Research on Tourism Data Prediction Based on Improved Genetic Algorithm

Faxian Jia[1, 2]

[1]*School of Management and Economics, North China University of Water Resources and Electric Power, Zhengzhou, 450046, Henan, China*

[2]*School of Management, Henan University of Urban Construction, Pingdingshan, 467000, Henan, China*

Abstract

With the coming of big data era, the development of big data is highly valued by the country, and the tourism big data industry is booming. Smart tourism is based on the Internet and cloud computing technology, combining a variety of big data technologies, innovating the development situation of the tourism industry, providing convenience for tourists to travel, and making the modern tourism industry move forward in the direction of science and technology and intelligence. In the process of tourism economic development, it is necessary to use appropriate forecasting methods to obtain the law of tourism economic development and provide scientific basis for tourism economic decision-making. Based on this, this paper makes a prediction based on the improved genetic algorithm, and explores a more accurate and more suitable prediction method for tourism data to predict the reality. The processed information can make tourism plans for tourists, provide high-quality tourism services for users, and promote the continuous improvement of market competitiveness of tourism enterprises.

Keywords*: Big data, Smart tourism, Forecast*

Ⅰ. Introduction

In recent years, China's economy has been developing rapidly and the per capita income has been increasing, which has greatly affected people's spiritual life. People pay more and more attention to spiritual enjoyment, and more and more people begin to take tourism as a normal life [1]. In the development of tourism, there are many information data involved. If a large number of complex data cannot be processed in time and effectively, it will cause serious problems to tourists' tourism experience [2]. At present, there is a certain problem of information asymmetry in China's tourism industry. With the development of society, tourism products and services are becoming more and more diversified, and it is more difficult to manage [3]. Therefore, relevant departments and managers can carry out smart tourism industry with the help of information technology, effectively promote information communication, help managers obtain relevant information of tourism industry, increase market sensitivity, reduce the development cost of tourism industry and improve the efficiency of tourism development [4]. The continuous development of the network information technology industry has also made outstanding contributions to the innovation and breakthrough of the tourism industry. Various tourism websites and tourism software have sprung up. The main function of these software is to provide people with appropriate tourism information. Its principle is to collect and analyze massive tourism information by using big data technology [5]. In the process of tourism economic development, it is an inevitable need to use appropriate prediction methods to obtain the law of tourism economic development and provide scientific basis for tourism economic decision-making [6].

Based on the Internet and cloud computing technology, smart tourism combines a variety of big data technologies, innovates the development situation of the tourism industry, provides convenience for tourists, and makes the modern tourism industry move forward in the direction of science and technology and intelligence [7]. Under the new situation, the tourism industry must seize the development opportunities brought by big data and take big data as the core to drive the rapid development of tourism. On the basis of big data, the tourism industry must innovate management concepts and models, deepen tourism research, and reflect the characteristics of smart tourism [8]. With the rapid development of society and the continuous improvement of people's quality of life, people's tourism

needs are becoming more and more diversified. The traditional tourism management concept and model can no longer meet people's tourism needs [9]. Information technology has penetrated into the tourism industry and created conditions for the birth of smart tourism. Big data extracts value from various large-scale data with high-speed capture, discovery and analysis technology. It has the characteristics of large amount of data, various types, fast generation speed and low value density [10]. Based on the improved genetic algorithm, this paper explores a more accurate and more suitable prediction method for predicting the actual situation of tourism data. The processed information can formulate tourism plans for tourists, provide high-quality tourism services for users, promote the continuous improvement of the market competitiveness of tourism enterprises, and realize the long-term sustainable development of tourism.

Ⅱ. Research on the Application of Big Data in Smart Tourism

A. Construction of Smart Tourism Public Service Platform

Tourism industry is highly dependent on “information”, and the circulation of information promotes the value flow of tourism industry. However, because it is difficult to break down the information barriers, the traditional tourism industry is often difficult to accurately know the tourists' needs, thus unable to provide tourism services in a timely and effective manner. China's smart tourism is a new product in the tourism industry, which is still in the early stage of development. Many people have not realized the role and value of smart tourism, which leads to the inadequate investment of Chinese social resources in smart tourism, which in turn leads to insufficient supporting facilities. Tourism big data uses big data methods and technologies to break down information barriers, effectively collect and integrate tourism-related data, and realize multi-dimensional accurate analysis and effective prediction of tourist information [11]. The main function of big data in enterprise software is to comprehensively analyze tourism information, integrate tourism resources, use huge database as background support, analyze users' preferences through algorithms according to users' needs, and tailor-made suitable travel routes and travel plans for users. At the same time, in the process of resource management, enterprises can also implement different management schemes for different tourism resources in different categories, and reduce the management cost of enterprises. By analyzing the massive user feedback suggestions and policy planning requirements. The tourism transportation solution based on cloud Internet architecture is shown in Figure 1.

ISSN: 0010-8189

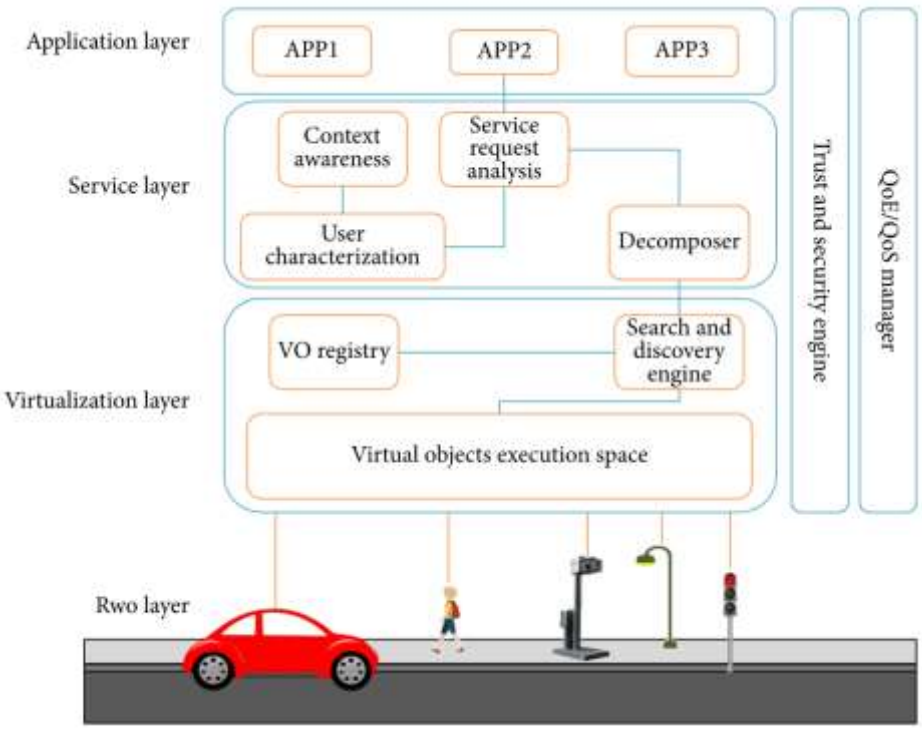

Fig.1 Tourism Transportation Solutions Based on Cloud Internet Architecture

In order to realize the effective application of big data, the tourism industry needs to vigorously carry out the construction of this service platform, so that users can choose tourism activities independently by operating directly on mobile devices, and tourism companies and local scenic spots can also make management work plans and reception plans for tourists after they arrive at their destinations according to the information of tourists' tourism needs on the platform. For the tourism management of enterprises, big data is mainly used in market research and development in the early stage. By analyzing the lifestyle and thinking mode of current tourism groups and aiming at local tourism policies, safe, rich, unique and highly profitable tourism projects are developed. At the same time, in the publicity, it is necessary to selectively push the products from the massive user data, and through analyzing the user's preferences, it is helpful to improve the enterprise reputation [12]. Tourist attractions in many areas of China have not been able to use big data equipment to build an information-based network system, and the digital monitoring and ticket payment are not perfect. The data in all aspects of smart tourism are not recorded in time, which affects the creation of smart tourism databases and databases. A perfect information sharing platform must be established in tourist attractions and supporting facilities around scenic spots in various places, so as to jointly promote the development of local tourism.

B. Construction of Smart Tourism Data Center

When the local tourism industry cooperates with various tourism websites and operators, it is necessary to formulate a set of perfect information processing and sharing standards, so that the data information can be clearly divided under the specific standards, so as to provide corresponding tourism information and services for different types of tourists. From the microscopic point of view, the information integration of specific tourism projects is mainly considered by tourism big data. Through the integration analysis of the relevant information of tourism projects, the project planning, resource allocation, marketing, consumption feedback and other links are reasonably predicted and adjusted. From a macro perspective, we can analyze and evaluate the administrative planning, resource level and user groups of the whole tourism area according to market demand, and develop tourism projects according to local conditions, thus promoting the development of China's tourism industry. At the present stage, China's tourism

industry has formed an industrialization trend, which is mainly due to the development of big data and the absorption of advanced Internet equipment, which has promoted the overall progress of the tourism industry at a high speed.

Big data enables the tourism industry to build a single-family tourism website, collect and sort out the tourists' search situation, and recommend interesting tourism projects to users by means of big data pre-judgment. The principle of data communication link is shown in Figure 2.

Fig.2 Principle of Data Communication Link

When tourists need it, they can log on to the platform and put forward their own demands. After analyzing the data and information, the platform can quickly provide tourists with guidance on living, traveling and traveling. At the same time, before traveling, tourists can go to the tourism experience center in the city to ask and answer related questions, so as to actively carry out various tourism activities on the premise that tourists get a good experience. From the perspective of data itself, tourism data can be roughly divided into internal tourism data and external tourism data. Although big data can provide a large-capacity data sharing platform for managers and users, there are few data with real utilization value. Using big data to make forward-looking analysis and forecast of the project can effectively avoid the problems of excessive resources or insufficient supply caused by insufficient preparation. Through time investigation, adopting a reasonable user demand forecasting model, consulting relevant researchers, and considering the time cost comprehensively, we can achieve the balance between tourism resources and market demand.

Ⅲ. Tourism Data Prediction Based on Improved Genetic Algorithm

Under the background of big data, the development of smart tourism must build an information-based industrial chain to provide tourists with more humanized tourism services. According to the utilization characteristics of big data, managers should improve the speed of big data technology and the efficiency of information processing, and improve the overall level and quality of smart tourism. Traditional tourism management relies mainly on personal experience and perceptual management, which is subjective. With its powerful data collection ability, tourism big data can collect a large number of intelligent tourism data, and tourism-related management departments can analyze the data on this basis, and then integrate various resources, simplify management processes, improve management effectiveness, and optimize management decision-making process [13]. Big data technology can optimize the management mode of tourism enterprises, integrate internal data, integrate relevant data in tourism field with big data, and help tourists search for relevant information conveniently when necessary. Therefore, big data should also help customers improve search efficiency in smart tourism. Big data has the characteristics that traditional smart tourism data does not have. The application goal of big data technology is to improve the utilization rate of information data and find out valuable information data by sorting out and analyzing a large amount of data information.

Genetic algorithm uses population to represent the solution set of the problem, which is composed of several solutions, and each solution is called a chromosome. The algorithm starts from a population, reproduces the next generation through crossover and mutation operations, and finds the optimal solution of the problem in this evolution. For a mathematical model:

$$\begin{cases} \max f(x) \\ s.t. X \in R \\ R \in U \end{cases} \quad (1)$$

Let $X = [x_1, x_2, \ldots, x_{n-1}, x_n]^T$ to represent a solution to the problem, then in the genetic algorithm, $X_i (i = 1, 2, \ldots, n)$ is represented as a chromosome, and B is represented as n genes of the chromosome.

If people regard big data as a domestic industry, if the big data industry wants to achieve its development goals, it must improve the processing speed and quality of data and increase the value of data. Through the mining and analysis of big data, we can broaden the breadth and depth of tourism industry research data, understand many factors such as market composition, market segmentation characteristics, consumer demand and competitors' situation of tourism industry from the data, accurately judge the layout of tourism market, implement accurate positioning of enterprises, and ensure the individuation of tourism brand positioning. In the process of tourism management, big data can open functions such as tourism performance management and product revenue, systematically organize tourism service platforms, create a big data tourism cloud platform, uniformly publish tourism information, build a tourism big data center, and solve the previous obstacles in the process of providing tourism public equipment [14]. There are still many shortcomings in the application of big data in smart tourism. Therefore, tourism enterprises must analyze the existing problems in the development of smart tourism in detail, take timely adjustment measures to solve the existing problems, reasonably formulate the development plan of smart tourism, and clarify the development goals of smart tourism.

In the era of big data, through real-time monitoring, forecasting and data quantification of tourism big data, tourism scenic spots, government departments and other relevant departments can effectively achieve the accuracy of their decision-making, design, investment and management processes, and lead to new formats such as new management, new accommodation and new scenic spots, and innovate new tourism development models. Tourism data prediction based on genetic algorithm is to use improved genetic algorithm for data mining. First, count the times of each destination in tourism records, and use FP-Tree data structure to mine frequent closed item sets. Conditional frequent pattern tree uses FP-tree to mine the conditional frequent pattern tree of each item according to the header, which is also called conditional database. Finally, frequent patterns are obtained according to this conditional FP-tree. As shown in Figure 3.

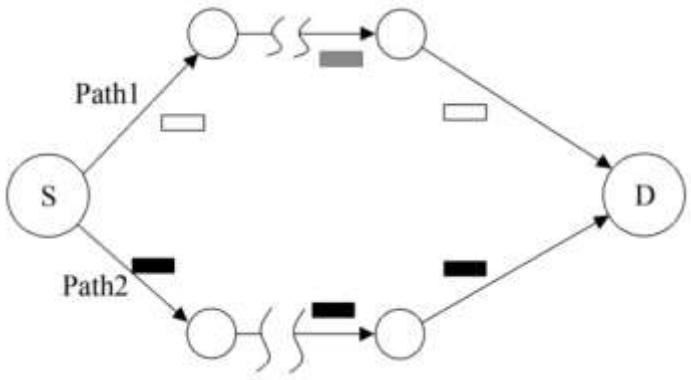

Fig.3 Fp-Tree

If the travel data sample data set W is divided into training set A and test set B, then $W = A \cup B$ 1. If you shape the prediction model, you need to divide the prediction subset C again to ensure that $W = A \cup B \cup C$.

To shape the general functional relationship between the output y of the prediction model and the input $x_1, x_2, \ldots, x_n$, the Kolmogorov-Gabor polynomial is as follows:

$$y = f(x_1, x_2) = a_0 + a_1 x_1 + a_2 x_2 + a_3 x_1^2 + a_4 x_2^2 + a_5 x_1 x_2 \quad (2)$$

And treat each of the monomials as m input models in the original structure of the modeling network:

$$v_1 = a_0,\ v_2 = a_1 x_1,\ v_3 = a_2 x_2, \ldots,\ v_6 = a_5 x_1 x_2 \quad (3)$$

Self-organizing process adaptively forms the first-level intermediate model:

$$z_k = f_k(v_i, v_j), i, = 1,2,\ldots,6 \quad (4)$$

And in the training set A, the parameter prediction method is used to predict the coefficient of z_k. In the test set B, the competition model $\{z_k\}$ is filtered through external specifications, and the intermediate candidate prediction model $w_k = (z_k)$ is collected and regarded as the input of the second layer of the network.

Open data sharing is the inevitable trend of big data development, and it is also the internal demand and powerful driving force of the transformation and development of government and society. The open sharing of tourism big data runs through different levels of smart tourism development, and its security needs to start from the aspects of technology, management and law. In terms of technology, it is necessary to formulate a hierarchical, differentiated security protection system that adapts to the characteristics of cloud computing environment. If we want to improve the management level of tourism and achieve the management goal, we must change the traditional management idea and mode. Tourism enterprises need to start with internal management, improve the degree of enterprise information data, and optimize the internal management process. In the aspect of user information management, tourism enterprises must pay attention to the collection of user information and the accumulation of data, and know the management of tourism enterprises through data analysis, so as to provide more attractive products for users. Scenic spots can also better adjust the flow, and better meet the actual needs of different users from the user's point of view. The government needs to start the related legislation and standards of data opening as soon as possible, establish the standards of public basic data resources, and improve the relevant systems of data resource collection, sharing, utilization and confidentiality, which provide legal guarantee for effectively protecting the legitimate rights and interests of the people and enhancing the benefits of big data.

Ⅳ. Conclusions

In fact, big data means that the scale and quantity of data are relatively large, which can no longer be sorted out by modern tools. Under smart tourism, the rational application of information technology can speed up the dissemination of tourism information. People can not only obtain tourism information through television, but also obtain the necessary tourism information through the Internet platform. In the development process of smart tourism, we must rely on the advantages of big data to build a smart tourism service chain, create personalized smart tourism management service mode and promote the innovation of tourism marketing mode. Tourism data prediction based on improved genetic algorithm has more comprehensive consideration of its non-stationary characteristics and time-dependent characteristics, thus showing better prediction results. The application of big data in tourism service intelligence can also guide scenic spots to develop infrastructure, improve tourism service quality, and improve users' satisfaction and trust. In the future development of tourism, it is necessary to continuously strengthen the

research on the effective integration of smart tourism and big data, further promote the improvement of tourism big data processing ability, and continuously improve the quality of tourism.

Ⅴ. Acknowledgment

Foundation Project: North China University of Water Resources and Electric Power Doctor Innovation Fund, B2017120114

References

[1] Li Yan, Xia Zenggang, Chen Ailing. Tourism passenger flow forecasting method based on multi-scale combination. Statistics and Decision, vol. 562, no. 22, no. 179-182, 2020.
[2] Liu Zhixia. Research on the Application of Big Data in Tourism Management. Journal of Guangdong Normal University of Technology, vol. 37, no. 4, no. 95-102, 2016.
[3] Zhang Chuancai, Liang Liuke, Su Xiaoyan, Yu Ruyi, Bian Qingquan, Yang Kang, Liu Yajing. Based on tourism big data, tourism network attention and visitor volume correlation mining. Journal of Luoyang Normal University, vol. 258, no. 11, no. 61-66, 2020.
[4] Yang Fan. Research on the Application of Big Data in Tourism Management. Journal of Baotou Vocational and Technical College, vol. 78, no. 3, no. 47-49+53, 2020.
[5] Chen Duanhai. Modeling and forecasting of port logistics based on genetic algorithm optimization of neural network parameters. Ship Science and Technology, vol. 42, no. 8, no. 188-190, 2020.
[6] Yan Xiaojuan, Gong Renxi, Zhang Qianfeng, et al. Application of SVM optimized by genetic algorithm in short-term wind speed prediction. Power System Protection and Control, vol. 44, no. 9, no. 38-42, 2016.
[7] Ren Wujun, Li Xin. Architecture design of tourism early warning system based on multi-source big data. Science and technology promote development, vol. 12, no. 2, no. 162-167, 2016.
[8] Gao Yanfang, Wang Jiwei. Research on Human Resource Information Service of Tourism Industry Based on Big Data. Journal of Wuhan University of Commerce, vol. 30, no. 5, no. 14-18, 2016.
[9] Liao Shushu. Research on the Application of Big Data in Tourism Management. Contemporary Tourism, vol. 18, no. 10, no. 58-59, 2020.
[10] Zhang Hongchang, Shu Boyang. The behavioral logic and path exploration of collaborative tourism governance in the era of big data. Management modernization, vol. 218, no. 4, no. 55-58, 2018.
[11] Pu Songyan, Hou Lijun. Analysis on the Application of Big Data in Tourism Management. Shanghai Business, vol. 494, no. 4, no. 57-59, 2020.
[12] Alaei A R, Becken S, Stantic B. Sentiment Analysis in Tourism: Capitalizing on Big Data. Journal of travel research, vol. 58, no. 2, no. 175-191, 2019.
[13] Lu Qin, Yu Weiguo. Innovation and Application of Consumer Big Data in Tourism Data Analysis. Digital Technology and Application, vol. 347, no. 5, no. 97-99, 2019.
[14] Hu Yanhui. Tourism culture innovation based on big data. Office Automation, vol. 373, no. 8, no. 35-36, 2018.