Establishment and Application of Information Service System for Development of western China based on National Spatial Data Infrastructure(NSDI)

Liu Jiping, Wang Liang, Zhao Rong
Chinese Academy of Surveying & Mapping
#16,BaitaipingLu ,Beijing 100039,P.R.C.
E-mail:Liujp@casm.cngov.net

Abstract: The great demands to spatial data in the present age have promoted the establishment, popularization and application of National Spatial Data Infrastructure(NSDI). In order to accelerate economic and social sustainable development of western China, the Chinese government has positively pushed forward the strategy for development of western China. Many urgent tasks of the development strategy of western China are concerned with the application of spatial information systems closely. In this paper, we summarize the situation of National Spatial Data Infrastructure in China, and analyze the relationships between NSDI and the development of western China. Some critical technologies of system establishment and application are proposed in detail, such as establishment and integration of general databases, software systems design, comprehensive analysis and evaluation, and application model etc. Besides, some topical applications of Information Service System for Development of western China based on NSDI for Government Agencies are given.

Keywords: Development of western China, National Spatial Data Infrastructure, Information Service System , Government Agencies.

INTRODUCTION

In order to represent, query and analyze different data related to spatial position on networks, and fit for the rapid development of National Information Infrastructure(NII) around whole world, we need to create the National Spatial Data Infrastructure(NSDI). In 1998, according different demands of society, economy, and sustainable development, the Digital Earth strategy has been proposed in USA to solve main problems concerning with data acquisition, data sharing, construction of networks and database [1][2].

NSDI is an important base of Digital Earth, it is composed of spatial data framework, spatial data coordination and management, spatial data standard, and spatial data clearing house and its network. In the past decade, 1:1000,000 and 1:250,00-scales fundamental spatial databases cover the whole China have been established, they consist of topographic database, geographic names

database, and digital elevation. The 1:50,000 and 1:100,00-scales fundamental spatial databases are being developed continuously. National spatial data and geographic information coordination committee has been created to coordinate and manage the establishment of NSDI. Some important national standards have been worked out. So, NSDI in China can support planning, monitoring, management and decision-making, especially in following areas: land resources, environment, natural disaster and human life [3][4]

In order to accelerate economic and social sustainable development of western China, the Chinese government has positively pushed forward the strategy for development of western China. Long-term development of west China is the core of the development strategy. Because many urgent tasks of the development strategy of western China are concerned with the application of spatial information systems closely, such as returning cultivated land to grass and forest, construction and planning of infrastructure projects, environmental and ecological protection etc. So, both central government and local government have paid great attention to the development and application of information technologies for supporting the development strategy of western China. In this paper, we will summarize the relationships between NSDI and the development of western China, and propose some critical technologies of system establishment and application in detail. Next, several topical applications of Information Service System for Development of western China based on NSDI for Government Agencies are introduced.

The roles of NSDI in information engineering for development of western China

Information service system based on NSDI not only can provide rich information for development of western China, but also can give powerful functions support. Spatial data supports include basic geographic data and thematic geographic data with different details. System functions supports include visualized representation of comprehensive information based on common spatial data, information selection and querying, data processing, analysis and decision-making. So, this system can play important roles in many areas of development of western China, they include:

- By spatial data management and analyzing, this system can support planning, designing, and development monitoring infrastructure projects distributed at western region.
- By overlay analyzing for land resource data and DEM data, this system can calculate the distribution of land resources at different slops, and then support returning cultivated land to grass and forest.
- By comprehensive analysis of basic spatial data and environment data, this system can help planning and construction for protection and administration of environment.
- By multi-analysis of social and economical data, this system can help constituting policies of western China.

Critical Technologies of Establishment of Information Service System for Development of western China based on NSDI

Establishment of data classification system for Development of western China

In order to manage and analyze different data, we need to work out the proper data classification system for development of western China. The basic classification rules include:

- to describe the objects or phenomena and their relationships objectively.
- to consider the practical application demands and possibility of data acquisition and easy analysis sufficiently.
- to adopt issued international or national data classification standards.

Integration of fundamental spatial data and thematic data

In order to provide multi-level and multi-department users with comprehensive information, we should integrate basic geographic data, resource data, infrastructure data, environment data, and social and economical data together, and establish the western China comprehensive database. The integrated database should support data displaying, data querying and analyzing based on common software system . The main problems of integration include data format conversion, position match , projection transforming, and attribute connecting.

Comprehensive analysis and evaluation of resources and environment

Based on integrated digital analysis environment, we can study and establish natural resource evaluation model, environment quality evaluation model, and sustainable development evaluation model to support making decision for proper development of natural resources, environment protection, and constituting the sustainable development strategy of western China(Fig.1).

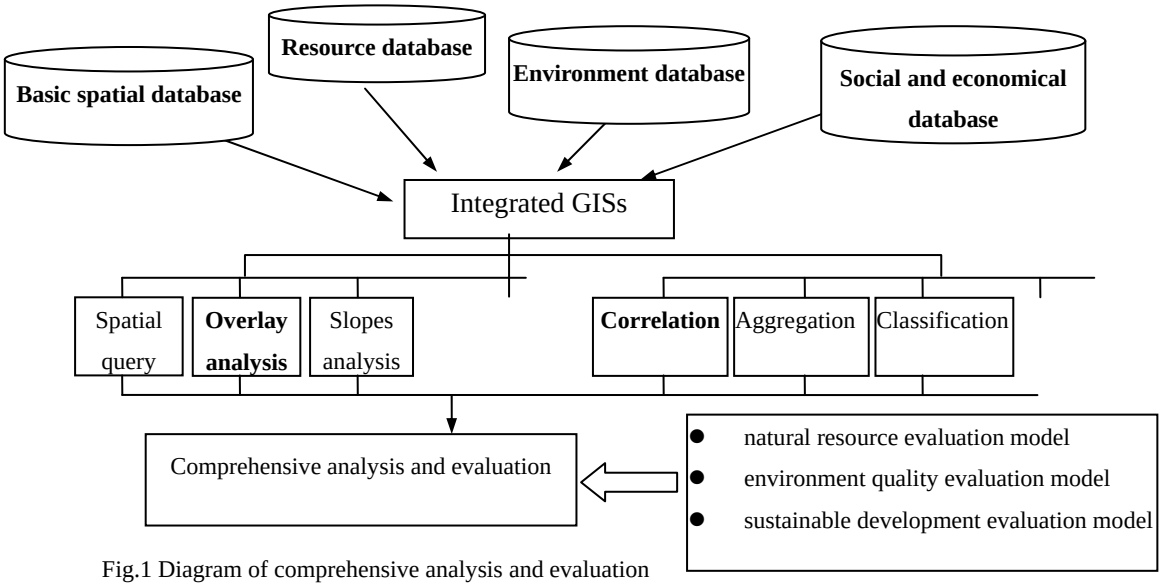

Fig.1 Diagram of comprehensive analysis and evaluation

Software system design

According application demands of Spatial Information System for development western China, we divide software system into four types: software for browsing, software for themes management, software for data processing and analysis, and data maintaining tools. The browsing software is used for results representation and browsing. According different application themes, the software for themes management is used for themes information querying, production of thematic map, and analysis requesting except for results representation and browsing. The data processing and analysis software is developed for data management, data processing, data analysis, and data evaluation. Basic functions of the data maintaining tools include data conversion, projection transforming, data updating, data representation, and database establishment etc.

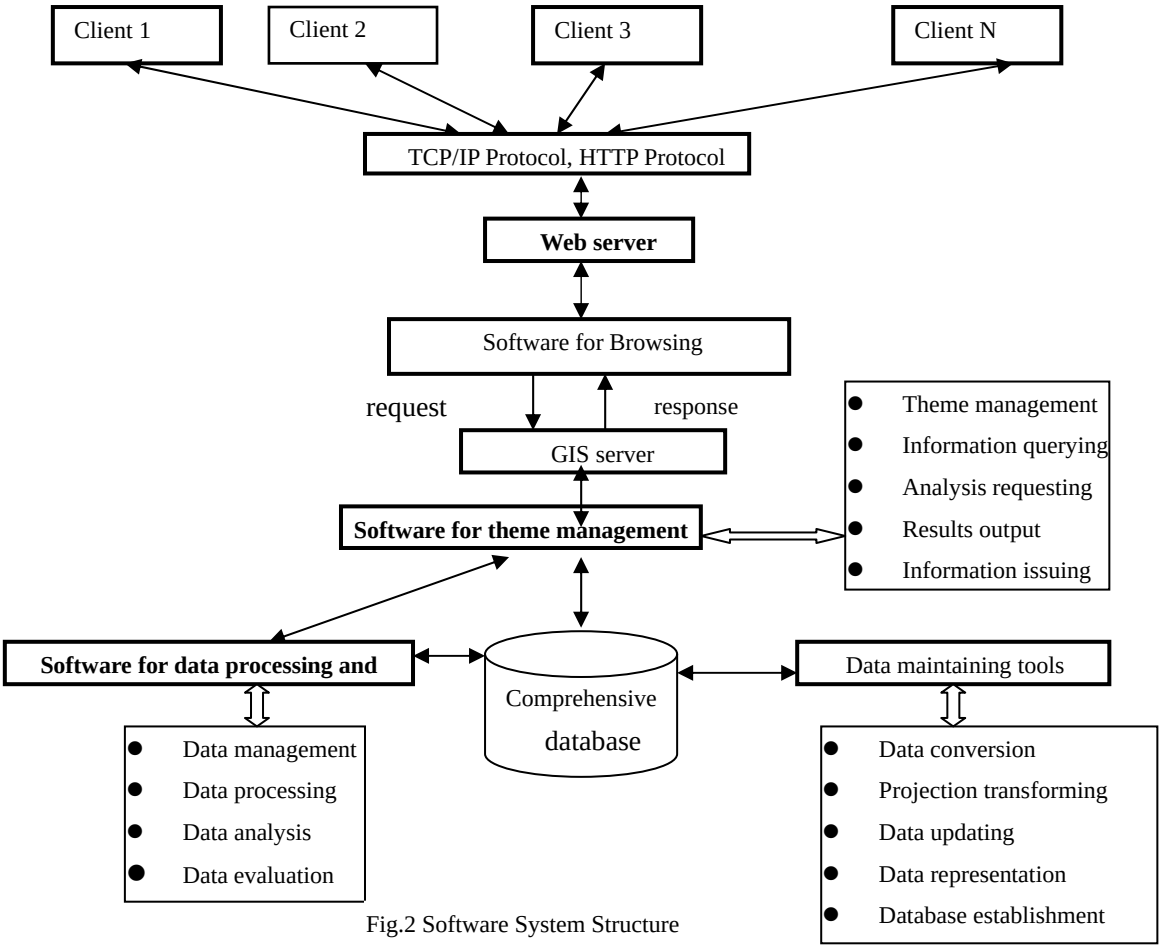

Fig.2 Software System Structure

The application model of Information Service System for Development of western China based on NSDI

Information Service System for Development of western China based on NSDI mainly serve for government leaders, officers, exporters, and system maintaining technicians. Through this system, the government leaders and officers not only can browse western China information with digital map, image, table, document, and graph, but also can query interesting information. According different themes, the experts will take advantage of system functions and data, and work out decision-making suggestions by comprehensive data analysis and processing. The system maintaining technicians are in charge of system data updating and establishing application theme database(Fig.3)

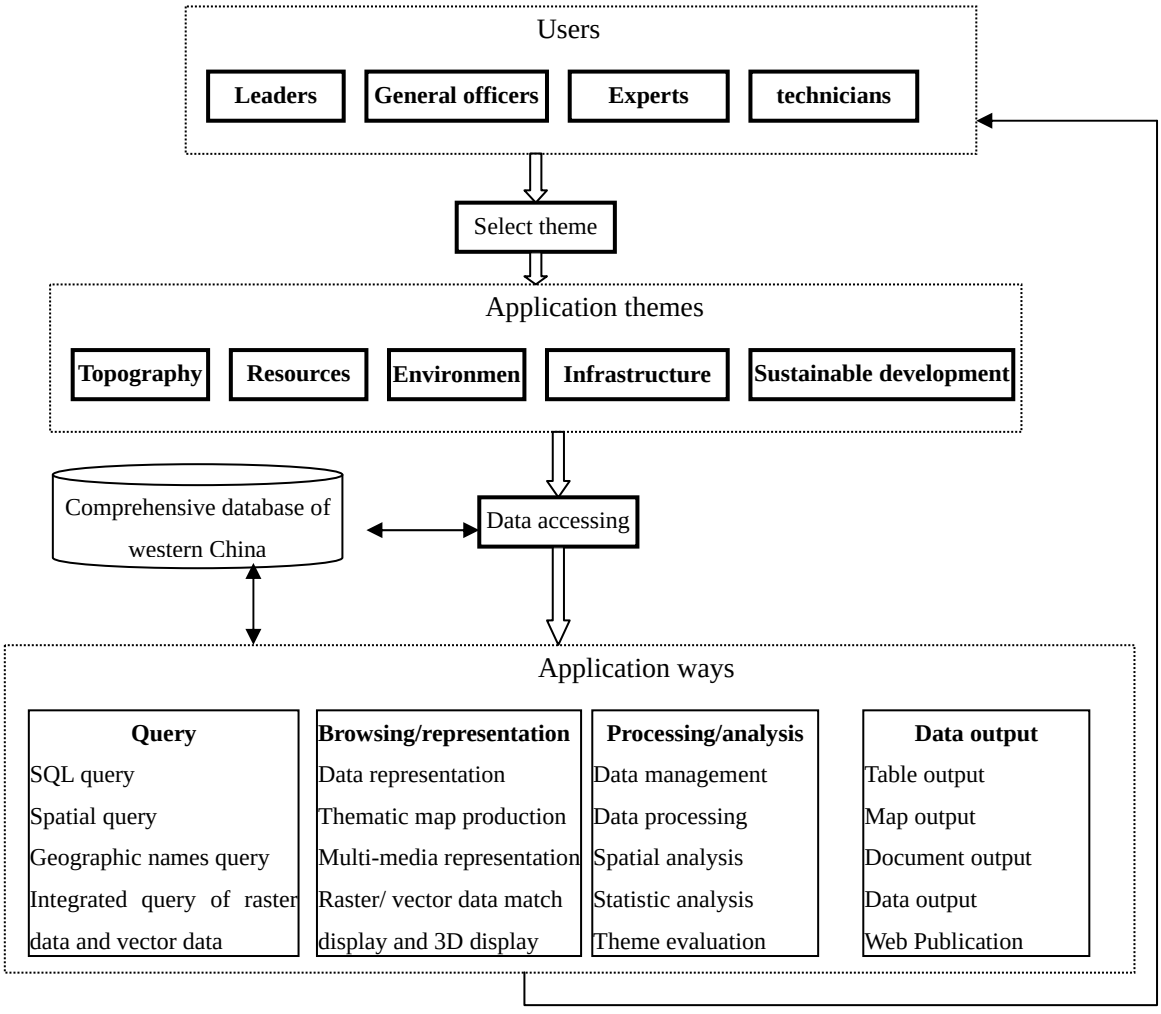

Fig.3 The system application model

The establishment of Information Service System for Development of western China based on NSDI

In order to urge the application of spatial information system in the development of western China gradually, we will start-up several topical applications of Information Service System for development of western China based on NSDI for Government Agencies in the beginning, they include:

- Establishment of National Spatial Information Service System for Development of western China. In this experimental project, the secretary bureau of State Council of China is in charge of the coordination of data coming from different national departments, and all of data are integrated to common spatial database provided by National Bureau of Surveying and Mapping. This system will be used for providing central government leaders with comprehensive information related to basic situation of western region, infrastructure projects, returning cultivated land to grass and forest, environmental and ecological protection etc.
- Establishment of provincial spatial information service systems for development of western China. In order to implement information mutual exchange and spread service between central government and local government, the system basic structure, software system, and technical plan adapted in this project will be same with national system. In the first phase, GAN SU province, QING HAI province and XINGJIANG Uigur autonomous region are selected for making experiment systems, and the application themes of experiment systems include the key infrastructure projects and returning cultivated land to grass and forest in GANSU province, the management of land resource and the fountain protection of the Yangtze river, Yellow river, and LANCANG river in QING HAI province, the water facility management of ILI river and the tour resource management in XINGJIANG UYGUR autonomous region.

REFERENCES

[1]Li Deren 1999, National Information Infrastructure, National Spatial Data Infrastructure and Digital Earth, ACTA GEODAETICA et CARTOGRAPHICA SINICA,Vol.28,No.1.

[2]Cheng Shupeng 1999,Geoinformatics of the 21st Century, Digital Earth, China environment press.

[3]Jiang Jingtong, Liu Ruomei, Development of the Spatial Data Framework Of NSDA in China, Proceedings of Spatial Data Infrastructure & Digital Earth

[4]Yang Kai 1999, National Spatial Data Infrastructure in China, Proceedings of Spatial Data Infrastructure & Digital Earth.

[5]Liu Jiping, Zhao Rong, Zhang Qingpu and Wang Liang, Establishment and Application of Government GIS for Development of western China, Proceedings of OA'2000 International Conference on Office Automation.