Design of Logistics Public Information System for SMEs

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Abstract—**The public logistics information system for SMEs is developed by the use of advanced technology, which is based on the idea of building blocks. The whole system is divided into three subsystems, and each with its own direction. A layered architecture is used for the core services subsystem. Using the extended interfaces and services provided by the core service subsystem, the value-added services and functions are constructed. Users do not need to install the system and only need to open the browser for using the system. Thus the troubles caused by system upgrades can be avoided . For users, it is simple, fast start, and zero maintenance. OGIS is a set of public space data manipulation functions, which can be applied in any platform and system, making it possible for the users to use in a sole environment and a work flow and being suitable for any geography data distributed on the net. But the OGIS function collection is imperfect. It cannot provide unified standards for space data conversions of various levels and fields and it cannot completely solve problems of data centralism and distribution processing. The example proved that the method used in this paper has realized fast loss less transformation for the spatial data, which has a broad application in relative field.**

Keywords-Logistics Information; System Design; Information System; Public Logistics

I. INTRODUCTION

In recent years, with the continuous development of the economy, China's logistics industry has been greatly developed[1]. The logistics information technology is a means to reduce costs, optimize logistics processes, expand profit margins for enterprises, which not only can enhance the level of service, but also to enhance the core competitiveness[2]. Therefore, building management information systems has become a trend[3-4].

A logistics public information system for small and Medium enterprises (SMEs, for short) is real-time, informative, professional and strong[5]. Using of the Internet, the exchange of logistics information among users can be done in the fingertips, and give users great convenience, so their information daily exponential growth[6-7]. Enterprises do not need to hire a large number of seats personnel to make overhead significantly reduced.

In order to meet the needs of users and provide a higher level of service, in this paper, the public logistics information system for SMEs is developed by the use of advanced technology[8]. Through data warehousing and data mining, the system provides daily information analysis and statistics, which provide logistics and transportation trends, distribution of information, information on the type of distribution, seasonal information distribution, and other valuable information on the distribution of information for users[9-10]. It can also predict the development trend of transportation in the next few years, which is based on historical information[11]. As the high levels of service, the investment and risk aversion of users in industry has played a guiding significance[12]. The system, which compared with the old information system, has a very good competition and broad application prospects.

II. EASE OF USE THE STUDY OF SYSTEMATIC TECHNICAL PROBLEMS

In order to achieve the expected results of the project and solve the existing problems of industry status, in the development process, the paper mainly solves the following technical problems: information analysis, information search performance optimization, receiving and sending high-performance mass of information, friendly experience for users, opening information exchange service, high-performance data warehouse and discover information data.

A. Information Analysis

In order to analyze the "Information", the words for commonly used in the logistics are analyzed and summarized, the "expression of information" within the industry (that is, the information sent by the users) has been studied, the logistics information glossary for information analysis be finally established.

B. Information Search Performance Optimization

Information search and filtering functions for users to find and read information will have a big help, It speeds up users to find what they 're interested in the information, indirectly increases the daily work. To increase search / filter speed, the system optimizes the search algorithm, offers a variety of search and filtering capabilities, which has met the needs of users.

C. Receiving and Sending High-performance Mass of Information

In order to ease the pressure of massive information and multi-user, the servers in a system have been optimized to meet the requirements of multi-user concurrent operation for massive information.

D. *Friendly Experience for Users*

Users only need to open the browser when the system can be used. All system upgrade on the server side, it will not affect the user and not need to send customer service staff.

E. *Opening Information Exchange Service*

In order to meet the exchange of information between operators and to break the situation of the "information area" , In the early development the system began to develop and analyze for incumbent operators, and ultimately the "information exchange service" can be obtained to meet this requirement.

F. *High-performance Data Warehouse*

To meet the massive information storage, the system began to build high-performance data warehouse. If the daily information only is stored, there is little value at all. After the information is stored every day , the system will uniformly gather the information into the data warehouse, and then follow the topics on relevant industry to organize data for being ready to explore and use these data.

G. *Discover Information Data*

The data stored in the database is to be explored and used. Explore information will meet the demands for users of a higher level and understand the historical changes of the industry, and ultimately forecast and analysis the future development of the industry.

The system provides users with data statistics and generate reports for decision support, and in the business data collection on the basis of the analysis using the data analysis model was used to deeper business data in order to obtain instructive value to the enterprise information management strategy.

III. STYLING DESIGN OF LOGISTICS PUBLIC INFORMATION SYSTEM FOR SMES

A. *Logistics positioning technology in the system*

In studying the system, the implementation mechanism of existing systems and the exchange system of information flow within the logistics industry are analyzed. The consumer behavior and the historical data of industry for many years can be studied to provide the platform of decision and support for Enterprises. Mining users' needs is to provide more information of the business intelligence on the logistics industry. To provide technical supports and business opportunities is to third-party operators and service providers. Therefore, we propose the basic building block of the system. The whole system is divided into three subsystems, which have their own direction for each.

The construction of the public logistics information platform is a cross regional, cross sectorial, and cross industry construction. The purpose is to integrate existing logistics information resources and improve the operation of the whole logistics system and the operational efficiency of the logistics system. The open problems will involve a large number of logistics related information resources and data reorganization of assets interface. The construction of urban public logistics information platform needs to absorb a large amount of capital and the participation of many enterprises.

Here, the user interface subsystem is for using and experiencing of users. All the core functions of the system are implemented by the core services subsystem to provide services for other subsystems. The expansion subsystem is a subsystem of third parties, which gets its own value-added services through the extensions interfaces using the core services subsystem. The core service subsystem utilizes a hierarchical structure.

Each layer can realize the specific functions and provide the opening services, and has extensible parts. The core services provide functional support to the other two subsystems. Data mining sub-layer is achieved in extended data services layer. The sublayer focuses on data warehousing and explore functions, full functions of the sub-layer are implemented by the interactive collaboration with extended data services layer. User interface layer uses the service provided by "core services" to perform their own functions, and the extensions provided by third-party are indirectly used through core services.

The conversion from vectors to grids can be used for logistics public information system data conversion. When the difference between the columns is greater than the number of rows, the center line of each column paralleled to the Y axis is called the scan line.

The grid element ranks is (I, J) after the vector coordinate point (x, y) is converted, then

$$I = 1 + \left[\frac{y_0 - y}{D_y} \right], J = 1 + \left[\frac{x - x_0}{D_x} \right] \qquad (1)$$

Find the intersection of each scan line and the line segment, and then convert the intersection point to grid coordinates by the gridding method of points. Suppose that x_m is the abscissa of the central scan line for each column and (x_1, y_1) and (x_2, y_2) are two endpoints of a line segment, and then the intersection coordinates are as follows

$$x = x_m, y = (x - x_1) \frac{y_2 - y_1}{x_2 - x_1} + y_1 \qquad (2)$$

Based on the size of the first and last corners of the vector and the angle α, we can calculate the line number (i_a, i_e) or the column number (j_a, j_e).

When $|x_2 - x_1| < |y_2 - y_1|$, the line number (i_a, i_e) can be calculated.

When $|x_2 - x_1| \geq |y_2 - y_1|$, the column number (j_a, j_e) can be calculated.

Assume that the current processing line is i, The length of the grid is m. The calculation procedure is as follows,

Setp1. Calculate the tangent of the vector tilt angle α

$$\tan\alpha = \frac{y_2 - y_1}{x_2 - x_1} \qquad (3)$$

Setp2. Calculate initial column number

$$j_a = \left[\left(\frac{y_0 - (i-1)m - y_1}{\tan\alpha} + x_1 - x_0\right)/m\right] + 1 \qquad (4)$$

Step3. Calculate end column number

$$j_e = \left[\left(\frac{y_0 - im - y_1}{\tan\alpha} + x_1 - x_0\right)/m\right] + 1 \qquad (5)$$

Step4. From column j_a to column j_e, the remaining grids of line i call out marks.

Step5. If the current processing line is not a terminating row, the bank terminates the column number J_e as the initial start column number J_a. Line number i is increased by 1, and goes to (3). Otherwise, the rasterization process of this vector segment is over.

B. Theoretical basis of FME and Arc Map

FME contains software module operation essential factor object and the read module reads essential factor data from exterior data pool. The essential factor factory module makes these data merge together or split under the users' control. The transformation module makes these essential factors convert from one kind of expression format to another one and it may also articulate these essential factors to exterior database. While writes module can outputs these objects by one kind of support form [13]. The spatial data consists of the graph information and the attribute information. The graph information is the major lines of GIS and the DWG data and it is the carrier of attribute information. The attribute information contains the GIS classification coded message and all service information as well. It is the annotation of graph information.

The goal of FME and Arc Map transformation is to convert DWG form data to the .shp data of Arc GIS and this article makes use of that goal. DWG data is stored by image layers, and each converted layer is strictly divided into points, lines, areas, texts (some may not fully include). After that, the converted data is stored in the corresponding elements layers of the Arc GIS database. In this paper, the surface data is converted to point data or line data. The data are under topological reconstruction and assignment processing in order to make the storage of the data in the later stage more convenient[14].

The logistics public information system can not be separated from the geographic information system. We build Geo database so that the logistics public information system can be integrated with the geographic information. The geometric properties of DWG and geodatabase data is shown as Table 1.

TABLE I. Geometric Properties of Shape Graphics of DWG and Geodatabase Data

DWG data	Geometric properties of DWG graphics	Geodatabase data	Geometric properties of Geodatabase graphics
annotation	Point	annotation	Polygon
point	Point	point	Point
line	Polyline	line	Polyline
surface	Polygon	surface	Polygon
Three-dimensional model	Multipath		

From table 1, we can see that in the conversion form DWG data to Geo database data, points, lines and areas, the three types of spatial data format are the same and the conversion process is relatively simple. While in the Geo database, the format of DWG data recorded information is coverage annotation with its geometry attribute is Point. The format of GIS note recorded information is feature class annotation, whose geometry property is Polygon; during note transitions, paying attention to this problem is needed.

Open FME Universal the Viewer loaded topographic diagram, take the 211 (general house) chart level as the example. We may see that under this chart level, there has point, line, area and text. Therefore, when one uses FME to transform the data, he or she has to pay attention that in 211 layer, only need to switch point, the line, the surface, the text content. If there has other layers, one needs to be transferred to the corresponding level according to the actual situation.

C. Comparisons of Topographic Map Data Before and After Conversion

The Figure 1 is the comparisons of the conversion of CAD data effect chart and the original data, from which we can see that before and after conversion, the data is consistent. We also can see that the graphical elements and the property of elements are competing as well as the graph performance effect also meets users' need.
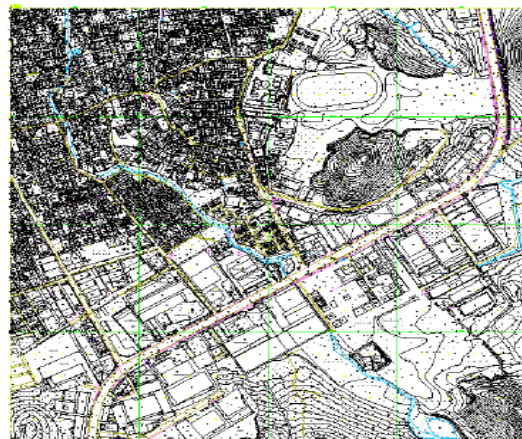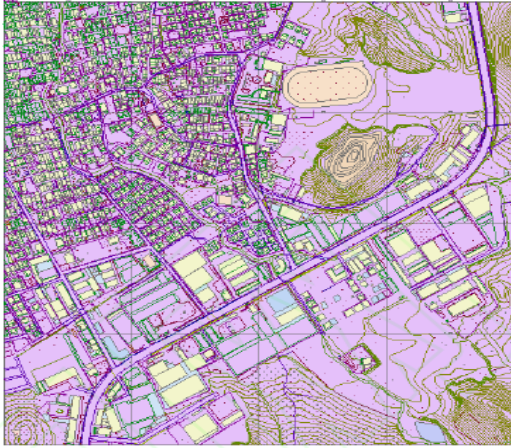
Figure 1.   Comparison of Experiment Result

The comparisons of the name of the data layer before and after the conversion and the number of data of the converted layers. Through the contrast test, it can be discovered that geometry essential factors, including the point, the line and the area, as well as the text can transform correctly. Moreover, the corresponding relations of the information of graph and attribute are correct, which is basically consistent with the original information.

Information service interface of the system uses Web Service to implement as open, cross-platform, cross-language. For third party, regardless of any platform and language to development, existing system that needs to be developed can interact with the service to achieve the flow of information. Using scalable architecture, the system provides maximum flexibility. A variety of interfaces and services provided by the system can develop a variety of plug-ins to enhance existing functionality of the system and add new services. Third parties can also develop their own plug-ins and will make them be integrated into the system. The system and extended plug-in can be considered as a whole to provide users with services. Various extension is transparent to the user, and does not affect the user's normal use. The advanced services provided by system through Data mingling, users and third parties via standard interfaces using these services.

IV. Conclusion

Through analysis of existing systems, the public logistics information system for SMEs is developed by the use of advanced technology, which is based on the idea of building blocks. The whole system is divided into three subsystems, and each with its own direction. A layered architecture is used for the core services subsystem. Using the extended interfaces and services provided by the core service subsystem, the value-added services and functions are constructed. Users do not need to install the system and only need to open the browser for using the system. Thus the troubles caused by system upgrades can be avoided . For users, it is simple, fast start, and zero maintenance.

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