

## Design and Development of Intelligent Logistics System Based on Semantic Web and Data Mining Technology

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**Abstract**—The intelligent logistics distribution of e-commerce is the computer technology and modern hardware equipment, software system and advanced management tools used by the logistics distribution enterprise. Data mining technology is the process of finding the probability distribution of random variables from a large number of source data. Automation of intelligent logistics system can improve labor productivity and reduce the error of logistics operation. This paper proposes design and development of the electronic commerce intelligent logistics system based on combination of semantic web and data mining. Experiments show that the proposed method is effective.

**Keywords**-Semantic network; Intelligent logistics system; Electronic commerce; Data mining; Ontology

### I. INTRODUCTION

Data mining should be applied to any kind of knowledge mining in any information storage mode, but the challenge and technology will be different because of the different types of source data [1]. In particular, the research shows that the data storage types of data mining is more and more abundant, in addition to some common value of the model, architecture and other research, but also carried out some research on the complex or new data storage methods of mining technology or algorithm.

The semantic web is a vision of the future, in which information is given a clear meaning that machines can automatically process and integrate information on the web. The Semantic Web uses XML to define custom tag formats and the flexibility to express data. Resource description framework (RDF) is a standard for describing resources. What is resource? This is a very difficult question to answer.

Ontology is used to describe the knowledge of a domain. The ontology describes the relations between concepts and concepts in the field. Different ontology languages provide different features [2]. The latest ontology language is the introduction of OWL W3C. It has plenty of operators, such as and, or, and negation. It is based on the logic that allows it

to define concepts or concepts. Complex concepts can be built on simple concepts.

E-commerce logistics, also known as online logistics, is based on the Internet technology, creative aims to promote the development of the logistics industry, new business models, through the Internet, logistics companies to owner customers is a greater range of take the initiative to find, can in the country and even the world to expand the business, trading companies and factories can more quickly find the price the most suitable logistics company; e-logistics is committed to the world within the scope of the maximum number of a logistics needs of the owner of the business and provide logistics service of the logistics company are drawn together and help logistics supply and demand sides, deal with neutrality and integrity, free online logistics market. At present, there are more and more customers through the online logistics market to find a customer, to find a partner, to find a foreign agent. Online logistics provides the greatest value, is more opportunities. In this paper, we propose the design of intelligent logistics system based on Semantic Web technology and data mining.

### II. ANALYSIS OF RDF TECHNOLOGY BASED ON SEMANTIC WEB

URI is the uniform resource identifier, which is used to identify and locate resources on the network. URI has many forms and can be extended, the most common of which we are familiar with the URL refers to the Internet is currently the best search engine Google refers to the founder of the semantic web, Berners Tim lee. In addition, there are many other forms of URI, including UUID, TAG and els, etc.. We can use URI to uniquely identify any thing, and any of the things that have URI can be said to be in the Web. For example, you just bought the book last week, some of your mind in the immature mind and even your own, etc., you can use URI on the network to identify.

Semantic web is not only able to understand human language, but also can make the communication between human and computer become as easy as the exchange

between people. Adds more to the vocabulary of attributes and types, such as (cardinality), disjointness, equivalence, attributes, attributes (e.g., symmetry), and enumerated (classes).

Definition 1 [3]: the measure word limit is made up of three parts, respectively (quantifier), attribute and filler. There are someValueForm (some, least one at) and allValueFrom (OWL). Note that the universal measure word also describes those individuals who do not have the attribute, and it is the full name does not indicate the existence of a relationship, as is shown by equation (1), but that it must be associated with a particular class.

$$MI_{FA}(f, a) = \sum_{f,a} P_{FA}(f, a) \ln \frac{P_{FA}(f, a)}{P_F(f)P_A(a)} \quad (1)$$

Some more complex queries, such as a lot of filtering steps, are more important than the. But the traditional method is not competent for this. In addition, the Jena system attempts to create a list of features from the RDF data, which will be a collection of information on a number of features on a column topic, but it is not good for those who cannot come from a table.

Schema XML is actually a kind of XML application; it uses XML syntax itself, so the XML document is a kind of self description document. Schema XML is an alternative to DTD (Type Definition Document), but it is more flexible than DTD. It not only provides a complete set of mechanisms to restrict the use of tags in XML documents, but also supports more data types, and can provide a better data verification mechanism for the effective XML document service.

We find that DAML+OIL can easily express domain specific knowledge related to software requirements document, but not so suitable for the generation of domain models. We have investigated the use of DAML+OIL to describe non functional requirements such as quality of service, which is believed to be a meaningful training. We will continue to observe the development of language in semantic web, looking for the opportunity to combine generative rules and explore two levels of grammar as another possible language of the semantic web. Of course, as is shown by equation (2). TLG is able to obtain the semantic information associated with the combination of software components, but it can not be obtained by using the semantic web language [4].

$$fresp(x, y) = Det(Z) - kTrace^2(Z) \quad (2)$$

Definition 2: RDF is a powerful place, it only provides the main - that - the - object - the description of the form, as the predicate and object in the end is what, can be freely chosen according to different needs. Therefore, RDF can be defined as "resource description framework" and not "resource description method". The most common predicate and object for RDF.

$$\begin{aligned} S_x &= E[(Y - EY)(Y - EY)^T] \\ &= E[AX - E(AX)][AX - E(AX)]^T \\ &= E[(A - EA)X][(A - EA)X]^T \end{aligned} \quad (3)$$

Similarly, we are now witnessing the early stages of XML's popularity. Although the XML itself is not sufficient for the realization of the semantic web, it is an important first step. XML and RDF are the W3C standards which are related to the semantic web. The earliest users may be interested in knowledge management and business to business electronic commerce. This momentum will drive more and more tools vendors and end users to adopt this technology. Of course, semantic web can be expressed as factual knowledge, and it can also be expressed as the connection between factual knowledge. Mainly in the following several aspects: 1, to express the fact; 2, to express the relation between things; 3, said the more complex knowledge.

Definition 3: RDF/XML how to put a RDF figure encoding XML elements attributes element content and attributes values of the basic ideas. URIrefs is written by XMLQNames, which consists of a short prefix (prefix) (representing a namespace URI) and an internal name (name local) (representing the elements or attributes of a namespace).

Semantic network is used to express complex concepts and their relations, so as to form a semantic network, which is composed of nodes and arcs. From the point of view of graph theory, they are a "directed graph", which is composed of nodes and nodes.

### III. RESEARCH ON CONSTRUCTION OF INTELLIGENT LOGISTICS SYSTEM OF ELECTRONIC COMMERCE

The basis of network in logistics field is information, which means that the network has two meanings: first, the computer communication network, which includes the logistics distribution center and the supplier or manufacturer [5]. Two is the organization's network, namely so-called enterprise internal network (Intranet). Logistics network is the inevitable trend of logistics information, is one of the main characteristics of the logistics activities of e-commerce. In today's world, the availability of Internet and other global network resources and the popularization of network technology provide a good external environment for the logistics network, logistics network can not stop.

According to the information, we analyze the logistics distribution center at home and abroad. The conclusion is that they are all over the stage of simple delivery, which is essentially a real logistics distribution, but at the level of logistics distribution, which is in the primary stage of logistics distribution, it is not equipped with information, modernization and socialization. It is gratifying that the relevant departments of the country have recognized these problems, is from the macro level to guide the efforts of China's logistics and distribution industry in the information, modernization, socialization of the new logistics distribution direction, some of the government officials, business circles,

academic circles are also common in this area, and have begun to practice.

**Definition 3:** Logistics center management information automation: in the construction of logistics center, we should make full use of modern information technology, such as bar code technology, radio frequency identification (RFID) technology, EDI (electronic data exchange technology), EOS (electronic ordering system), POS (point of sale), and so on, real information is automatic, fast and accurate collection, storage, transmission, processing and processing, logistics center for the management and intelligent monitoring to provide timely and reliable information support, as is shown by equation(4).

$$\Phi(m) := \left[ \left( \prod_{i=0}^0 A(mM+i) \right)^T, \left( \prod_{i=1}^0 A(mM+i) \right)^T, \dots, \left( \prod_{i=M-1}^0 A(mM+i) \right)^T \right]^T \quad (4)$$

The development of electronic commerce and enterprise distribution system is closely related. A complete electronic commerce is a business activity which is composed of inventory, logistics, capital, payment, etc.. Logistics is an important part of the operation of electronic commerce [6]. It plays an important role in the electronic commerce. With the rapid development of electronic commerce, the requirements for logistics distribution are also higher and higher. In China, although there are a number of postal courier and some express company, but they only completed the most basic logistics system, and the time is long, the channel is not smooth, in the customer reputation is not good, simply can not meet the requirements of high efficiency, low cost of e-commerce logistics, seriously restricting the rapid development of China's e-commerce.

First, the application of automatic positioning and tracking of the vehicle. Dynamic information using the computer management of GPS system stops can through GPS and computer network real-time collection of railway car goods, vehicles, cargo tracking management, and vehicle scheduling management in a timely manner. Second, the management of railway transport. Using GPS of the computer information management system, through GPS and computer network real-time collection of railway trains, and it is locomotives, vehicles, containers and the goods of dynamic information, to realize the trains and cargo tracking management. As long as know truck vehicles, models and license plate number, you can immediately from nearly 10 million km of railway network flow of hundreds of thousands of trucks found in the truck, but also know the truck now where to run or stop in where, and all of the vehicle for the delivery of information.

**Sorting automation:** for the high demand, sorting operation of large quantities of goods to adopt mature automatic sorting technology, and it is so that can improve the efficiency of sorting, and can reduce labor intensity. In the use of automatic sorting, must be manual sorting to stay in operation space, in order to use a flexible manual sorting as a supplement to the peak demand. **Packaging automation:** the use of highly efficient and environmentally friendly packaging system, both to improve the packaging efficiency,

but also to effectively reduce the volume of packaging. Such as Savoye's JIVARO is automatic packaging line.

E-commerce is helpful to improve the level of logistics management, electronic commerce, logistics information, logistics information, information processing, electronic, information transmission standardization and real-time, digital information storage, etc. [7]. With the development of logistics information technology, bar code technology, database technology, electronic ordering system and other technology, is gradually in the logistics field to get a wide range of applications, which will improve the level of logistics management to a certain extent, as is shown by equation (5).

$$V_j = V_{j-1} \oplus W_{j-1}, \quad \forall j \in Z \quad (5)$$

The traditional logistics distribution of the link is due to many subjects and the relationship of the artificial, so extremely cumbersome. In the e-commerce logistics distribution mode, the logistics distribution center can make the process simple and intelligent through the network. For example, the computer system management can make the whole logistics distribution management process becomes simple and easy to operate; the business promotion on the network platform can be used to make the shopping and trading process more efficient and less cost; logistics information is easy and effective dissemination of information makes the user to find and speed up the speed of decision-making process. Many of the activities that need to be processed and spent more time in the past are simplified because of the simplification of the network system, which greatly improves the efficiency of logistics distribution.

The automation of logistics system can improve labor productivity and reduce the error of logistics operation, but also can facilitate the collection and tracking of logistics information, improve the management and monitoring of the whole logistics system [8]. The facilities are very many, such as bar code automatic identification system, automatic sorting system, automatic access system, automatic guided vehicle system, cargo tracking system, etc.. In our country, the distribution of the logistics automation equipment should be determined according to the operating conditions and the characteristics of the goods, and the input and output analysis should be carried out in detail, as is shown by equation (6).

$$w(n+1) = w(n) + \frac{1}{2} \mu [-\nabla(E\{\varepsilon^2(n)\})] \quad (6)$$

Based on Semantic Web technology and data mining design of electronic commerce intelligent logistics system to complete the warehouse management of a single document management, including the storage of single edit and audit operation, the system must be able to maintain the data table of these operations. At the same time to maintain the information contained in these operating information, such as the information of various departments, such as the information of various departments. In addition to the system

to manage the warehouse management system user information, so to maintain a record of the user operation of the data table, the user's user name, password and operation.

In this theoretical framework, data mining technology is considered as the process of finding the probability distribution of random variables from a large number of source data [9]. For example, Bayesian belief network model, etc.. At present, this method has achieved good results in classification and clustering of data mining. These techniques and methods can be regarded as the development and improvement of the application of probability theory in machine learning. As an ancient subject, statistics has been widely used in data mining.

Association knowledge (Association) is a reflection of an event or an association between an event and an event. Data association in the database is the performance of the real world of things. Database as a structured data form, the attachment to the data model may describe the association between data, such as relational database primary keys and foreign keys. However, the association between the data is complex, not only is the above mentioned in the data model of the association, most of it is hidden.

IV. DESIGN OF INTELLIGENT LOGISTICS SYSTEM BASED ON SEMANTIC WEB AND DATA MINING TECHNOLOGY

Self built logistics, from the nature of the traditional enterprise logistics network operations, according to the specific needs of customers, the overall balance of the line on the line under the network configuration, based on self built warehousing centers and distribution points to carry out logistics services. In this mode, the supply chain of all aspects of the system and collaboration with high degree, the electricity supplier to grasp the initiative and to carry out targeted improvements to reduce the cost of customer information collection and confidentiality costs, but also to create their own brand image [10]. However, the pattern of capital barrier is high, the need to have a huge amount of orders as support, the enterprise is easy to be excessive expansion of the scale, to a certain extent, affect the company's resource allocation and decision-making, not all electricity suppliers have such a strong financial strength and professional management level.

Definition 4: HTML tags should be in pairs, such as <title></title>, <h1></h1>. But you write HTML file or those by specialized see income development tools automatically generate HTML files, even in grammar mistakes will not affect the HTML file display. Tags in HTML can be individually or not nested, such as <h1><h2></h1></h2>.

$$\begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_M \end{bmatrix} \approx \begin{bmatrix} c_{11} & c_{12} & \cdots & c_{1m} \\ c_{21} & c_{22} & \cdots & c_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ c_{M1} & c_{M2} & \cdots & c_{Mm} \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_m \end{bmatrix}, \quad C > 0 \quad (7)$$

As an electronic commerce logistics link, the most important feature is the timeliness, convenience and safety. Electronic commerce logistics link is based on the enterprise computer system's instruction completes the commodity distribution, the supply, the transportation entire process. Intelligent logistics system of the Internet of things is to run in the area of transport vehicle location, delivery of goods type, quantity of management and control. The logistics center is connected to the mobile communication network through the gateway, and the mobile communication network through the M2M and the transport vehicle. Through the GPS system, with the logistics center of the display, the management staff through the GIS maps to easily grasp the current position of the transport vehicle.

Logistics has been the "bottleneck" of the development of e-commerce, with the development of electronic commerce in recent years, the gap between the two. According to relevant statistics, the domestic e-commerce development speed is 200 - 300%, while the logistics growth rate of only 40%, the level of logistics development far can not meet the needs of the development of electronic commerce, especially during the holidays; express Logistics Company appeared frequently "explosion" phenomenon. Coupled with the logistics service level is not high, the arrival of the goods, goods lost, damaged goods, delivery is not in place and other services, has become one of the main complaints of consumers.

RDF is used to provide a simple way of publishing a statement about the Web resources (such as web pages). This section describes the basic idea behind the RDF to provide these capabilities (the specification of these concepts is the RDF concept and abstract syntax [RDF-CONCEPTS]).

This system is mainly divided into the following sub modules: login form module, storage module, a single edit module, a single audit module, the audit of the storage module, employee management module, department management module, the department leader in detail table module and operator set up module, as is shown by Fig .1.

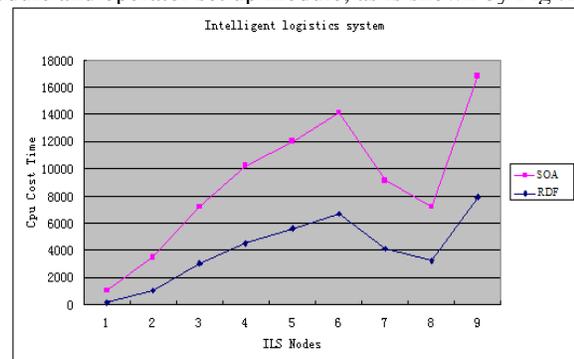


Figure 1. Design of intelligent logistics system based on Semantic Web and data mining technology RDF with SOA.

Data processing, data center to receive come through the Monternet and Internet transmission of data, generate standard database interface, business data storage, analysis, and as a basis for management and decision making; data query. In the end, the holder of the mobile phone will be able

to query the various business data, and to deal with various kinds of information management in the enterprise management, realize the functions of receiving and reply, using wireless network and personal affairs management to achieve joint office functions.

#### V. SUMMARY

E-commerce will promote the improvement of logistics infrastructure, logistics technology and logistics management level. The characteristics of high efficiency and global demand are for electronic commerce requires the improvement of logistics infrastructure, but also to improve the level of logistics technology to improve the efficiency of logistics. In addition, the level of logistics management directly determines the level of logistics efficiency, but also affects the realization of the high efficiency of e-commerce. Only by improving the management level of logistics, establishing scientific and reasonable management system, using scientific management means and methods in logistics management, we can ensure the smooth flow of logistics, realize the rationalization and efficiency of logistics, and promote the development of logistics in electronic commerce.

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