Location Based Routing Service In Distributed Web Environment

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Abstract: Location based services based on positions of moving objects are expanding the business area gradually. The location is included all estimate position of the future as well as the position of the present and the past. Location based routing service is active business application in which the position information of moving objects is applied efficiently. This service includes the trajectory of past positions, the real-time tracing of present position of special moving objects, and the shortest and optimized paths combined with map information. In this paper, we describes the location based routing services is extend in distributed web GIS environment. Web GIS service systems provide the various GIS services of analyzing and displaying the spatial data with friendly user - interface. That is, we propose the efficient architecture and technologies for servicing the location based routing services in distributed web GIS environment. The position of moving objects is acquired by GPS (Global Positioning System) and converted the coordinate of real world by map matching with geometric information. We suppose the swapping method between main memory and storages to access the quite a number of moving objects. And, the result of location based routing services is wrapped the web-styled data format. We design the schema based on the GML. We design these services as components were developed in object-oriented computing environment, and provide the interoperability, language-independent, easy developing environment as well as re - usability
Keywords: Routing, GML, GIS

1. Introduction

Today, according as the volume of traffic increases gradually, efficient use of determinate road and request of control are increased. Research and development for this investment have done in worldwide. Specially, traffic information is very useful service depending on situation that high-speed data communication technology of Wireless LAN, IMT2000 etc.

The traffic information based on the location includes the past and the future estimate for position as well as the present. Field that can apply location information of the moving object efficiently is location-based routing analysis service. That is, we can develop the variable traffic-application as producing the traffic information from the location of the moving object and analyzing this data and the geographic information. This effort enlarge the requirement about union with LBS (Location-Based Service) and ITS (Intelligent Transportation Systems).

In the paper, we describe the traffic service based on the moving object's location combining the intelligence traffic system and location based service. We study the base technologies research of each service in session 2. Session 3 presents the detailed design of systems. In session 4, our traffic routing service is implemented. Finally, we describe the conclusion of this paper in session 5.

2. Background

Is this paper, we develop our system based on OpenLS (OpenGIS Location Services) Architecture and GML (Geographic Markup Language) are proposed by OGIS (Open GIS Consortium Inc). This is used as the specification for implementing.

OGC (Open GIS Corsortium) is a not-for-profit, international consortium whose 2000 industries, government, and university members work to make geographic information an integral part of information systems of all kinds. This consortium produced the standard of LBS and GIS (Geographic Information Systems) for the interoperability, component-based development, and internet services [1]. This standard presents layered architecture of three services of the core, application, and portal [2] [3]. In this architecture, the routing service is the important part of core service layer [3]. These various functions of each layered service are applied to many application areas. Fig.1 presents the practical use of these services in traffic application area.

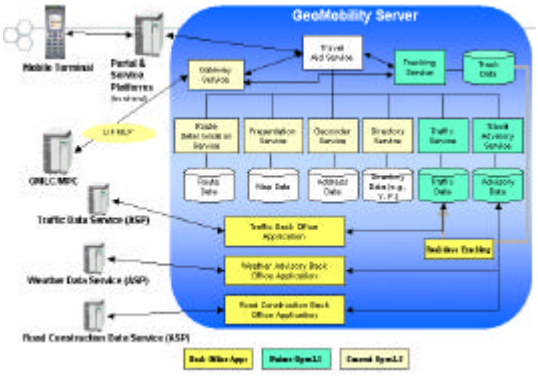

Fig . 1 . OpenLS Architecture

In Fig.1, web service for routing service is based on XML. That is, the standard XML (extensible Markup Language) schema about geographic, topological, and traffic information should be supported to offer the efficient web service. OGC propose GML of the standard schema based on XML [4] [5]. GML is an XML encoding for the transport and storage of geographic information, including both the spatial and non-spatial properties of geographic features. GML uses the W3C XML Schema Definition Language to define and constrain the contents of its XML documents. The GML v3.0 Specification [4] defines some basic conformance requirements for users to develop their own application schemas. Software applications attempting to process any arbitrary GML user application schema must understand GML and all of the technologies upon which GML depends, including the W3C XML Schema. This specification defines the XML Schema syntax, mechanism, and conventions that provide an open, vendor-neutral framework for the definition of geospatial application schemas and object. And, it allows profiles that support proper subsets of GML Framework descriptive capabilities.

3. System Design

We describe the modeling of Open GIS Service Architecture using the UML. The UML is an attempt to standardize the artifacts of analysis and deign: Semantic models, syntactic notation, and diagram. The UML provides anyone involved in the production, deployment, and maintenance of software with a standard notation for expressing a system's blueprint. The UML is a language for specifying, visualizing, constructing, and documenting the artifacts of software system, as well as for business modeling and other non-software systems [8] [9]. The components modeled using the UML are developed in object-oriented computing environment, ATL/COM and Visual C++. This developing environment provides the easiness of developing the application because of the language - independency.

Our routing service based on the location is designed in distributed web service. This system receives the GML-styled document and parameter as the request of client and provides the vector data, GML-styled document, and image map data. There are three processing phases. PUBLISH phase is registering the service content and functions to registering server. Clients send XML request is consisted of the service capability and functionality to registering server. This is FIND. Finally, Bind is connecting the client and service server.

Our web routing service system do multitasking modules of server for processing tasks of each request at the same time each client when service request from multiplex clients is given. For this server architecture, web service modules and server modules are designed as components. Fig. 2 presents distributed web service modules.

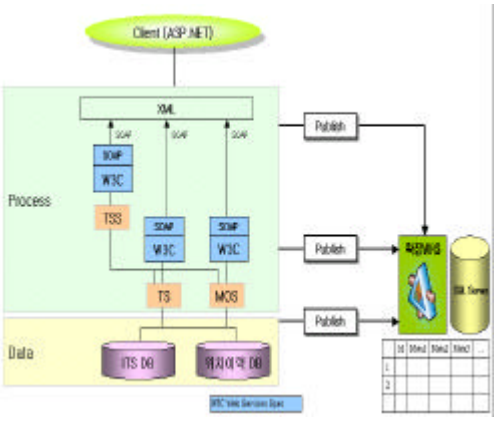

Fig . 2 . Distributed Web Service Module

Our web service system is consisted of data layer, server layer, and application layer.

Data layer provides static road network data and traffic information, and trajectory location trace. Road network data is GDF for transporting[10]. Traffic information is the real-time status of road network. This is gathered from the probe cars and other traffic centers.

Server layer supports the various analyzing functions of circulating shortest path, processing traffic information, and tracing location. This layer receives the traffic information and the location data from data server and provides the analyzing result to service layer.

Application layer is designed for providing total routing service to multiple clients. That is, the services of this layer are assembled with the result of the basic analyzing modules in server layer. Although there are many application service based on the traffic information and location data, we support the basic and essential function among of these services. The outputs of this layer are text format, vector data, GML, and image data containing the traffic information and location data.

4 . Implementation

This system offering traffic and location base service with that is designed in 3 chapter in component form.

This system is implanted as server-side components providing traffic services and location services based on designed architecture in session 3. components have the layered architecture and relationship with each other. The result is provided as various format is subject to application environments.

Client-side application is developed in desktop PC and PDA to support mobile environment . For example, PDA clients have GDF as static road network data or download this from data server . And this data is displayed in device window . Client-side application will connect to server and request the real time traffic information . When data transmission is finished, this data is displayed in client's device. Fig. 3 presents the example window of desktop PC.

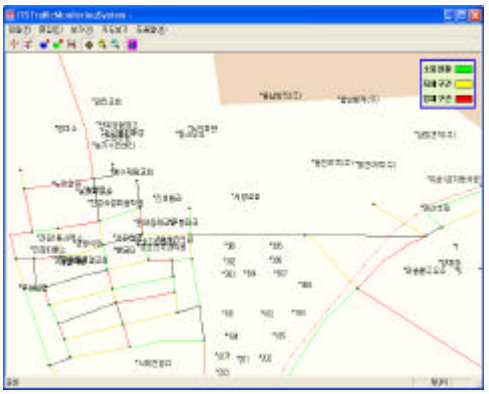

Fig . 3 . The Example of Location Based Routing Service

5 . Conclusions

In this paper, we design and implement the location based routing service as integrating LBS and ITS. This system is consist of GDF data processing component, server component, distributed web service component.

GDF data processing component provides the static road network data and traffic information, and trajectory location trace. server component supports the various analyzing functions of circulating shortest path, processing traffic information, and tracing location. web service component is text format, vector data, GML, and image data containing the traffic information and location data.

In addition, , we designed the system as multiple components using the UML and developed it. The components designing the Open GIS Service were implemented with ATL/COM provides the environment of the language-independency . This components can be appropriately composed to the application, and they have advantages of the reusability. The reusability guarantees the low cost of the software development.

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