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Retraction

Retracted: Study on Regional Control of Tourism Flow Based on Fuzzy Theory

Wireless Communications and Mobile Computing

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] W. Shang and G. Chuangle, "Study on Regional Control of Tourism Flow Based on Fuzzy Theory," *Wireless Communications and Mobile Computing*, vol. 2021, Article ID 9648879, 7 pages, 2021.

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Research Article

Study on Regional Control of Tourism Flow Based on Fuzzy Theory

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In order to solve the problems of poor regional control effect and high control difficulty coefficient of a traditional tourism flow, this paper puts forward the research of a regional control of tourism flow based on fuzzy theory. The capacity of regional tourism is determined by analyzing the factors that influence the regional control of the tourism flow. The regional tourism flow is divided into different time series by automatic clustering algorithm, the same sample data is fused, and the Euclidean distance between traffic is obtained. The regional tourism flow prediction model is constructed according to fuzzy theory. On this basis, the real-time capacity of regional scenic spot flow is calculated, and the regional tourist flow control model is constructed to realize the regional tourist capacity control. The experimental results show that the regional control error of tourism flow is always lower than 0.40, and the difficulty coefficient of control is low, which has certain advantages.

1. Introduction

Global tourism has developed rapidly in recent years. More and more countries will speed up the development of tourism as a strategic decision, and our country will position tourism as a strategic pillar industry and modern service industry to cultivate it and issued the Tourism Law to ensure and promote the sustainable and healthy development of tourism [1]. Tourism's share of GDP continues to rise. The focus of the development of world tourism is gradually moving eastward, and the tourism market in Asia, especially in China, accounts for more and more of the global tourism market. Worldwide, the external environment of tourism in China is further optimized, and the development trend of popular tourism is becoming more and more obvious. At the same time, tourism has become a hot field of industrial investment. Tourism is called "the promotion catalyst of national economy," " forever sunrise industry," and the demand for tourism service of our people is gradually increasing [2]. On the one hand, the development of tourism can meet the increasing material and cultural needs of people; on the other hand, it can directly or indirectly promote the development of national economy. At the same time, tourism is a very related industry. In the process of its operation, it can not only promote the development of six tourism characteristic industries, such as travel, housing, purchase, entertainment, food, and travel, but also promote the development of a series of industries, such as business and service industry. Regional tourism demand has become the foundation of tourism development [3].

At present, the regional tourism demand is rising. If the forecast result of tourism demand is not accurate, it will lead to waste of resources and repeated construction. The phenomenon of low tourism service quality and excessive reception load caused by tourism demand is [4]. The accurate forecast of tourism demand is the basic basis and reference of tourism policy making and investment development, and also the fundamental of regional control of tourism flow [5]. Therefore, the related research has carried on a lot of research and has obtained certain results.

A tourism flow prediction model based on a gradient lifting regression tree is proposed in [6]. The accurate prediction of tourist flow is the key problem in tourism economic analysis and development planning. Based on the idea of integrated learning, a tourism flow prediction model based on gradient lifting regression tree is proposed. In this model, the tree generation algorithm of the original model is optimized to minimize the nonanalytical solution of the objective function, and the person correlation coefficient is used to analyze the correlation of each influencing factor to construct the feature vector to predict the tourist flow accurately. Taking Guilin tourist flow from 2015 to 2018 as an example, the prediction accuracy of the exponential smoothing algorithm and support vector machine algorithm is analyzed by comparing the average error, mean square error, and error. This method has higher prediction accuracy and better application value in tourist flow prediction, but little consideration is given to regional tourist flow control. Literature [7] puts forward the real-time tracking and prediction method of tourist flow data in scenic spots under cloud computing. This method can accurately track and predict the tourist flow data of scenic spots in real time. It is necessary to consider the continuous passenger flow state of scenic spots under cloud computing and complete the real-time tracking of tourist flow data through the state equation of scattered passenger flow data. The traditional real-time tracking method of tourist flow data in scenic spots does not consider the state of continuous passenger flow in scenic spots, which leads to poor tracking accuracy. The real-time tracking and prediction method of tourist flow data in scenic spots under cloud computing is put forward. The state parameters of continuous passenger flow under cloud computing are modeled, the unidirectional passenger flow and the aggregation passenger flow are estimated effectively, and the state equation and observation equation of dispersed passenger flow data are obtained. Based on the adaptive Kalman filter algorithm to monitor the dynamic change of scattered passenger flow data in cloud computing, and to correct the system state noise and observation noise variance, finally, on the basis of data prediction sorting and similar clustering, the effective tracking of tourist traffic data in scenic spots under cloud computing is realized. The method has higher tracking accuracy and stable and reliable performance, but the control and prediction are time-consuming and have some limitations.

Mobile computing is a new technology emerging with the development of mobile communication, Internet, database, distributed computing, and other technologies. Mobile computing technology will enable computers or other information intelligent terminal devices to realize data transmission and resource sharing in the wireless environment. Its role is to provide useful, accurate, and timely information to any customer anytime and anywhere. This will greatly change the way people live and work.

Based on the shortcomings of the above methods, this paper proposes a regional control method of tourism flow based on fuzzy theory. By analyzing the factors that affect the regional control of tourism flow, the capacity of regional tourism is determined, the regional tourism flow is divided into different time series by automatic clustering algorithm, the same sample data is fused, and the Euclidean distance between traffic is obtained. The technical route of this method is as follows:

(1) To determine the capacity of regional tourism by analyzing the factors affecting the regional control of tourism flows

(2) The regional tourism traffic is divided into different time series by automatic clustering algorithm, the same sample data is fused, and the Euclidean distance between traffic is obtained, and the regional tourism traffic prediction model is constructed according to fuzzy theory

(3) On this basis, the real-time traffic capacity of regional scenic spots is calculated, and the regional tourist flow control model is constructed to realize the regional tourist capacity control

(4) Experimental analysis

(5) Concluding remarks

2. Regional Tourism Demand and Capacity Analysis

2.1. Analysis of Factors Influencing Regional Tourism. Due to time constraints, regional tourism has become the most popular choice in current tourism. Before controlling the regional tourism flow, it is necessary to analyze the influencing factors of regional tourism. On this basis, the regional tourism capacity is divided to lay the foundation for the subsequent regional control of tourism flow [8]. Regional tourism impact factors include the following:

(1) Seasonal factors

Seasonality is a prominent feature of the tourism industry. The phenomenon of seasonal characteristics in tourism industry is not only limited to individual countries or regions to fully understand this important feature of tourism industry but also the premise of rational development and utilization of tourism resources. Seasonal characteristics are the part that needs to be attached great importance to in the process of tourist volume prediction. For a long time, how to grasp the seasonal volatility of tourist volume in the process of tourist volume analysis has been an important and complex issue. In the literature of tourist volume analysis, there are two ways to deal with the seasonal variation of tourist volume, that is, it is regarded as random or definite. As to which of the two methods will produce more accurate prediction results in the process of tourist volume prediction, there is no conclusion at present [9]. There are many complicated reasons behind the phenomenon that the tourist volume fluctuates with the season, including the reason of the tourist destination itself. It also includes the reasons from tourists and the comprehensive role of the whole tourism industry chain. Therefore, in the process of tourist volume prediction, we may need to consider the seasonal characteristics of tourism in different regions.

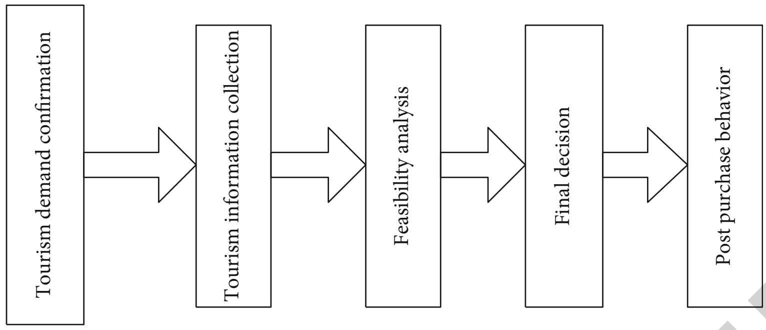

Figure 1: Traveller's regional tourism decision-making process.

(2) Sudden events

The impact of various unexpected special events on local tourism is very significant. For example, during natural disasters such as earthquakes and tsunamis, during severe outbreaks or during terrorist attacks and people's riots, tourism will suffer heavy losses due to these unpredictable emergencies. These natural or perceived events have caused huge losses to the number of visitors. The method used to measure the specific losses caused by these sudden events is to model and analyze the data before the event occurs, and to predict the local tourist volume under normal conditions. Then, compared with the actual observations at the time of occurrence, the difference between them is regarded as the loss caused by the event to the local tourist volume.

(3) Policy change

With the development of global international trade, economic and political exchanges between countries are frequent. In this context, tourism is also ushered in more foreign tourists. Countries' economic, political, and other related policies have a real-time impact on domestic tourism development. Therefore, this influence factor also becomes the important influence factor which affects the tourism industry progress and the development.

2.2. Regional Tourism Capacity Analysis. The so-called tourism market usually refers to the tourism demand market or the tourist source market, that is, the frequent buyers and potential buyers of tourism products: tourism consumption refers to people in the process of playing, the act and activity of meeting the needs of individual enjoyment and development by purchasing one or some tourism products. Tourism products are not stored as tangible products that are common in everyday life. They are essentially "perishable," [10] for example, hotel rooms, flight seats, and ticket tickets at a particular time and place will lose their current product value if they are not sold in time. Therefore, for the tourism market, it is very important to study and analyze the consumer's purchase behavior and make accurate tourism demand forecast.

A consumer purchase behavior model is an important theoretical reference for marketing activities. Through this model, we can determine the factors that affect consumers' decisions before and during the purchase of goods or services. In order to help marketers better carry out sales work, the decision-making process of consumer purchase is one of the important components of this behavior model and the decision-making process of tourists' regional tourism as shown in Figure 1.

When tourists make regional tourism decisions, they first "confirm the demand," and the purchase behavior will not occur for no reason. It must be because of some reason or stimulation that the demand for a certain commodity or service will trigger the desire to buy. The inducement may be accumulated for a long time, or may be temporarily stimulated by the behavior of acquaintances and friends, the effect of advertising, etc., such as seeing the photos of friends playing on social networks, suddenly producing the desire to travel outside. Then, we "collect information "; most people have to collect information to help make decisions before making decisions, information is the basis for decision-making, and purchase decisions are the same. Especially when it comes to larger amounts of money, consumers want to have a comprehensive understanding of information about goods or services, or to consult their own information, or to ask for advice from family and friends, or to study and analyze different package preferences, and so on. The larger the amount, the more detailed the information collection is. The characteristics of tourism services (inseparability, quality differences, family names, nonstorage, and nontransferability of ownership) determine that tourism consumption decisions are usually accompanied by higher risks, so consumers are more likely to conduct extensive information searches to reduce risk; again," evaluate goods ", which is based on the various types of information collected in the previous link, aggregate and further compare them, thus forming a consumer perspective and evaluation of a commodity or service, deciding whether to enter the next link or to give up buying. The final "decision to buy," that is, after confirming the availability of goods or services, occurs naturally, but this does not mean that the purchase is terminated [11].

When the regional tourism consumption of the above tourists is terminated, the regional tourist attractions need to plan the capacity to realize the control of the regional tourism capacity. The capacity of regional tourist attractions analyzed in this paper is shown in Figure 2.

The tourism capacity is the total capacity of the regional tourist attractions, and the composition of the capacity set to Z includes three parts of the influence factors, which are set

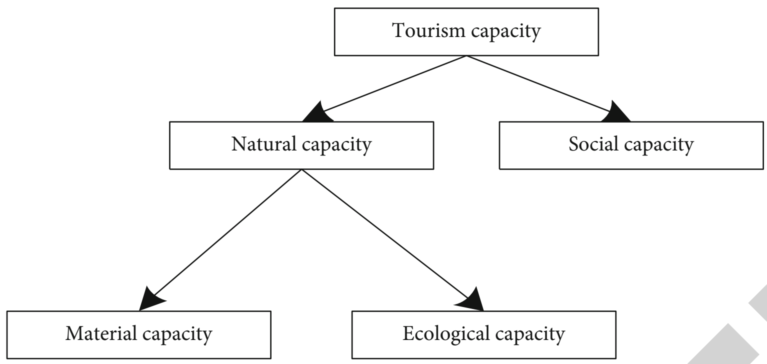

Figure 2: The capacity of regional tourist attractions analyzed.

to P, E, and S, respectively. The calculation formula can be expressed as

$$Z = P + E + S. \tag{1}$$

The content of formula (1) is not a simple addition, indicating that there is a vector relationship between the three, which is an inclusive relationship. Natural capacity is a supply-oriented capacity calculation, which mainly includes basic material capacity and natural ecological environment capacity. Among them, material capacity is a kind of facility capacity, according to the facility capacity of regional tourism to regional tourism. Social capacity is a kind of demand-oriented capacity, which is constructed on the psychological capacity of tourists and residents in tourist areas [12].

3. Regional Control of Tourism Flows

3.1. Construction of Regional Prediction Model of Tourism Flow Based on Fuzzy Theory. In order to realize the regional control of tourism flow, a regional prediction model of tourism flow is constructed to determine the flow of the tourism area.

First, the regional tourism traffic is divided into different time series by automatic clustering algorithm, and the historical sample is set as

$$y_i = (y_1, y_2, \cdots y_n). \tag{2}$$

By reordering the samples in formula (2), the same sample data is fused and [13], and the sorted sample data are expressed as follows:

$$y_i^{'} = \left(y_1^{'}, y_2^{'}, \cdots y_n^{'}\right). \tag{3}$$

On this basis, the mean value of the sample data is obtained, namely,

$$\mathrm{arv} = \frac{\sum_{i=1}^{n}\left(y_{i+1} - y_i{'}\right)}{n-1}. \tag{4}$$

Then, the Euclidean distance between different sample data is calculated, that is,

$$d\left(x_i, x_j\right) = \sqrt{\left(x_i - x_j\right)^2\left(x_i - x_j\right)}. \tag{5}$$

According to formula (5), the clustering center can be obtained as

$$c_j = \frac{1}{n}\sum_{i=1} d. \tag{6}$$

Finally, the regional prediction model of tourism flow is constructed according to fuzzy theory. A logical relation existing in fuzzy theory sets the interval between sample data as a set of fuzzy theories; fuzzy processing of sample travel flow data [14] obtained is as follows:

$$\begin{cases} A_1 = \dfrac{f_{11}}{u_1} + \dfrac{f_{12}}{u_2} + \cdots \dfrac{f_{1n}}{u_n}, \\ A_2 = \dfrac{f_{21}}{u_2} + \dfrac{f_{22}}{u_2} + \cdots \dfrac{f_{2n}}{u_n}, \\ \cdots, \\ A_i = \dfrac{f_{i1}}{u_1} + \dfrac{f_{i2}}{u_2} + \cdots \dfrac{f_{\mathrm{in}}}{u_n}. \end{cases} \tag{7}$$

After the above fuzzy processing, the logical relationship in the sample data of tourism flow is determined, and on this basis, the prediction model is constructed, that is,

$$A_j = \frac{p + M[A_i]}{s+1}. \tag{8}$$

Construction of the regional prediction model of tourism flow based on fuzzy theory is shown in Figure 3

3.2. Regional Tourist Capacity Control. According to the prediction results of the regional tourism flow prediction model, the control method of regional tourist capacity is designed to achieve the expected goal. For regional tourist attractions, the real-time control of capacity should be achieved, which requires scenic spots to predict the daily capacity. Setting up the entrance capacity of regional tourist attractions, that is, the main factor limiting ticket sales, is calculated by formula (9) and obtained [15]:

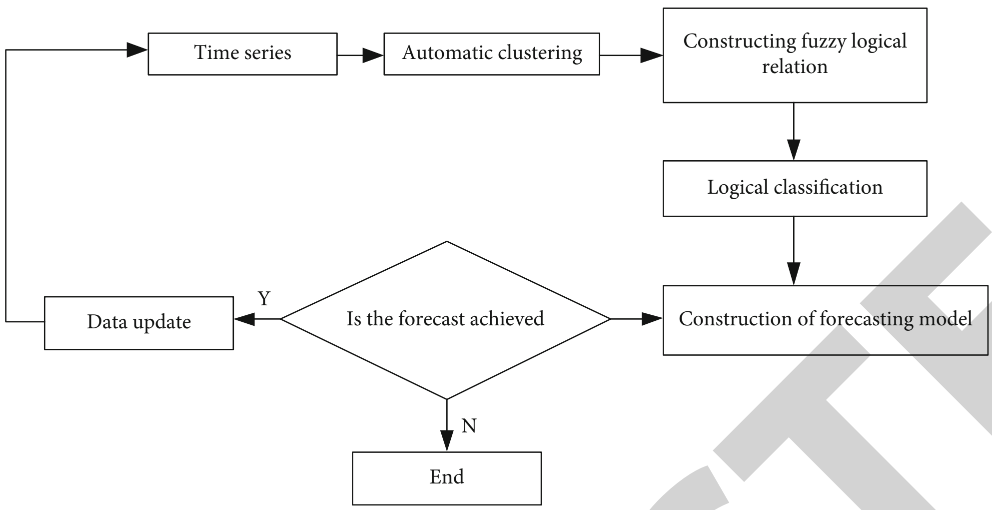

Figure 3: Flow of regional prediction model of tourism flow based on fuzzy theory.

$$T_i = \frac{(t - t_1)}{t_t \times F}. \quad (9)$$

In the formula, T_i represents the total entrance capacity of regional scenic spots, F represents the total number of tickets sold, and t_t represents the per capita flow of a single entry.

In the regional tourist capacity control, the key factor determining its capacity is the main play items in the scenic area, and the mathematical formula is as follows:

$$R_i = \frac{s_1}{s} \times \frac{t_{t-1}}{R_1 + R_2}. \quad (10)$$

In the formula, R_i represent the tourism facility application market, s_1 represents the landscape area, and R_1 represents the length of the tour.

According to the above analysis, [16] of regional tourist flow control model is constructed, and the following is obtained:

$$U = \frac{t_t - R_i}{T_i}. \quad (11)$$

In the regional tourist capacity control, according to the flow prediction model constructed by fuzzy theory, the real-time capacity of regional scenic spot flow is calculated, and the regional tourist flow control model is constructed to realize the regional tourist capacity control [17].

4. Experimental Analysis

4.1. Design of Experimental Scheme. In order to verify the scientific effectiveness of the proposed method, an experimental analysis was carried out. On the basis of the correlation analysis of real-time passenger flow data in a regional scenic spot, the data values with relatively high correlation degree are selected as the target research objects. Four data parameters in representative group 3 were selected as the main research objects. The experiment is carried out on the MATLAB platform. The experimental operating system is a WINDOWS XP system, and the system runs 16 GB of memory.

4.2. Design of Experimental Parameters. In order to verify the effectiveness of the proposed method, it is shown in Table 1.

Table 1: Experimental parameters.

Parameter	Short-cut process
Regional passenger flow (h)	500
Sampling interval (min)	5
Data statistics software	SPSS 7.0
Sample data volume	3000
Number of iterations (times)	10

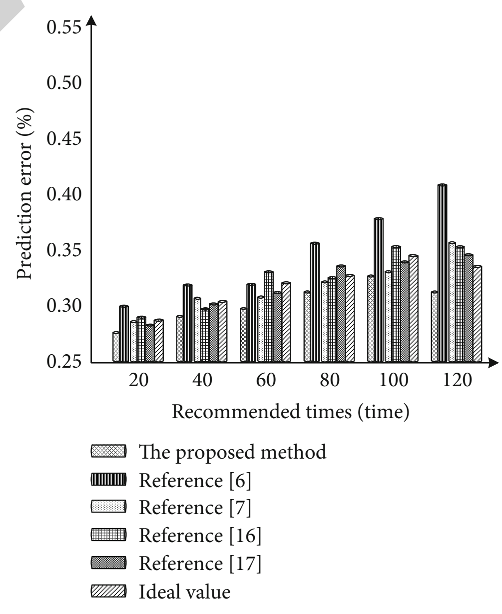

Figure 4: Comparison of regional traffic data prediction error in different methods.

Table 2: Comparison of the regional control coefficient of tourism flow with different methods.

Number of controls (times)	Methods of this paper	Document [6] methodology	Document [7] methodology	Document [18] methodology	Document [19] methodology
20	0.11	0.52	0.63	0.45	0.39
40	0.13	0.42	0.68	0.49	0.48
60	0.14	0.53	0.71	0.58	0.51
80	0.13	0.54	0.65	0.62	0.57
100	0.12	0.57	0.62	0.59	0.59

Under the above experimental environment and experimental parameter setting, the proposed method, literature [6] method, and literature [7] method are used to control the sample data, and the accuracy of regional flow prediction and the difficulty coefficient of control are taken as the experimental indexes. The prediction error is calculated by the following formula:

$$\mathrm{RMSE} = \sqrt{\frac{1}{N}\sum_{c=1}^{N}\left(y_i - y\wedge_i\right)^2}. \tag{12}$$

In the formula, $\widehat{y}_t$ and $\widehat{y}_i$ represent two different observations of passenger flow and $\bar{y}_t$represents the average measured passenger flow.

4.3. Result. To verify the validity of the proposed method, the error of the proposed method, the literature [6] method, and the literature [7] method in predicting the sample flow data is analyzed experimentally as shown in Figure 4:

The analysis in Figure 4 shows that the error of sample data prediction by using the proposed method, literature [6] method, and literature [7] method. When the number of iterations is 40, the prediction error of the proposed method is about 0.29, which is lower than the ideal error value. The prediction error of the literature [6] method is about 0.33, and the prediction error of the literature [7] method is about 0.32. When the number of iterations is 80, the prediction error of the proposed method is about 0.31, which is lower than the ideal error value. The prediction error of the literature [18] method is about 0.38, and the prediction error of the literature [19] method is about 0.33. When the number of iterations is 100, the prediction error of the proposed method is about 0.30, which is lower than the ideal error value. The prediction error of the literature [18] method is about 0.45, and the prediction error of the literature [19] method is about 0.34. In contrast, the prediction error of the proposed method is low, which is due to the fact that the proposed method determines the capacity of regional tourism by analyzing the factors that affect the regional control of tourism flow. The regional tourism flow is divided into different time series by automatic clustering algorithm, the same sample data is fused, and the Euclidean distance between traffic is obtained. The regional tourism flow prediction model is constructed according to fuzzy theory, in order to improve the accuracy of the proposed method.

Table 3: Comparison of RMSE with different methods.

Methods	RMSE
Methods of this paper	0.56
Document [6] methodology	0.72
Document [7] methodology	0.65
Document [18] methodology	0.71
Document [19] methodology	0.61

To further verify the effectiveness of the proposed method, the experimental analysis of the proposed method, the literature [6] method, and the literature [7] method on the tourism flow regional control coefficient, the value of the control coefficient range between 0 and 1, where the lower value represents the better control effect; the results are shown in Table 2:

The analysis of the data in Table 2 shows that under the same experimental environment, there are some differences in the difficulty coefficient of sample data control using the proposed method, literature [6] method, and literature [7] method. When the control times are 40 times, the control difficulty coefficient of the proposed method is 0.13, the control difficulty coefficient of the literature [6] method is 0.42, and the control difficulty coefficient of the literature [7] method is 0.68. When the number of iterations is 80, the control difficulty coefficient of the proposed method is 0.13, the control difficulty coefficient of the literature [18] method is 0.62, and the control difficulty coefficient of the literature [19] method is 0.57. When the number of iterations is 100, the control difficulty coefficient of the proposed method is 0.12, the control difficulty coefficient of the literature [18] method is 0.59, and the control difficulty coefficient of the literature [19] method is 0.59. It has some advantages. In addition, the RMSE of each comparison method is given in Table 3.

5. Conclusion

In view of the shortcomings of traditional methods, this paper puts forward a regional control study of tourism flow based on fuzzy theory. The capacity of regional tourism is determined by analyzing the factors that influence the regional control of tourism flow. The regional tourism flow is divided into different time series by automatic clustering algorithm, the same sample data is fused, and the Euclidean distance between traffic is obtained. The regional tourism flow prediction model is constructed according to fuzzy theory. On this basis, the real-time capacity of regional scenic spot flow is calculated, and the regional tourist flow control model is constructed to realize the regional tourist capacity control. The experimental results show that the regional control error of tourism flow is always lower than 0.40, and the difficulty coefficient of control is low, which has certain advantages.

Data Availability

Data is available on request from the corresponding authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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