Design and Implementation of a Social Economic Statistical Information System Based on ArcEngine

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***Abstract* — Social and economic statistics provide the scientific basis for government and enterprise decision making. The efficient use of such statistics is an important problem faced by the Information Technology statistical industry where the complexity of socio-economic statistics affects its efficiency. This paper takes Henan province social economic statistical data as an example, and the statistical space unit as the core to integrate statistical information resources. We aim to provide analysis and design of information system of social and economic statistics to form a complete solution to the problem of economic statistics application. We put forward an application scheme of information system of social economy statistics based on a review of: i) the characteristics of these statistics, ii) economic and social statistical geographic information system research, iii) GIS spatio-temporal data model, iv) statistical database, metadata management research and application of ArcEngine, v) the rearranged statistical data from 2000 to 2004 and the spatial data mining method for project management and software engineering, and vi) the analysis and design of the society the economic statistics information system.**

Keywords - ArcEngine component library; social economy; statistical information system; spatio temporal database; Web GIS software

I. INTRODUCTION

In recent years, with the national economic and social IT development, government departments at all levels, enterprises and society of national macro social economic statistical data in the increasingly high demand, macro-economic and social statistical data as the social economic development pulse, plays an important role in government and enterprise management and decision-making process. At the same time, socio-economic statistical data is also the foundation of social economic researchers and research institutions. Therefore, the macro social and economic statistical data become an important information resource, the management, development, analysis and utilization of such information resources has become an urgent problem to be solved. However, the traditional statistical geographic information system, mainly in the network system of the PC system or C/S structure, this system is mainly suitable for statistical departments, based on spatial data processing, statistical analysis and result output, not convenient, timely and effectively provide information services for social and economic statistics for other government departments and the public. With the development of GIS technology and integration into the mainstream of information technology, research and development of social economic statistical spatio-temporal data service system based on WEB technology and GIS technology, information released by Internet/Intranet to achieve social and economic system[1], will make the statistical spatio-temporal data service system can effectively provide statistical information services for government and society, but also the development of the society economic information especially the inevitable need for government macro decision making. After years of development, the application of social and economic statistics GIS have made a lot of achievements in all aspects, which not only provides a space for the development of visualization tools for public understanding of the national economy and the society, also provides a tool for government and enterprise managers and decision makers and professional researchers to analyze social economic statistical data them. Effective management of social and economic statistical data is the premise of large-scale statistical analysis, but also the protection of long-term in-depth analysis. The social and economic statistical data of agriculture, industry, population, financial and other types of data, the data storage format, not the same, the means of access to information is not the same, the attribute of time and space are different, in different areas of multi-source spatio-temporal data integration is very difficult, for the comprehensive utilization of data, data sharing and data update inconvenience. This paper is devoted to the study of social economic statistical metadata management system, realizes the integration of statistical information resources in space-time framework and integration problems, and is to break the current bottleneck of statistical information on the most effective technical means, so as to effectively utilize the existing statistical resources [2]. This paper is devoted to the study of the social and economic statistical data analysis, and tries to dig the connotation of space analysis of social economic phenomenon reflected by various statistical data and rules, so as to provide better services for government decision-making. Statistics of traditional geographic information system, mainly in the network system of stand-alone systems or C/S structure, this system is suitable for statistical departments, based on spatial data processing, statistical analysis and result output, not convenient, timely

and effectively to other departments and the public to provide information services to the social economic statistics. This paper is devoted to the study of social and economic data of Web services, through statistical data applications and channels, so as to better provide statistical information for statistical departments at all levels and the public. Based on the analysis of the above problems, the application of current social statistics GIS urgently needs a spatio-temporal data service system based on Web to adapt to the sharing and utilization of statistical data. Therefore, this paper puts forward the analysis and design of social and economic statistics spatial and temporal data service system[3]. With the increasing demand of social, economic and statistical data by government, enterprises and society, the problems of comprehensive utilization and management of social and economic statistics are increasingly prominent. Based on the research of the social and economic data of Web and application of metadata management, and the research to the Henan Province Economic and social statistical data as an example, try to provide solutions for problems related to application of information encountered in the development of social and economic statistics industry, economic and social statistical spatio-temporal data service system, so as to promote the government and enterprise managers and decision makers social economic statistical data management and application of effective. The sketch map of social economic statistical information system is shown in Figure 1.

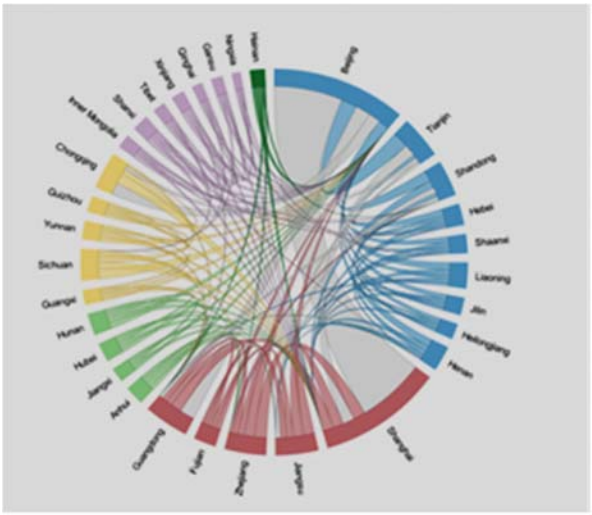

Figure 1. Schematic diagram of information system of social and economic statistics

This study from the actual needs of the government and society on the social and economic statistical data of Henan Province, through the research on social economic statistical data, and using the method of GIS project design and analysis, try to put forward a whole social economic statistical spatio-temporal data service system solutions, the use of temporal data social economic statistical model, the establishment of social the economic statistics spatio-temporal database Geodatabase and meta database based on Web metadata management, to achieve economic and social statistical spatio-temporal data query by metadata mechanism, the realization of social and economic statistics and statistical data of Web application space data analysis.

II. KEY TECHNOLOGIES INVOLVED IN THE SYSTEM

A. Embedded GIS component library introduction

ArcGIS Engine is a complete embedded GIS component library for building custom applications. Using ArcGIS Engine, developers can integrate ArcGIS functionality into some applications. In ArcGIS 9 series of products, ArcGIS Desktop, ArcGIS Engine and ArcGIS Server are based on the core component library Arc Objects build. Arc Objects component library has more than 3 thousand objects for developers to call, for developers to integrate a large number of GIS features, can quickly help developers to conduct the two development of GIS projects. Since ArcGIS Desktop, ArcGIS Engine and ArcGIS Server three products are built based on Arc Objects applications, then for developers Arc Objects development experience in these three products is generic. Developers can expand ArcGIS Arc Objects through Desktop, custom ArcGIS Engine applications, using ArcGIS Server to achieve enterprise class GIS applications. ArcGIS can be developed in a variety of programming environments, including: C++, support COM programming language,.NET, Java, etc.. ArcGIS Desktop development kit (SDK) included in ArcView, Arc Editor and Arc Info, support COM and.NET development. Users can use ArcGIS Desktop SDK to extend the functionality of ArcGIS Desktop, such as adding some new tools, custom user interface, add new expansion module, etc.. ArcGIS Server implements a set of standard Web GIS services (e.g. mapping, access data, geocoding, etc.) to support enterprise level applications. ArcGIS Server SDK allows developers to establish a centralized GIS server to achieve GIS functionality, publishes Web based GIS applications, the implementation of distributed GIS operations, etc.. In 2004, ESRI released ArcGIS Engine, ArcGIS provides a series of ArcGIS Desktop can be used outside the framework of the GIS component of Engine development kit, ArcGIS Engine there is a good news for developers who need to use Arc Objects, because before the release of ArcGIS Engine, the development of Arc Objects based on ArcGIS Desktop framework can only be carried out under the huge. Development environment: Arc Objects must rely on the ArcGIS Desktop platform, namely the purchase of ArcGIS Desktop is installed at the same time, to install Arc Objects, developed by AO; ArcEngine is the embedded components independently, does not depend on the ArcGIS Desktop platform, ArcEngine Runtime and Developer Kit installed, you can use the development in different development language environment. ArcGIS Engine contains a development package for building custom applications. Programmers can install their own computer ArcGIS Engine development kit, working in their own familiar programming language and development environment. ArcGIS Engine through the development environment to add controls, tools, menu bars and object library, embedded in the application GIS function. For example: a programmer can build an application that contains an Arc Map thematic map, some

map tools from ArcGIS Engine and other custom features. All applications built with ArcGIS Engine require ArcGIS Engine runtime, Engine runtime provides the core functionality of ArcGIS applications[4]. ESRI uses the Engine runtime in desktop applications and server applications, the same way you build your application deployment. The standard Engine runtime can increase reading and writing support for Geodatabase by adding specialized read and writes extensions, as well as extending spatial analysis and 3D analysis. ArcEngine structure schematic as shown in Figure 2, the development interface shown in Figure 3. The core code is listed below.

Figure 2. ArcEngine structure diagram

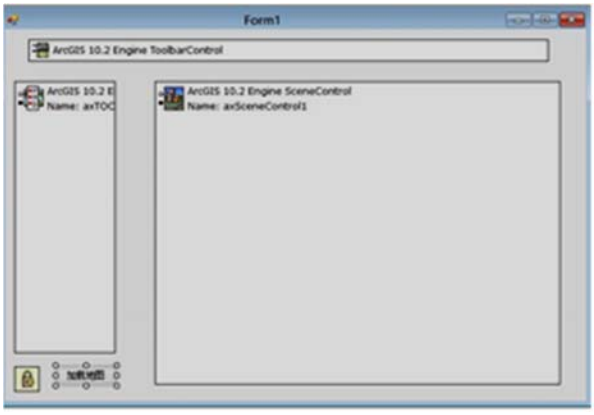

Figure 3. Schematic diagram of ArcEngine development interface

```
Private void axMapControl1_OnMouseMove(object sender, IMapControlEvents2_OnMouseMoveEvent e)
{
IFeatureLayer pFeatureLayer = axMapControl1.Map.get_Layer(0) as IFeatureLayer;
pFeatureLayer.DisplayField = "Name";
pFeatureLayer.ShowTips = true;
string pTip;
pTip = pFeatureLayer.get_TipText(e.mapX, e.mapY, axMapControl1.ActiveView.FullExtent.Width / 10000);
if (pTip != null)
{
toolTip1.SetToolTip(axMapControl1, "name： " + pTip);
}
else
{
toolTip1.SetToolTip(axMapControl1, "");
}
}
```

B. Web GIS

Web GIS is a product of Internet technology used in GIS development, is an important part of modern GIS technology. Common Web GIS development software superengine image. Geographic information system is a dynamic interactive, distributed, and is composed of a wireless terminal multiple hosts, multiple databases, and by the client and the server (HTTP server and application server) connected with the. GIS through the WWW function to expand, truly become a popular tool. From any node of WWW, Internet users can browse the spatial data in WebGIS site, make thematic maps, and carry out various spatial retrieval and spatial analysis, so that GIS into millions of households. Web GIS technology has been rapid development in recent years, its application also extends to all aspects of GIS applications. GIS is through the computer network can quickly expand, become truly serve the public tools. Internet based geographic information system, we often call Web-GIS, mainly because most of the client applications using the WWW protocol. With the progress of technology, the client may use new application protocols, therefore also known as Internet GIS1, WebGIS is the product of Web technology and GIS technology combined, is a new technology of using Web technology to expand and improve the geographic information system. 2, because the HTTP protocol uses the C/S request / response mechanism based on user interaction with the ability to transfer and display of multimedia data in the browser, and the information in the GIS is mainly to spatial data graphics, image display, user interaction through the operation of spatial data query and analysis. These features make it possible for people to use Web to find the spatial data they need and perform various operations. WebGIS is a product of Internet and WWW technology applied to GIS development[5], is an optimal solution to achieve GIS interoperability. From any node of Intemet, users can browse the spatial data in WebGIS site, make thematic maps, and carry out various spatial information retrieval and spatial analysis. Therefore, WebGIS not only has the most or all of the traditional GIS software has the function, but also has the unique advantage of using Internet, the user does not need to install GIS software on your local computer can access the remote GIS data and applications on Internet, GIS analysis, providing interactive maps and data in Internet on. The key features of WebGIS are object oriented, distributed and interoperable. Any G1S data and functionality are objects that are deployed on different servers of Intemet and assembled and integrated when needed. Any other system on Intemet can exchange and interoperate with these objects. Truly popular GIS due to the explosive development of Internet, Web services are entering millions of households,

WebGIS to provide more users with the opportunity to use GIS. WebGIS can browse, query using a common browser, additional plug-ins (plug-in), ActiveX control and Java Applet are often free of charge, reduce the end user economic and technical burden, largely expanded the scope of potential users of GIS. The past GIS due to high cost and technical difficulty, often become a few experts have professional tools, it is difficult to promote. Good scalability WebGIS easily with other information services in Web seamless integration, you can build flexible GIS applications. (4) cross platform features before WebGIS, although some vendors for a different operating system (such as: Windows, UNIX, Macintosh) were provided by the GIS software version, but not a real GIS software has the characteristics of cross platform. The Java based WebGIS can do once compiled, running everywhere (write once, run anywhere), the cross platform features to play incisively and vividly. WebGIS must support data distribution and computing distribution: WebGIS server provides GIS services for network users: geographic data access services, geographic data directory services, geographic information analysis services and map display services. Through Interoperability Technology, sharing distributed data objects, running on many different platforms to maximize the use of network resources. WebGIS schematic shown in Figure 4. Web GIS core code cited as follows[6].

Figure 4. Schematic diagram of B/S mode

```
this.drawLayer=function(layerObject)
{
switch (layerObject.type)
{
case "tail" :
drawTailLayer(layerObject) ;
break;
case "denamic" :
drawDynamicLayer(this.control,layerObject) ;
break;
case "point" :
drawPointLayer(this.control,layerObject) ;
break;
case "line" :
break;
case "polygon" :
break;
}
}
```

C. *Data Mining Algorithm*

Data mining (English: Data mining), also translated as data mining, data mining. It is a step in database knowledge discovery (English: Knowledge-Discovery in Databases, abbreviation: KDD). Data mining generally refers to a large number of data through the search algorithm to hide the information in which the process. Data mining is often associated with computer science, statistics, and through online analysis processing, information retrieval, machine learning, expert system (depending on the old rules of thumb) and pattern recognition and many other methods to achieve the above objectives. Data mining algorithm is a set of heuristics and calculations to create data mining models based on data. To create the model, the algorithm first analyzes the data you provide, and looks for specific types of patterns and trends. Need is the mother of invention. In recent years, data mining has aroused great concern in the information industry, the main reason is the existence of large amounts of data, can be widely used, and the urgent need to convert these data into useful information and knowledge. Access to information and knowledge can be widely used in a variety of applications, including business management, production control, market analysis, engineering design and scientific exploration, etc.. The use of data mining from the following areas: (1) from the idea of statistical sampling, estimation and hypothesis test (2), artificial intelligence, pattern recognition and machine learning algorithm, modeling technology and learning theory. Data mining also quickly embraced ideas from other areas, including optimization, evolutionary computation, information theory, signal processing, visualization and information retrieval[7]. Some other areas also play an important supporting role. In particular, database systems need to provide effective storage, indexing, and query processing support. Techniques derived from high performance (parallel) computing are often important in dealing with massive data sets. Distributed technology can also help to deal with massive data, and when the data cannot be concentrated together to deal with is even more important. EC in the United States has just begun, the reason for the EC as an epoch-making thing, because Internet's ultimate major commercial uses, e-commerce. At the same time, in turn, it can be said that a number of years after the business information, mainly through Internet transmission. Internet is about to become the nervous system of our business information society. By the end of 1997 in Vancouver at the Fifth APEC informal summit (APEC) on US President Barack Clinton urged countries to jointly promote the development of the electronic commerce bill, which caused the attention of world leaders, IBM, HP and Sun and other

international famous information technology vendors have announced on 1998 in e-commerce. Usually, prediction is done by classification or valuation. That is to say, a model is obtained by classification or valuation. In this sense, prophecy is not necessarily divided into a single class. The purpose of the prediction is to predict the unknown variables in the future, which needs time to verify, that is, after a certain period of time, only to know the accuracy of the prophecy is how much. DHL is a global market leader in international express delivery and logistics industry. It provides express, air and water three road transport, contract logistics solutions, and international mail service. DHL international network will be linked to more than 220 countries and regions, the total number of employee's more than 285 thousand people. FDA in the United States to ensure that the delivery process of drug shipment temperatures under the pressure, DHL pharmaceutical customers strongly require more reliable and affordable options[8]. This requires DHL to track the container temperature at all stages of delivery. Although the information generated by the recorder method is accurate, but cannot transfer data in real time, customers and DHL are unable to take any preventive and corrective measures in the event of temperature deviation. Therefore, DHL's parent company Deutsche Post World Network (DPWN) through technology and innovation management (TIM) group clearly developed a plan to prepare the use of RFID technology at different time points to track the shipping temperature. Mapping the key functional parameters of a service decision process through the IBM global business consulting service. DHL won two benefits: for end customers, enabling customers to respond to medical problems in the process of transporting the shipment in advance, at a low cost and with compelling overall strengthens the delivery reliability. For DHL, improve customer satisfaction and loyalty; to maintain a solid foundation for competitive differences and become an important new source of revenue growth. In this paper, K-Means algorithm, K-Means is one of the most classic is the most widely used clustering method, to date there are many based on its improved model proposed. K-Means's idea is very simple, for a clustering task (a topic worthy of study you need to specify clustered into several classes, of course, according to the natural idea should not need to specify the number of categories, the problem is the current clustering task), first randomly selected centers K cluster, and then repeated calculation of the following process until all clusters the center does not change (cluster does not change so far): Step 1: for each object, and each cluster center to calculate the similarity of the cluster is classified as the most similar in. The working process of K-means algorithm is as follows: first, a data object from the n choose k objects as the initial cluster center; but for the remaining other objects, according to their similarity with these cluster centers (distance), were assigned to the most similar (represented by the cluster center and clustering); calculate the clustering center of each received a new clustering (mean the clustering of all objects); begin to repeat this process until the standard measure function until convergence. Generally, the mean variance is used as the standard measure function. K clustering has the following characteristics: each cluster itself is as compact as possible, and each cluster is separated as much as possible. The schematic diagram of the k-means algorithm is shown in Figure 4 and the core code is listed as follows[9].

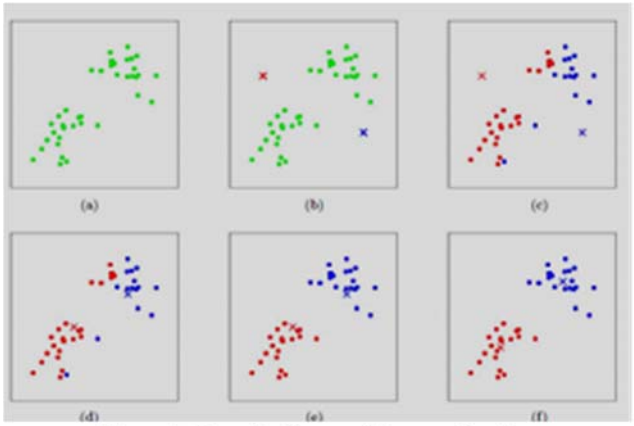

Figure 5. Schematic diagram of K-means algorithm

```
mu3=[-1.25 1.25 -1.25];
S3=[0.3 0 0;0 0.35 0;0 0 0.3];
data3=mvnrnd(mu3,S3,100);
plot3(data1(:,1),data1(:,2),data1(:,3),'+');
hold on;
plot3(data2(:,1),data2(:,2),data2(:,3),'r+');
plot3(data3(:,1),data3(:,2),data3(:,3),'g+');
grid on;
data=[data1;data2;data3];
 [u re]=KMeans(data,3);
[m n]=size(re);
figure;
hold on;
for i=1:m
   if re(i,4)==1
       plot3(re(i,1),re(i,2),re(i,3),'ro');
   elseif re(i,4)==2
       plot3(re(i,1),re(i,2),re(i,3),'go');
   else
       plot3(re(i,1),re(i,2),re(i,3),'bo');
   end
end
grid on;
```

III. SYSTEM SCHEME DESIGN

A. Statistical Information Analysis

After decades of efforts, China's statistics department has been formed based on periodical censuses, sample survey of recurring theme, with the necessary statistical reports, comprehensive investigation and analysis, key to complement the statistical investigation methods system, and gradually establish and improve the statistical standard system of statistic index system, etc., and the formation of the massive statistical data reflecting the social economic situation over the years. To effectively integrate, these

massive statistical data resources exploitation and mining, extraction implied between these statistical data and statistical data of social and economic development pattern, become the statistics department level, quality and efficiency of the key services in the field of statistics. At present, information has entered a stage of integration and integration of information resources, the integration and integration of statistical data becomes the key to the development of statistical information. Statistical data integration and integration is the core of must have a framework and integration of information integration, integrated geographic information system for information integration provides an effective framework for spatio-temporal information integration, can be better in the statistical space unit as the core integration and integration of various professional information resources. Because of the separation of data resources caused by the independent development system, the traditional statistical geographic information system cannot meet the requirement of information resource integration. Beijing SuperMap GIS Technology Co. Ltd., put forward a series of economic and social statistical geographic information system Super Map based on GIS solution, put forward comprehensive metadata driven economic and social statistical system based on geographic information system and the statistics department at all levels for the domestic economic and social statistical geographic information system. Shanghai Municipal Bureau of statistics and development of the Shanghai City Economic and social comprehensive geographic information system[10], the system describes the social and economic statistical information on location, the map of Shanghai city in the distribution and trend analysis of Shanghai city social and economic development, for the study of social and economic development in Shanghai and provide the basis for layout planning. Geographic information system through information loading, on the map from three aspects of socio-economic status study: target geographical location; geographic information analysis; geographic information fitting analysis. Functions include: database query; thematic map production; street population and population density thematic map; basic unit census thematic map. However, these two systems still have shortcomings, such as lack of time series information, limited management data and so on. Therefore, this paper proposes a socio economic statistical spatio-temporal data service system, trying to solve these problems.

B. System Requirement Analysis

The social and economic statistical data service system is facing the society, system management application service to the society, has multiple levels of customer groups, customer level includes: national and domestic statistic departments at all levels of decision-making management leadership; statistics department specific service staff; data sharing, statistical query, analysis the researchers through the system; scattered around, due to a variety of statistical information service to the general public. The system needs to provide summary statistics and analysis of spatio-temporal data of social economy statistic function, submit visualization space and time trend, and the thematic map, histogram, pie chart and curve and other forms of direct leadership to support decision-making. The system provides the function of GIS and the Statistics Department of the business combination, the business data and spatial data fusion, meets the requirement of application system using the statistics department, the system will support the following applications: query of administrative information in the electronic map, mainly is the basic information of county and municipal administrative divisions, such as administrative code information through the query statistics; system; publish service information based on electronic map. Researchers and the public can easily carry out statistical information services, data sharing, statistical information query and analysis through the socio-economic statistics spatial and temporal data service system. According to the above analysis, the social economic statistical data service system data requirements are divided into geographic information resource database and statistical database, geographic information resource database layer mainly adopts the current administrative division, through the collection of statistical data into the statistical database. The basic data of the spatial and temporal data service system of social economy statistics are widely distributed and various, so it is necessary to establish a reasonable and effective management system to store and manage the basic data of the system. Social and economic statistical data sources, large amount of data, more kinds of indicators. Statistical Yearbook is the most commonly used social economic data, the provincial statistical yearbook of statistics as an example, including natural resources, economy, population, the three industry index, energy production and consumption and finance; statistical data is divided into: the provincial, municipal and county statistics, statistical indicators at all levels of statistical data are different there are also changes, statistical indicators in different years. Social and economic statistics are usually statistical by region, statistical yearbook statistical area of statistical data is the administrative divisions, such as cities, counties, etc.. The statistical data has spatial characteristics with regional statistics, and it expresses the statistical data from the spatial angle, that is, the spatial visualization of statistical data, which makes the statistical data more intuitive. Economic and social statistical data are usually set, multiple sets of data in a time sequence. Therefore, the social and economic statistical data with time characteristics, social and economic statistical data including statistical attribute data and spatial data statistical unit, both of which has the characteristics of time. The temporal statistical attribute data to describe the change of social and economic development in quantity, the spatiotemporal change of statistical unit data description statistical unit, with the change of time, statistical attribute data and spatial data statistical unit will change. The temporal characteristics of socio-economic statistics generally reflect the changes of social and economic development with its attribute or spatial characteristics. The spatial and temporal characteristics of statistical data are combined into attribute, spatial and temporal features[11].

C. System Scheme Design

Based on geographic information system (GIS) and the World Wide Web Geographic Information System (Web GIS) the theory and method of support, with the computer network, Web programming technology as auxiliary means, construct the system of social economy statistics spatio-temporal data service system, and realize the statistics of spatio-temporal data management, query, analysis and sharing, so as to provide important information basis for government decision-making, and convenient statistical staff, researchers and the public. The design of social and economic statistics spatial and temporal data service system follows the hierarchical principle of software architecture. Horizontal stratification: the use of B/S structure, the software system of presentation logic, business logic, and database is separated into three different levels, carry out their duties. Logic is responsible for the input and output of user interface and information; business logic is responsible for transaction processing; the back-end database is responsible for data persistence in business logic. The three level through the network distribution environment standard protocol (such as TCP/IP, HTTP, RMI, IIOP, etc.) connection. Vertical stratification: further stratification on the business logic layer, including infrastructure layer, public infrastructure layer, business object layer and application layer, the lower module provides services for the upper module, the top-level module directly for application, basic module provides the system operation system. A system of professional GIS application development J2EE system of social economy statistics based on service, using INTERNET and WEB technology and multi-layer system structure, has the characteristics of openness, flexibility, compatibility, flexibility, cross system. The system mainly based on B/S structure, client and server data exchange and function calls using XML format and Web Services mode. Therefore, the social and economic statistics spatial data service system framework is mainly divided into three levels: data, business and representation. Data level: including spatial database, statistical space-time database, and meta database. Through Arc SDE spatial data engine stored in relational database. Through the database to achieve the business logic and data persistence; business level: this layer is responsible for receiving and handling client requests to the data layer, query and extract the needed data, analysis and processing functions provided by the system, and the results will be returned to the client. Here the system provides GIS basic functions, spatio-temporal query, thematic analysis, metadata management functions; presentation level: user and system interface. In addition, Arc IMS application server connector and client viewer using Servlet connector and HTML viewer this custom thinner client way. The advantages of this technology application system architecture development in cross platform application; code and data sharing; the development cycle and difficulty can shorten the application; the structure of the system can be optimized; openness and integration is greatly improved; to improve the security, scalability and stability of the system. The overall structure of the system is shown in Figure 6.

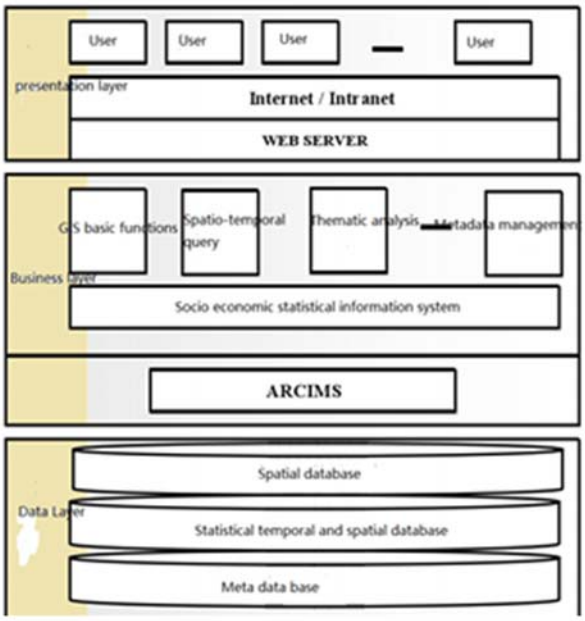

Figure 6. Schematic diagram of overall system structure

IV. SYSTEM IMPLEMENTATION

According to the previous system design and system application, the business layer is divided into four modules: GIS basic functions, statistical space-time query, thematic analysis and mapping, metadata management. GIS the basic functions of the system include: View operation, geographic location; statistical spatio-temporal query function: region query, query; thematic analysis and mapping functions: thematic mapping analysis, thematic statistical analysis of spatio-temporal data; metadata management module: metadata registration, metadata maintenance, map upload service, map storage service. As an application of social and economic statistics spatial and temporal data service system, its vitality depends mainly on the system of socio-economic statistical space-time data application, analysis and management to meet the actual needs. Therefore, the main task is to design target of system development to plan the size and determine the system each part of the system, and explains their role in the whole system and management, so as to ensure the realization of the overall goal of the system. The system is a GIS system obtained by two times in the development of Arc based on IMS, which basically inherits all the basic functions of Arc provided by IMS, view operation functions include map zoom, map, roaming, map printing preservation, layer control; map display using the navigation map effect (i.e., Hawkeye). If we call a literal description of an address as a record, then the process that gives the record a X/Y coordinate based on this address makes it possible to locate it on an electronic map. A large number of records with only address attributes can be directly positioned on the map by using geocoding. This system uses the geocoding way is to locate to the region, thus realizes according to the administrative division name to carry on the map localization. Statistical spatial information

query is refers to the spatial entity, according to certain requirements of the geographic information system described by spatial information and time information access, from many spatial entities retrieved to meet user requirements of spatial entities and their corresponding properties. The system provides flexible information query, including region query and combination query. The system provides a complex combination of query, can be spatio-temporal data social economic statistics according to the statistics of the year and the administrative unit (such as a city or county) combined in a variety of query conditions, or fuzzy query, so as to obtain the attribute information of the spatio-temporal data of social economy statistic. The system provides the thematic map is the combination of social and economic statistical data and spatial data, on the map with a column, pie, icons, color of the form distribution of a statistical data in space, is a performance analysis means more intuitive, with detailed information display. The system provides thematic map settings, thematic mapping analysis module includes three parts, set the specific combination of thematic settings, receiving the statistical results; the special setting is the main part, including thematic map style, numerical analysis, comparative analysis, time type composition analysis set. Numerical analysis can be a variety of social and economic indicators for analysis of data statistics; time comparative analysis can analyze a certain social and economic indicators in each year; the types of analysis can be according to the type of social statistics indicators (such as the first and the second industry and the third industry analysis). Statistical data of thematic analysis is administrative unit and the statistical year social economic statistical data combination in the form of dynamic histogram, graphs and pie charts to reflect changes in the state of a statistical data in time, can also reflect a difference of statistical data in different administrative units. In addition, the sum of the statistical data can be obtained. Thematic analysis of statistical data can be divided into municipal statistical data thematic and county-level statistical data topics, according to different statistical content, also divided into natural resources, three industries, population, national economy and other topics. Meta registration service function has three main functions: metadata registration function. Economic and social statistical spatio-temporal data service system will be registered with the need to upload the administrative division map data and statistical spatio-temporal data related metadata information, and the metadata is saved to the corresponding element in the database; metadata maintenance function. Some maintenance update operations for registered metadata information, such as modification and deletion operations; metadata field maintenance. To upload the spatial data, describe its field attribute information, and save it in the database. To view field description information for spatial data later. Database is the core component of GIS, as a GIS system, its data not only to store and manage attribute data, but also to store and manage graphics data. The attribute data of this service system are directly derived from the socio-economic statistics provided by the statistical yearbook of Henan Province in 2000-2004. Including the statistical data of the national economy, population, city status, agriculture, industry, construction, transportation, foreign trade and international tourism, finance, insurance, education, science and technology and counties; spatial data mainly use the map of administrative divisions of Henan provinces new. Spatial auxiliary data is provided by the National Bureau of statistics annual national or county level administrative divisions change and code. User interface refers to the interface between the software system and the user, usually including input, output, man-machine interface and interface, for the user, the interface is the system. User interface determines the efficiency of user use system. The system supports a variety of map display, the user can according to the needs of various operations on the map, such as zoom, roaming, print, browser user map operation request transfer to the server[12], the server handles the corresponding operation, then Arc IMS will have a map of the JPG format pictures, and displayed on the client on the web browser, users see the results of the operation. The system login screen is shown in Figure 7.

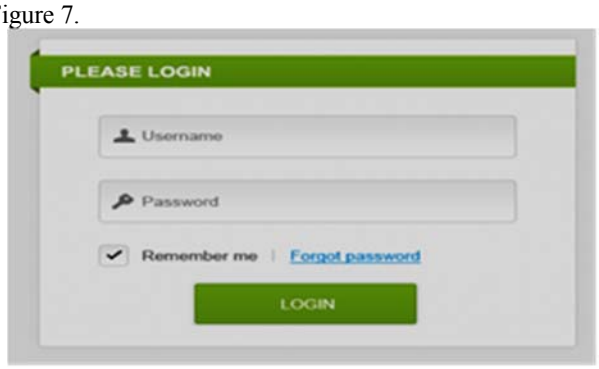

Figure 7. System login interface.

V. CONCLUSIONS

Through the theoretical and technical basis, system analysis and design, the realization of the system and other research process, socio-economic statistics space-time data service system in the analysis, design and development phase of research has made some achievements. The research process and the final application verify the feasibility of the research methods and research ideas. Of course, there are still some limitations in this study. In view of the research progress and limitations of the study, this chapter finally puts forward the ideas for the follow-up study. The analysis and design of spatial data service system with social and economic statistical software engineering ideas combining with project management method, the literature review, the theory and technology of basic research, design method as the foundation, through the analysis and summary statistics to determine the demand situation of information society, application, data demand research, and puts forward solutions the spatio-temporal data service system of social and economic statistics, Henan province in 2000 and 2004 economic and social statistical data, used in Oracle9i, Geodatabase in the establishment of Henan Province Economic and social statistical spatio-temporal database and

meta database, through social and economic statistical spatio-temporal data service system to achieve the basic operation of GIS, spatial data query, statistical analysis and statistical data of thematic mapping thematic analysis, and metadata management and other functions, so the validation of the system feasibility.

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System evaluation on Serious soil and water loss control engineering in the northwest of loess plateau area. The Impact of Feminization agricultural on agricultural productivity (2013XYS0)

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