity driven by market demands and technologies.

The integrated system is designed to work on mobile intelligent terminals, and brings new dimension–at any time, any place–to access geospatial and attribute information in GIS. It is called mobile geographic information system (MGIS). MGIS offers another new perspective for the use of GIS and further extends the "office" GIS works in mobile environment. MGIS was early applied to assist office and collect data in the field.

The research on mobile GIS started from the 1990s. The aim of the mobile geographic information services is to assist the geographic data management of some special department, such as the managements of power, engineering construction, and water supplies. The link and data transfer of the outside and inside GIS by the wireless network is the key technology of MGIS. Procis

Software developed this kind of MGIS in 1992. MGIS is only considered a part of the company GIS, so it must depend on the data management system, mobile geographic information management system (MGIMS). MGIS needs the abilities of MGIMS, such as offering the wireless communication channels, and managing and integrating the data collected outside.

In the middle of the 1990s, with the progress of the computer hardware and software and the development of new mobile terminals, location-based services (LBS) became the key topic of this period.

In this period, MGIS made some advanced technical preparation, but many applications were competed using the traditional paper map service. For example, solving the problem of "which is the nearest route?" or "where is the nearest restaurant?" the paper maps just showed the attribute information of the point/line without any explanations.

Actually, MGIS had more achievements in the traffic and cartography fields than the geographic information service at that time. Some implementations regarding navigation service by pocket PC/PDA/palm and vehicle monitoring system integrated with GPS were built, and client/server GIS structure and flush type GIS software were the most important topics in this age.

These kinds of MGIS applications were also called location-based services. The technologies involve geographical information systems, global navigation satellite systems (GNSS), radio frequency identification (RFID), and various other location sensing technologies with varying degrees of accuracy, coverage, and cost of installation and maintenance. Some most recent location sensing technology based on ultra wideband radio can even achieve accuracies on the order of centimeters in an indoor environment. Meanwhile, the rapid evolution of cell phone industry from initial simple talk services to multiple functions of multimedia messaging and voice services with the emergence of broadband wireless infrastructure has created tremendous demands for various location-based services.

Maybe the first real mobile geographic information service concept was proposed by Nippon Telegraph and Telephone Public Corporation DoCoMo in 1998. The earliest explanation of DoCoMo is that it is a Japanese character combination that means "anywhere." However, now it can be taken to mean "do communications over the mobile network." And the first character "i" of i-mode standard proposed by DoCoMo presents information, is interactive, independent, Internet-based, and "ai" (the Japanese and Chinese voice of love) (Keiji Tachikawa, the CEO of DoCoMo).

What are the mobile geographic information services? The mobile geographic information services are services provided by the geospatial service systems wherever and whenever are needed. It defines an "interactive" model between the user and the actual

Figure 1. GIS developing trends