

# DESIGN AND IMPLEMENTATION OF GEOGRAPHIC INFORMATION SERVICE MODE FOR DIGITAL HOME

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**ABSTRACT:** This paper designed and implemented geographic information services for digital home. Society and life information service based on multi-scale electronic map, considering as a new geographic information service mode, enriched digital home service contents and accelerated informatization pace. This paper described the architecture and the main function modules of the service system in detail. Moreover, the key technologies about digital television middleware technology, network transmission technology, visualization technology for television terminals were introduced elaborately in the paper.

**KEY WORDS:** digital home, geographic information services, system design

## 1. INTRODUCTION

Digital home service industry, as an important part of modern service industry, is an integrated form of network, information, intelligent and service. The goal of digital home development is to achieve specialization, network and integration of the public service system. Establishing perfect information service platform is a crucial point of building digital home.

According to authoritative statistics, location-relevant information accounts for 80% of the routine life information. It indicates that geographic information services play a significant role in the entire information services. It is essential for people's daily life (Liu, 2004).

In the light of network connection mode, traditional geographic information service model can be divided into two modes: web-based geographic information services in fixed network environment and geographic information services in mobile computing environment (Bi, 2004; Wang, 2006; Wu, 2003; Minsoo, 2005). Digital televisions as a popular source of information services arouse a great demand for geographic information service based on television terminals. However, limited research has been found in geographic information service of digital home on the basis of digital television terminals. With the extensive application of digital home, how to provide personalized, intelligent geographic information services by digital televisions in order to satisfy diverse needs, has become a key point in the development and construction of digital television services.

In this paper, an in-depth research of design and implementation of geographic information service mode for digital home has been done based on television terminals. We have constructed the geographic information service system for digital home, and make a detailed depiction to system design and key technologies. Design and implementation of this system is not only an exploratory study but also possesses extensive practical value.

## 2. ARCHITECTURE OF THE SYSTEM

According to the service characteristics of digital home, C/S structure was selected to establish geographic information service system (Yuan, 2008; Wang, 2007) (Figure 1). The system consists of the explorer, web servers and data servers. Geographic information services on digital televisions was

implemented using network transmission technology and visualization technology based on system structure design, database structure design, function modules design and component-based development methods. The system finally completed flexible application of geographic information service system for digital home.

Users could send their requests to application server through digital televisions, such as place names, interactive information and various business services information.

The server executes appropriate actions in response to the request, and transfers the corresponding query results, as well as satellite imageries from geographic information services database to the client browser by HTML forms.

## 3. SYSTEM FUNCTION

When designing function of the system, we abided by following rules: rational system design, clear logic, independent models, high stability and scientific data processing. Function structure was shown in Figure2:

### 3.1 Data Maintenance

The data maintenance function was designed to manage and maintain image database, vector database, thematic database and user management database of geographic information service system for digital home.

**3.1.1 Data Import Module:** Support to import a variety of external image data, vector map data, thematic data and their standardization.

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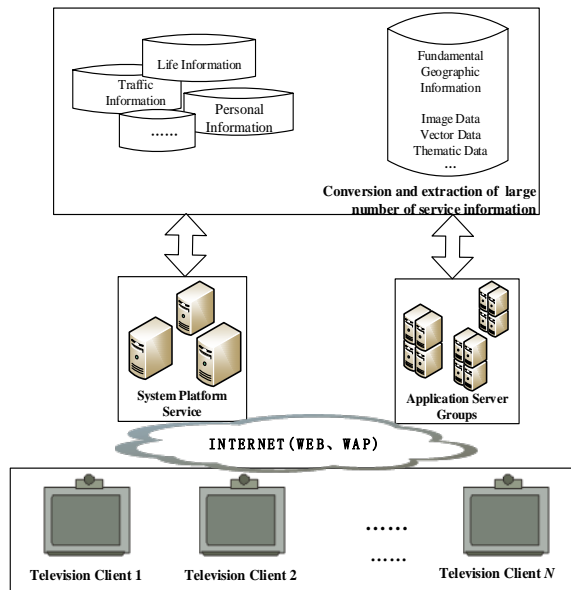


Figure 1 Architecture of the system

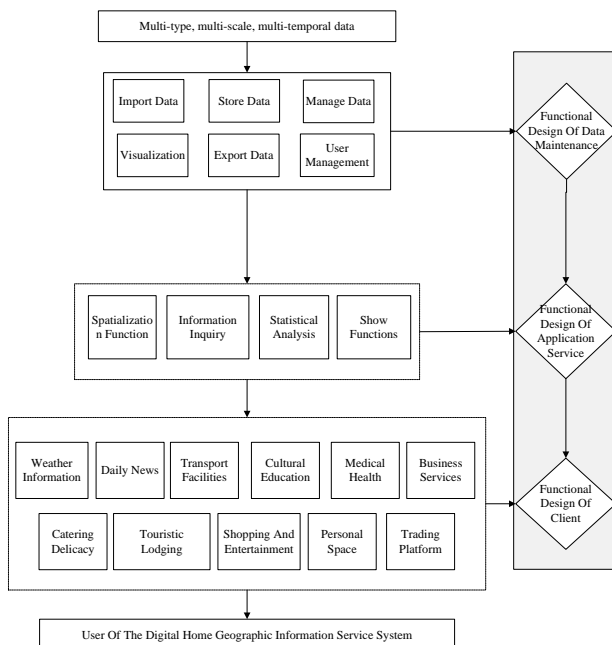


Figure 2 Function of the system

**3.1.2 Data Storage Module:** Multi-scale geospatial data and non-spatial data are stored, integrated and managed in a unified mode.

**3.1.3 Database Management Module:** Edit, splice, cut, back up, recover and manage logs for all types of data.

**3.1.4 User Management Module:** Set up different rights for system function and data using taking into account the systematic security and geographic information service requirement of different users.

### 3.2 Application Services

Through an integration of electronic map information services and digital home applications, information exchange between electronic maps and digital home provides users with location

services, transportation services, travel services and life information services.

**3.2.1 Fast Data Loading:** Corresponding databases and data loading models were established to manage multi-source, multi-scale and multi-temporal data, including image data, vector data, terrain models, social life service data, multimedia data and text data, so as to achieve real-time and efficient data loading.

**3.2.2 Information Query:** Digital home users could do accurate or fuzzy query about service information by categories and keywords in accordance with personal interests and demands. Service information queries could be depicted as follows:

**Basic Geographic Information Services:** weather news, urban transport, leisure tourism, commercial network, cultural and education life and so on.

**Interactive Information Services:** job hunting information, recruitment information, commodity trading information, leasing house information, second-hand housing transactions.

### Personal Information of Clients

**3.2.3 Surrounding Environment Query:** The system could provide related facilities and environment information within the region by online query, such as surrounding transportation facilities, culture, education, medical, life service and commercial outlets.

**3.2.4 Visualization:** The system could achieve multi-level remote sensing image display and roaming as well as exhibition of relative thematic information, text information and picture information according to the query conditions from digital home users. The results could be used as intermediate data and also be viewed directly.

**3.2.5 Map Label:** All kinds of information, such as address information of chain stores, hotels, schools, hospitals and other public service facilities and the user's personal address could be labelled on the map within appropriate scale. When users browse the map, they could focus on the concerned information at the same time. It is very convenient for users to choose the local and appropriate service sites.

**3.2.6 Statistical Analysis:** The service information could be summarized and analyzed according to the statistics of all types of social life information. The system could provide basic decision services about travel, shopping and entertainment for digital home users.

**3.2.7 Map Operation:** The system could offer multi-scale electronic map display and switch, zoom in, zoom out and cruise.

### 3.3 Client Services

Client services, which are supported by application services, could supply users with customized geographic information. The service contents include geographic living information, interactive information and personal information. It could also support surrounding environment browsing, map labelling and map showing.

In this system, the client service for digital home could be divided into three contents, including eleven service modules:

**3.3.1 Public Information Service Module:** The module contains nine sub-modules involving weather information, daily news, traffic facilities, culture, education, health care, business services, food and beverage, tourism lodging, shopping and entertainment (Figure 3). It could provide basic public information query, browsing and labelling and information statistics.



Figure 3 Tourism and lodging

**3.3.2 Interactive Platform Modules:** This module is used for displaying transaction information about building renting, sale and transfer. News source and contact information can be dynamically labelled on the map to supply users with convenient trading services.

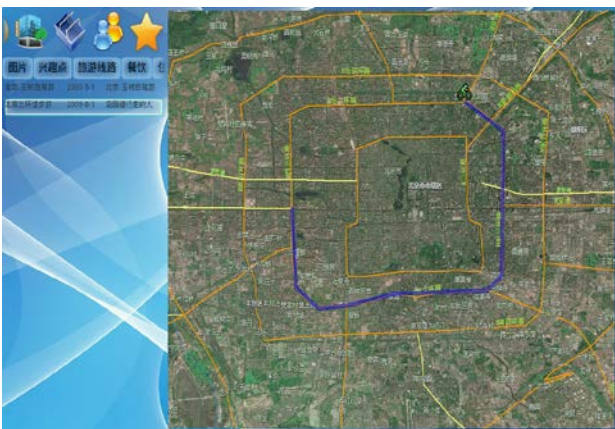


Figure 4 Personal space

**3.3.3 Personal Space Module:** It is used to store, manage and browse personal information, including interested points, personal pictures, tours, catering, accommodation, shopping and other personalized information (Figure 4). The information mentioned above can be illustrated on the map directly.

## 4. KEY TECHNOLOGIES

### 4.1 Digital Television Middleware Technology

Digital television middleware is the software between Digital television set-top box application system and system software. It has strong communication ability and excellent scalability. In actual operation, a set of standard application protocols and interfaces are defined in order to achieve fast supply of GIS data and rapid response of services. When digital television client application needs to access certain data or services, servers access the middleware system to find data source or related services from the internet. And then the middle system transports users' requests and reconstruct reply message. Finally, it transmits the results to the application programs.

### 4.2 Network Transmission Technology

Data transmission standards, information efficient coding and digital technology of television receivers are considered as the core of network transmission technology. High-speed networks access and interconnection network are the guarantee of digital television transmission network technology. Reliable connection of home broadband network is used to achieve propagation of digital bit stream from the head end to the terminal by compressing, sampling and quantization coding of geographic services information. Furthermore, information demodulation is executed on digital television terminals, and then social life service information can be displayed, real-time queried and interactively visited based on electronic maps in digital television terminals.

### 4.3 Visualization Techniques for Television Terminals

Visualization for television terminals is implemented through hardware and software equipment and relevant technologies on the basis of multi-source data standardization and visualization theory. Pre-generate image slices on the server according to a series of specific scales and block sizes to solve the problem of huge amount of data. And then achieve sustained and stable, efficient and reliable dynamic visualization services of geospatial information in virtue of block model transferred and level of detail model processing technology. At the same time, take advantage of pyramid structure to cache the tile image data, which significantly improves quality of client information visualization service.

Taking into account that the system has good scalability and operability, build the interface among client, server and database, based on the HTTP protocol, combined with the OGC specifications, SOA architecture and other standards to solve the compatibility problem between geographic information services system and television terminals. It implements dynamic display of spatial map and related thematic information on television terminals.

## 5. CONCLUSIONS

Geographic information services are significant for people working and living. This paper designed geographic information service system for digital television terminals and discussed the system architecture and key techniques. This system, combining electronic map information service and digital television application, implements geographic information services based on digital television. It builds up a

new style of geographic information services and satisfies the requirement for map, weather, news, and other routine life related information.

However, the system still has some blemish in application services. Proactive service and personalized service will be the future of the system.

## 6. ACKNOWLEDGEMENTS

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