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Urban Geographic Information System Principle and Application, with Smart City Construction as an Example

Xin Chi

School of Resources, Sichuan Agricultural University, Chengdu 611134, China

*13664284913@163.com

Abstract

With the advancement of national management system and management ability of modern, give smart city construction has brought unprecedented opportunities for development. As one of the urban infrastructure, urban geographic information system has played an important role in intelligent construction of city.

Keywords

UGIS; Smart City; Smart Society.

1. Introduction

Urban governance and management not only is an important part of national governance system, at the same time is also the important carrier of the global Internet governance system and the important foundation of building cyberspace community of fate.

The past few years, nearly three hundred cities in China carried out the pilot smart city construction, improve the level of public services, improve the management ability, promoting the city's economic development.

With the advancement of national management system and management ability of modern, with "innovation, coordination, green, open, sharing" the deepening of the development idea, along with the network power strategy, national big data strategy, the implementation of the "Internet" action plan and the construction of "digital China" development, the city is endowed with new connotations and new requirements, which not only promote the evolution of intelligent city, more smart city construction has brought unprecedented opportunities for development.

Smart city through Internet infrastructure, cloud computing infrastructure, geospatial infrastructure such as a new generation of information technology to realize the intelligent management of the city.

The urban geographic information system as an important part of geographic space infrastructure for the smart of the city construction provides an important geographical information and service guarantee.

2. Urban Geographic Information System

2.1 Overview of Urban Geographic Information System

Urban geographic information system (UGIS) is to reflect the current state of the city, planning, change of all kinds of spatial data (such as topography, physiognomy, construction, roads, pipelines, etc.) and describe the characteristics of space attribute data through the computer input, storage, query, statistics, analysis, and the output of a comprehensive space information system.

2.1.1 Main Features of Urban Geographic Information System

City's population, resources, environment and social economic factors populated geographical complex, is a highly complex humanities and natural complex system.

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Therefore, compared with general geographic information system, urban geographic information system has the following major features:

1)The diversity of data types and diverse level of the service object.

Urban geographic information system contains a geographical basis elements and resources, environment, social economy and various types of data, in time is long, the structure is multi-level, nature only "spatial positioning" and "properties" and both give priority to with graphics vector data, and is the source of the raster data with remote sensing, and the relational statistical data, it is inevitable for data model is put forward special design requirements.

In terms of the service object, should not only consider the municipal competent, technical, and query needs of the public, and to meet the management, evaluation and prediction of different user needs.

Urban geographic information system to the service object, therefore, requires a high degree of multiple level.

2)High precision, strong processing along.

From a specific perspective, urban geographic information system is the geographic information system application in large scale map.

For example, it is used for housing and cadastral management, therefore to collecting and processing data, its accuracy is very high.

In addition, to speed up the urbanization and urban development, increases to information updated timely request, have to ask for "update" on a daily basis, to ensure good processing along system information.

3)Modeling, intelligent and versatility.

Urban geographic information system is to realize modernization management, and to optimize the formulation and implementation strategy and it is bound to have a set of analysis, evaluation, prediction and optimization model, and case management analysis and prediction, evaluation and other functions, it is more comprehensive than general geographic information system should have and the more advanced intelligent requirements.

4)With the integration of office automation.

City government department office automation is one of the functions of urban geographic information system should possess, and to ensure that urban geographic information system with vitality and information update ability is a very important way.

Therefore, the functions of the government department office automation is best can fully application of urban geographic information system technology, and integrated system structure.

5)Strict hierarchies and highly unified standard.

The functional departments of the city a lot, the structure is relatively complex.

Therefore, for an urban geographic information system, from its underlying fundamental geographic information subsystem, to the middle of all kinds of special subsystem and the high-level integrated subsystem, on the hierarchical structure and construction sequence have strict requirements.

Group on the information standard, technical standard and system must have a complete set of specifications, in order to ensure information sharing and system compatibility.

6)Strong practical demand.

Practical requirements of the construction of urban geographic information system is very urgent, the user explicitly, the goal is clear, may obtain economic benefit and social benefit is obvious.So, than other geographic information system, and its practical application demand will be more strong and clear.

2.1.2 Main Functions of Urban Geographic Information System

The function of urban geographic information system can be described from two perspectives: one is from technical point of view of a data processing analysis and expression of description, can be

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summarized as data acquisition, conversion, and editing, data reconstruction and transformation, data analysis and expression, query retrieval and results of six major functions such as output, this is for generalization of urban geographic information system professionals.Second is used as the guidance, from the user using geographic information system for city management and urban planning point of view to describe, can be divided into three functions:

1)Management functions

Through the establishment of urban geographic information system, the realization of digital, standardization and computerization of all kinds of information, so as to achieve unified management, data sharing, and promote the office automation, realize the quick query, retrieve, exchange of real-time and visual expression and output, gradually formed a dynamic management system, with the computer as the core city of urban modernization management.

2)Evaluation analysis function

Through the establishment of different analysis models and auxiliary decision support system, the city of a single or comprehensive problems, such as transport network, the location of the investment environment, planning and management, enterprise or engineering benefits, such as comprehensive evaluation analysis, and put forward solutions and reference for decision-making by the competent department, including dealing with some sudden events, such as urban disasters such as flood, disaster, also can through the analysis of related evaluation, a rapid response.

3)Planning and forecasting functions

This is according to the present situation, development trend and potential ability to comprehensive factors, such as show possible prospects, through the different forecast model for reference and mid-long term plans of macro-control.

Urban geographic information system that support this powerful tool for planning and forecasting. Now focus on exploration of urban geographic information system that can be used for city sustainable development ability construction of the function [1].

3. Urban Geographic Information System in the Application of the Smart Urban Construction

3.1 “Smart” Life

Intelligent transportation is an important symbol of smart urban construction.

With the further increase of car production and sales, the city of the future intelligent transportation should have the following characteristics: convenient, safe, efficient and predictable.

The GIS system can effectively manage and display various data of urban traffic management.

Intelligent traffic geographic information system by integrating various elements of location and attribute information, and then through the communication network, accurate, quickly and efficiently to provide services, it is a professional urban geographic information system.

Underground pipeline is an important part of urban infrastructure, smart of pipeline system has realized the comprehensive management of urban underground pipe network.

Using GIS technology, the city all the information of all kinds of underground pipe network and orderly deposited in the computer management system, not only make the darkness bright underground pipeline, and bright as dynamic, implement the data update, data sharing and data analysis, so as to improve the efficiency of management of the underground pipe network, really realize the modernization of the urban underground pipe network management.

GIS technology in the process of logistics distribution, can more easily deal with logistics distribution in the transportation, storage, loading and unloading, delivery of the goods and so on each link, and the involved problems such as the choice of transport routes, storage location selection, the capacity of the warehouse set, reasonable loading and unloading, transportation vehicle scheduling and route

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choice for effective management and decision analysis, such as help logistics enterprise effective use of existing resources, reduce consumption, improve efficiency [2].

Streets and Bridges construction is one of the important part of smart urban development, the construction of good roads and Bridges engineering can ensure the high quality of the main road traffic, improve the convenience of People's Daily activities [3].

3.2 “Smart” Planning

Smart city planning and design work, in order to realize the scientific management of land, keep good design effect, the need to strengthen the GIS geographic information system is used, the present situation of land utilization in urban planning and design, own the property relationship of system analysis, and in the form of data and about the present situation of regional ecological planning environmental impact assessment for compatibility analysis, land management work done efficiently, maximizing the land resources utilization value in urban planning and design, meet the requirements of smart city construction and development; In the process of smart city planning and design work, using GIS technology, can be for early decision, project location, later scientific design, etc. To provide technical support, and in the form of visual analysis and scientific management, to urban planning and design more reliable quality, deepen the intelligent degree in the process of its development, to better reflect the potential applications of the GIS geography information system.

Smart cities in the development of geographic spatial information services, health relationship with its planning and design effect, reflecting the related design level.

Therefore, in promotes the development of smart city, improve the level of job of planning and design process, in order to give them a good geographic spatial information services, you need to design units and personnel to consider the introduction of GIS geographic information system and scientific applications.

3.3 "Smart" Case - "Digital Tianjin"

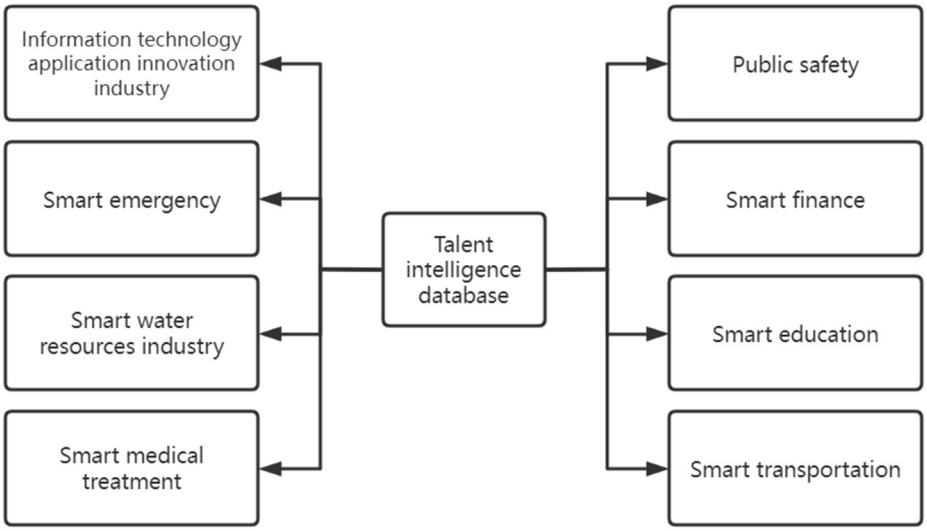

Figure 1. "Digital Tianjin" support architecture

Tianjin city agent issued to Huawei, apply with smart, intelligence center, four layers architecture, intelligent connection, intelligent interaction in the join, computing, cloud, AI and other four areas continue to Tianjin, power digital ecological construction in Tianjin.

Through the digital industry, building open city agent, trade agent, constantly release digital production capacity, the development of new production of "force", boost the northern international shipping and core area and the northern international exhibition city building; Through digital governance model projects, the establishment of demonstration "force", boost continuous deepening of reform and opening to the outside first area, realize the modernization of the management ability

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and the management system; Through the new digital infrastructure, foster innovation source "force" and drop carbon "force", Liz, advanced manufacturing, research and development base of the country's boom References, see Figure 1.

4. Conclusion

A people-oriented new smart city is not only the main theme of the development of new urbanization, but also an important way to realize digital China and smart society. Urban geographic information system development until now, has been gradually mature in technology and application, the construction of intelligent city is the opportunity to continue to develop urban geographic information system, discusses the relationship between smart city and urban geographic information system, and help urban geographic information system in smart city construction, seize the new opportunities of urban geographic information industrialization, in the process of industrialization development and innovation, built for the early smart city, a basis for realization of city informatization.

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