

Analysis and Design of Intelligent Electronic Commerce

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Abstract—E-commerce refers that the individuals or enterprises use the Internet network, which is a digital electronic way for business data exchange and business activities. This paper analyzes the design and function of the intelligent electronic commerce recommender system. Recommendation system of intelligence electronic commerce is a kind of program according to the user's personal preference to recommend the product. It can help e-commerce companies to change the site's visitors to buyers, while improving the electronic commerce website cross selling ability and customer loyalty to the site. The paper presents the analysis and design of intelligent electronic commerce.

Keywords- *Electronic commerce; Intelligence Recommendation System; Artificial Intelligence; Mobile Electronic Commerce; Intelligent Agent*

I. INTRODUCTION

With the development of Internet and the related Web technology, the electronic commerce has changed greatly, and the new technology has led to the research upsurge of the new electronic commerce mode. In the online transaction mode based on Internet, many famous domestic and foreign experts and scholars were studied, and in the network environment in migration of traditional business transactions model has a large number of research results, and constantly promote the development and application of electronic commerce [1]. In the near future, the electronic commerce network business model and its application mainly concentrated in the online bidding, online auction and electronic negotiation and other fields.

E-commerce refers to the individual or enterprise through the Internet network, the use of digital electronic way for business data exchange and business activities. E-commerce covers the range is very wide, generally can be divided into business to business (business to business) mode, such as Alibaba for many enterprises to provide a network trading platform; business to consumers (Business-to-Consumer) mode, such as Amazon and Joyo and Dangdang, the emergence of electronic commerce changes the enterprise business philosophy, management methods and means of payment, brings great changes to the society in various fields.

With the improvement of information technology, network has become an important part of people's learning, work and life. How to find the required information in the vast ocean of knowledge has been more and more people's

attention. The traditional network service does not take into account the difference between users, but in order to expand the scope of information, the method of increasing the depth of information to provide the same information space for different users. In the face of huge data source, users are in urgent need according to its characteristics of the automatic organization and adjustment of information service mode, this is the electronic commerce recommendation on the emergence and development of the intelligent system has provided an opportunity.

With the popularization and development of Internet technology, the new business model is accepted by more and more people. However, due to the open Internet, dynamic and heterogeneous characteristics, with the unceasing development, the information continues to expand, the people who get the information need to bring a certain degree of trouble. In order to solve this problem, the intelligent e-commerce system came into being; intelligent e-commerce system is a based on Internet, can instead of people and has the ability of logical reasoning, self learning ability, and communication ability of intelligent electronic transaction mode. Intelligent electronic commerce can help people to complete much complex information processing work; can bring a lot of convenience to people.

The most complete and most advanced e-commerce should use the Internet to carry out all the activities of trade, namely on the Internet the information flow, business flow, capital flow and logistics to achieve, that is to say, you can find customers from the beginning, has been to negotiate, order, pay online (received) shall, according to the invoice and even to the electronic customs, electronic payment through the Internet in one fell swoop. To achieve complete e-commerce, but also relates to many aspects, in addition to the buyers and sellers, but also banks or financial institutions, government agencies, certification bodies, distribution centers and other institutions to join [2]. Because of all the parties involved in the electronic commerce in physics is met each other, so a replica of the whole process of e-commerce and not the physical world of business activities, online banking, online electronic payment conditions and data encryption, electronic signature technology in the electronic commerce play to focus on and indispensable role. The paper presents analysis and design of intelligent electronic commerce.

II. PERSONALIZED RECOMMENDATION FOR INTELLIGENT ELECTRONIC COMMERCE

At this stage of e-commerce, intelligent recommendation system is still not perfect, so the user needs to choose classification browse commodity preferences. A handful of electronic commerce website to display in the mechanical products and the integration of personalized composition: popular products, similar products and other user evaluation services, to guide the user choose to further. However, this recommendation for all users, while not emphasizing the differences between the types of recommendations and methods, is not conducive to the implementation of intelligent recommendation.

The so-called commodity personalized recommendation system is the electronic commerce website through the commodity intelligent recommendation system to provide the user with the product recommendation service. Its working principle is electronic commerce website through customer statistics of some kind of commodity browsing time, click frequency, purchase experience, customer consultation times, page used quantity analysis of purchasing psychology, personal preferences, used to predict customer propensity to buy, timely to customers recommend related goods and information and guide the customer buying behavior, facilitate transactions reached [3]. It is for this reason, in recent years, the research on the intelligent recommendation system of commodity has received the extensive attention of the industry.

Electronic commerce recommendation intelligence system is a kind of program according to the user's personal preference to recommend the product. It is based on the electronic commerce website, through the establishment of the recommended system model, analysis of user consumption preferences, to provide personalized products, improve the satisfaction of customers to business services.

Data warehouse is a data warehouse that is distributed in the network, which is stored in a single integrated relational database. Using this integrated information, users can access the information easily; also can make the decision makers in a period of time on historical data analysis, research, in order to get the trend of the development of things, as is shown by Equation (1).

$$E\{w(k)w^T(j)\} = Q(k)\delta_{kj} \quad (1)$$

Based on user information, electronic commerce recommendation system provides users with information, which adapts to the change of the user's information. Search results according to the user preference ordering, so that it is more convenient for users to get the required information; the expansion history enrich the customer information set, it is after the change of business give user prompt. Customer intelligence management: According to the user's level of interest and purchasing power characteristics, to provide different marketing strategies and management methods. Track sales of goods, according to the terms of the use of goods, the user two times recommended.

The purpose of data analysis is to establish the customer behavior model, forming the customer file. In accordance with the needs of the recommendation algorithm, these models can be the customer's classification or clustering; can also be some association rules. These models should be able to answer questions such as high and low consumer, what kind of characteristics, they have what kind of preferences as well as their own purchasing habits and behavior characteristics, etc.. Data mining, neural network, modeling algorithm and other information processing methods have been widely used in data analysis. Each of these methods has advantages and disadvantages, the recommendation system needs to take into account the accuracy and real-time, a good system is likely to be a combination of multiple methods or technologies.

High information content customers are all frequent visits to customers. These customers are loyal customers of e-commerce sites, but also the main recommendation system service. For this kind of customers can choose the content based recommendation system and the collaborative filtering recommendation system. Content based recommendation is based on the correlation between the product and the customer's interest to recommend it. On the one hand, based on the attribute model of the product, the product has the similar properties to the customers. Recommended results and customer interest are in a very high degree. On the other hand, based on the relevance between the products, the products associated with the customer's interest.

Electronic commerce website proprietary is user operation platform. The primary items stored in customer shopping cart for post operation will be in Webpage browse at the same time. Operation contains user information, account information, purchase commodity information, Chibidaigou commodity information, also should include users and financial institutions, the distribution mechanism of interaction, such as: mode of payment, delivery methods [4]. Information retrieval: from the database to find the character of the input and the user to match the information and data, to return to the target set of results. In the electronic commerce environment is mainly used for the need for the commodity inquiry.

$$S_x(\omega) = \lim_{T \rightarrow \infty} \left\{ E \left[\frac{X_r(\omega)^2}{2T} \right] \right\} \quad (2)$$

Intelligence is one of the basic characteristics of intelligent agent technology, mainly refers to is the agent's reasoning and learning ability; that is, it has required to solve the problem of knowledge, methods and data, can carry out related reasoning and intelligent computing. At the same time, intelligent agents can not give a very clear demand when the user to capture the user's preferences, interests and intentions, and the best way to complete the task. In addition, intelligent agents can also filter and filter the information, automatically reject some unreasonable or possible to bring harm to the user's request.

Data mining (DM) is from the large, incomplete, fuzzy, noise, random data, and extraction implicit in which people do not know in advance, but is potentially useful

information and knowledge of the non trivial process. These information forms: rules, concepts, rules and patterns. Decision makers use it to analyze historical data and current data, extract the hidden relationships and patterns, and predict future behavior.

The association rules can reveal the intrinsic relationship among the products, some of which are neglected or difficult to find, and the results are creative. And not just limited to the customer purchase of the product category. Often can help customers to carry out the product's supporting choice, apparel, collocation, etc.. The recommendation system based on collaborative filtering is the most successful and widely used recommendation system. Its implementation is based on the customer's evaluation of the product, based on the evaluation of the distance between the customers, will be similar to the target customers to buy the product recommended to the target customers [5]. These two methods have advantages and disadvantages, and complement each other. Based on the content analysis of customer preferences, and other customer preferences and to the similarity between the customer for collaborative filtering, final recommendation to target customer preferences similarity high or associated with a strong degree of product and its neighbor customers high evaluation of the product, as is shown by Equation 3.

$$MSE = \frac{1}{MN} \sum_{x=1}^M \sum_{y=1}^N (\tilde{P}_{xy} - P_{xy})^2 \quad (3)$$

The number of people using smart phones and mobile devices increased year by year, the explosive growth of smart mobile devices is changing people's lifestyles and consumption habits. We find that the number of people using mobile phones to play games more and more, with the micro blog, micro channel chat more and more people who use the phone to watch TV shows more and more. This may not be the best way to communicate with others, but it will certainly be an excellent condition for the development of mobile e-commerce in China.

Data mining and Discovery in Data (Base) is the development of database technology, artificial intelligence technology and network technology. Especially with the development of electronic commerce, the amount of information is increasing, more urgent need effective information analysis tool, in order to be able to detect dependencies between a large number of business data hiding, in order to extract the useful information or knowledge to guide business decisions. In the past, only a simple data statistics technology, has not yet reached an intelligent data analysis tool. Therefore, there is still a big gap between data generation and data understanding. Such as is Equation4.

$$kd \sin \theta = (2\pi d \sin \theta) / \lambda \quad (4)$$

Purchase history is stored in the electronic commerce website backstage transaction database, it is each user previous shopping detailed records, including shopping time, list of goods, prices, discounts, etc. At the same time also can collect the product that the user is put in the

shopping cart and not to buy, and the connection of the commodity that the user has clicked. For e-commerce sites, this information may be than the user purchases more important can help companies target user preference analysis, improved online marketing system structure and performance, to launch the corresponding measures, improve the click rate of products. The web page browsing record is stored in the server's log file, and the user's access behavior, frequency, content and user source are recorded.

Client of personalized recommendation is to construct the matching model and to find neighbor users, according to the needs of neighbor users change speculated that the original user preferences and to recommend related products; according to user preferences is according to the combination of recommended products, users convenient disposable shopping; auto filter users are not interested in information; the negative commodity for discount or bundled with interested the commodity. Personalized information retrieval is the traditional sense of information retrieval needs to be dynamic, temporary information input and static, stable database matching. To some extent, this has caused the discontinuity of information.

Mainly refers to the intelligent agent to operate independently [6]. With a strong behavior, the purpose is to take a series of actions to achieve a certain purpose. Intelligent agent technology can according to changes in the current environment, dynamically adjust their to complete tasks, plan, and actively to information filtering, sorting is provided to customer service, and from the experience in continuously self learning, according to the environment in a timely manner to adjust their own behavior, so as to improve the ability to analyze and solve problems.

E-commerce personalized recommendation system plays a very important role in the development of e-commerce. It can help e-commerce companies to change the site's visitors to buyers, while improving the electronic commerce website cross selling ability and customer loyalty to the site. Related research shows that the use of personalized recommendation system for e-commerce sales, sales can increase by 5% ~ 18%, the recommendation system can greatly improve the company's sales. In the process of the development of e-commerce, personalized recommendation system has become the key word of electronic commerce.

III. ELECTRIC BUSINESS INTELLIGENCE TECHNOLOGY ANALYSIS

The development of the Internet can only be used to describe a thousand. A few years ago, the electronic commerce is not how to know, overnight, the electronic commerce has been common. Today, the electronic commerce website is one of the fastest industry growths and 2 e-commerce website was born per day on average, size, good and bad, each has its own characteristics. Of course, every day, how many electronic commerce website to give up because of the operation, the situation is not optimistic.

E-commerce service has a comprehensive coverage of the commercial economy in various aspects: whether the manufacturing field of national economy, or the field of circulation industry service; regardless of the enterprise application, personal application and government

procurement [7]. More and more large and small enterprises finally see the benefits of electronic commerce; whether it is self independent of official e-commerce platform, or the use of third-party e-commerce platform, let permeability of electronic business affairs accordingly to maintain the sustained and rapid growth.

When data from the application oriented to extract the data warehouse, due to the naming conflicts, the conversion of data structure, such as the conflict and need the original data extraction, cleaning and processing, the formation of the consistent naming, variable metric, code structure, physical property. Non default is due to the data warehouse data is historical data, when the data is integrated into the data warehouse, do not need to change. Data and access to the data is limited, there is no data recovery, data synchronization, repair and other complex issues.

In the e-commerce platform and its application in practice, how to according to the user's intention, interest and characteristics of adaptive and intelligent to from the existing customer information, commodity inventory information, such as large amount of data of information were relevance arrangement, adjust the matching mechanism, to obtain the user satisfaction of the search and output, has become a technical problem faced by e-commerce in the future application [8].

$$\mu_{ik} = \frac{\exp(-\frac{d_{ik}^2}{2\sigma^2})}{\sum_{j=1}^c \exp(-\frac{d_{jk}^2}{2\sigma^2})} \quad i=1,2,\dots,c; k=1,2,\dots,n; \sum_{i=1}^c \mu_{ik}=1 \quad (5)$$

Intelligent agents can be seen as a black box, through the sensors to perceive the environment, through the environmental effect. At the same time, the intelligent agent can also be viewed as knowledge processing entity. It is composed of the knowledge base, rule base, the inference engine, agent communication protocol to complete knowledge discovery agent, communication agent collaboration, rules library application proxy, supervision agency, knowledge base management agent, push proxy function. In the working process of intelligent agents, each agent has its own knowledge base; users express their information needs, through cooperative communication agent transfer to the knowledge base. Then according to the user information database user specific requirements and recent is interest as the standard to screen information. Agency supervision role is when the user is presented with the information they need, check the knowledge base whether there before the user is similar to the information demand, if put knowledge base in the previous user demand records extracted, sent to the user through the push proxy.

Mobile commerce technology is a powerful technical support for the development of mobile e-commerce. In practice, the innovative development of each mobile technology will further promote the development of mobile electronic commerce. From the public wireless communications, WCDMA and CDMA networks began to quickly deploy in the world, the three major 3G standards to further mature quickly seize the market. In the near distance communication, Bluetooth technology, NFC,

RFID integrated into the phone, you can easily achieve payment and ticketing transactions, is now listed NFC, 3G and the corresponding IPV6.

Based on the community life service business platform operation process simply stated as follows: user community through mobile phone micro channel as the entrance, puts forward the demand information, the service life of the community business platform system the subscriber ordering information is assigned to the corresponding business information terminal, businesses according to order information to respond, and feedback the result to the platform, such as user community services to businesses have an opinion, can be feedback to the center platform, realize the life of the community service business platform for the effective supervision of the business.

The center of gravity of the mobile e-commerce will gradually to the enterprise transfer in recent years, with the rapid development of China's mobile communication technology, mobile technology and electronic commerce between more closely, under the condition of market economy, enterprises as the main body of its application in the adaptation of mobile users personalized demand at the same time, will inevitably the main business activities transferred to mobile commerce, and realize the benefit of the enterprise growth by using its unique advantage of mobile electronic commerce. Mobile electronic commerce center in the field toward the enterprise application transfer, highlighting the important development trend of mobile e-commerce, as to promote the rapid development of mobile electronic commerce enterprise application with the spending power, rapid development and strong stability characteristics can be foreseen mobile electronic commerce and the center of gravity is inevitably the enterprise application.

Electronic commerce infrastructure will increasingly perfect gradually tend to regulate, supporting environment, the enterprise develops the electronic commerce to further expand the depth, and personal participation in the depth of e-commerce will also be expanded. Image communication network, multimedia communication network will be built and put into use, and irresistible trend, high-speed broadband Internet will play more and more important role, control network bottlenecks in the development of electronic commerce in China is expected to be eased and solved step by step. The development of electronic commerce in China will have a good network platform and running environment [9]. The supporting environment of electronic commerce gradually tends to be standardized and perfected, as is shown by Equation (6). The application of individual to the electronic commerce will be from the point of the point to the point of the linear way to more intelligent development.

$$P(l) = N_l / \sum_{k=0}^{L-1} N_k \quad (6)$$

The network service platform planning as Haitian B2B business development, B2C oriented network operators to provide business services to the new business department. The platform mainly consists of two parts, network center customers and network services business group. Network

customer and product service center is mainly responsible for the study of B2C network object demand, found net goods products hot trends and selling organizational adaptation of net goods promotion product line, net goods marketing strategy formulation. Network business group is mainly responsible for contact the B2C network, net goods product line promotion, customer resources to expand the network, establish and maintain business relations.

Data warehouse is subject oriented subject-oriented, integrated (integrated), non default (non-volatile) and time-varying of time-variant for decision-making and management of the data set. Thus, data warehouse is a kind of analytical database, based on standard enterprise model integrated with time attribute oriented themes in the data set and compared with the traditional support query based transactional database operations; there is an essential difference between.

$$\tilde{x}_i = x_i - \bar{x}, \Phi_i = [\tilde{x}_1 \tilde{x}_2 \cdots \tilde{x}_M] \quad (7)$$

KDD and DM are a kind of new data analysis technology, which are designed to extract the hidden, predictive information from large databases, data warehouse construction, find the potential between the data model, in order to facilitate understanding and observation in the form of reflected to the user and for the enterprises to make forward-looking, based on knowledge of the decision-making advice. Problems needed to be solved in the DM and KDD: large scale databases and high dimensional data; missing data; changes in the data and knowledge; understand; non standard data format; processing of multimedia data and object oriented data; and other system integration; network and distributed environment of KDD problems.

Personalized product recommendation is the core objective is to meet the individual needs of different customers. Then the personalized recommendation system design and recommend strategies to highlight the main purpose of the customer needs. The characteristics of customers need to use different recommendation strategies and recommendation systems. According to the amount of customer information to grasp how much customers can be divided into low information and high customer information.

IV. ANALYSIS AND DESIGN OF INTELLIGENT ELECTRONIC COMMERCE

The rapid development of electronic commerce for the user provides optional commodity rich, for example, only overcoat has more than 4 million, in this case, how users on the Internet find their favorite goods has become a big problem. Currently various types of e-commerce sites to meet user needs continuous improvement system function, try to shorten the time of user search products, and is convenient for the users to buy goods, to optimize the user experience and improve the loyalty of the users of the site, to enhance the user from Click to buy conversion rate. One of the more effective is the product personalized recommendation system.

The key technologies of the electronic commerce recommendation system are mainly two types: information retrieval technology and personalized recommendation

technology. They have different emphases in the system. Information retrieval is based on the search request submitted by the user, the corresponding target results set in accordance with the matching degree of similarity ranking after the release. And the information retrieval system of electronic commerce recommendation system can not only find out the information, but also improve the efficiency based on the user's preference. At the same time, through the occasional interaction, the initiative to add and modify the user's goal set, to provide more comprehensive information.

The application of intelligent agent is very extensive; in many aspects has important applications, for example, e-commerce, information services, systems and network management, and other fields. The idea of artificial intelligence is introduced into the electronic commerce transaction process, make the electronic commerce transaction process becomes more automation and humanization, can be said to be the latest stage in the development of electronic commerce [10]. In E-commerce, the intelligent agent acts on every link of value chain and virtual value chain, and can be used in the process of electronic commerce. Intelligent agents can be divided into different levels in practical application.

$$\bar{w}(m) := [\bar{w}^T(m,1), \bar{w}^T(m,2), \dots, \bar{w}^T(m,M)]^T \quad (8)$$

Leading telecom operators and mobile electric commerce, traditional e-commerce provider leading mobile e-commerce, equipment providers, e-commerce and leading emerging mobile commerce provider of mobile electronic commerce provided. Among them, the leading telecom operators (such as mobile, telecom, China Unicom) mobile e-commerce model, has a huge potential consumer groups to the obvious advantage; while in the traditional e-commerce provider as the leading mode, is guided by the brand, such as traditional e-commerce brand taobao.com, dangdang.com, Alibaba other well-known equipment providers; to the leading model, one successful example is Apple's App Store; a model which, compared to the other three models, the advantage of using a variety of new technologies combined with various ideas, put forward innovative application is completely different from the traditional e-commerce.

The main driving factors of the rapid growth of mobile commerce are that one is subject to the improvement of intelligent terminal and the rapid growth of network speed, and user habits change promoted the rapid development of mobile shopping; the second is electronic commerce is the mobile Internet relatively more into mature business model, promote the business enterprise and the traditional enterprise in the layout of the mobile business, and promote the development of mobile shopping market.

Structured description: after obtaining the information, the construction of the model of the user information for a structured description. The structured description should adopt the user information as the basis, to accurate, standard, easy statistics as the basis for the creation of user information demand model to describe the mode and storage mode. Build demand model: build user demand model, so that the system can be based on the different information provided by the user to complete the

establishment of the model of personalized information needs. Personalized recommendation: according to the results of the model given the personalized recommendation is usually in a variety of forms of feedback to the user. We are concerned with how the form and user interaction in order to achieve the best personalized recommendation, as is shown by Figure 1.

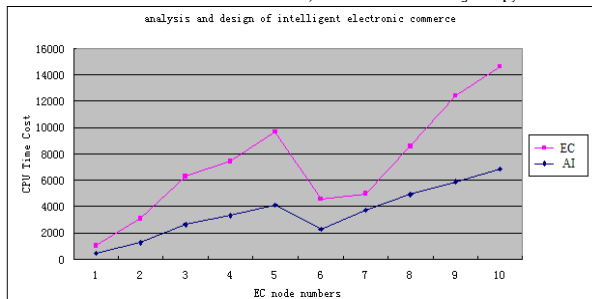


Figure 1. Comparison results of analysis and design of intelligent electronic commerce with Artificial intelligence.

Intelligent agent in the electronic commerce application of micro level mainly according to the special needs of users simultaneously search multiple sites and information on the goods for screening or monitoring, finally found in line with the site conditions where the property to carry out business activities. This technology in China's large-scale commodity price comparison shopping site, check the net price reflected more obvious, the price check network search engine technology and intelligent agent technology to combine, for users provide commodity price comparison and daily lows in the express information service, the goal is to become the connection of consumers and dealers in the commodity price information exchange platform.

Intellectualization of electronic commerce recommendation system can make electronic commerce website to browse change for buyers, in a certain extent improve e-commerce websites sales skills and customer loyalty of e-commerce sites; at the same time, it is more convenient for the user to retrieve his interest in the goods. In the future of network transactions, e-commerce recommendation system will be integrated into a more perfect operating control system, and become the mainstream of electronic commerce.

V. SUMMARY

Intelligent has effectively solved the information in the Internet information space, so as to deal with the problem of e-commerce, e-commerce transaction both sides have a strong temptation, based on intelligent agent technology, electronic commerce will be a very promising direction. However, because intelligent agent technology at present is not very mature, currently in the electronic commerce activity, so the application of intelligent agent technology is still relatively lacking, which means e-commerce intelligent agent systems also need further research.

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