

Research Article

Classification of Rural Tourism Features Based on Hierarchical Clustering Analysis Knowledge Recognition Algorithm

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The vigorous development of tourism has made rural tourism a highlight of the new era. In order to better realize the classification of rural tourism features, this paper proposes a knowledge recognition algorithm based on hierarchical clustering analysis. Firstly, the rationality of the optimization of the rural tourism feature algorithm is analyzed in this paper; secondly, the rural tourism feature classification index system is constructed based on the hierarchical clustering analysis; finally, the index weights are clearly divided according to the characteristics through the hierarchical clustering analysis of the knowledge identification algorithm. According to the specialties of hierarchical clustering analysis, the criteria of the algorithm are determined, and the characteristics of rural tourism are carefully classified. Rural tourists can visit different scenic spots in high density and improve the mobility of rural tourism. The experimental results show that: through the analysis of the characteristic classification data of the Rural Tourism College in this paper, it can be seen that the average daily income of the scenic spot is higher than that of the traditional rural scenic spot. The average daily income of rural tourism has increased by more than 261,900 yuan, which has largely promoted the development trend of rural tourism in my country. It is proved that the hierarchical clustering analysis method is helpful for rational zoning and serious thinking about the characteristics of rural tourism. This paper provides a reference for promoting the classification of rural tourism.

1. Introduction

In the process of data mining, the main way of data analysis is cluster analysis, which plays a crucial role. It divides the data set into many subgroups. Because objects in a subset are similar, the similarity of objects in a subset is small. People can focus on data analysis. Cluster analysis techniques are widely used in practice because it is difficult to obtain labeled data and relatively easy to obtain unlabeled data, and because of its uncontrolled learning nature. Cluster analysis includes not only data independent analysis, but also solving various data information before applying other algorithms. Now, cluster analysis technology has a rapid development trend and has been widely used in computer and information search, analysis, statistical analysis, establishment methods, image processing, and other applications [1]. Therefore, cluster analysis method can be widely used in tribal and practical activities. For similar data features, clustering

analysis can make data features more effective and accurate. With the continuous development of innovative technology, Internet technology and database have been widely used. In addition, more and more people are looking forward to using the approach of intelligent systems to discover the information hidden behind big data and help them make sound management decisions. So, data mining technology came into being. In the new natural environment of science and technology, scientific research achievements have been widely applied in indoor space, computer information technology and other aspects [2]. Data mining is also being used in agriculture, business, diagnostics, and medical treatment, which will make everyone's daily life more comfortable. With the rapid development of data era, many standards related to data mining techniques have been clearly emphasized. From this perspective, the future development trend and market prospects of data mining technology are very broad. Data mining technology is the

whole process of using big data mining ant colony algorithm to discover the data information of high value and hidden professional skills from a very huge data information component package. Data mining technology includes image and data signal analysis, information content retrieval, neural central system software Internet algorithm, and human neural central system Internet. Cluster analysis, prospecting inspection, standard analysis, and pattern mining are all part of the routine work of data mining techniques. Variable demarcated data model mining is the entire process of finding multiple frequency connections in the transaction management data information component package. Hierarchical cluster analysis is a basic way to analyze data information. Scientific research and analysis of data information involved in data mining technology is helpful to further grasp the characteristics of the crowd. At present, cluster analysis is not limited to data information mining. Many biologists are also involved in cluster research in industries such as visual systems, device learning, and training. Now, clustering analysis technology can expand image clustering analysis, image segmentation, Internet retrieval, and intelligent system business services. Once the image cluster analysis is carried out, a reasonable IMAGE SQL database index can be established to effectively improve the image retrieval rate. Through the application and segmentation of the image, the clustering algorithm is helpful to further grasp the characteristics of the image. Nowadays, there are many kinds of websites in our country. Through to the form of data clustering analysis, it can classify the web pages with similar contents and improve the retrieval speed obviously. Using cluster analysis to study a lot of consumer data information included in the business steps of intelligent systems is conducive to significantly improving the effectiveness of customer relationship management [3].

At present, China's rural tourism is developing rapidly, and people's attention is also increasing. Rural tourism has become an effective way to revitalize rural areas and enrich farmers. Foreign research institutions put forward the concept of rural scenic spots in the early 1960s. Recreational farms have long existed in developed countries, combining recreation with industry. Through advertising and program planning, game and entertainment farms closely focus on large and medium-sized characteristic farms and breeding farms, key construction of holiday tourism machinery and equipment, create a variety of characteristics of rural tourism scenic spots, attract urban residents to carry out leisure and entertainment themed activities. As early as 1990, some authoritative experts and scholars carried out corresponding scientific research on the zoning of rural tourism scenic spots. The different thinking ability of rural tourism means that they do not belong to the scope of rural tourism attractions. Rural tourism is divided into four levels: one is the landscape design level of vacation tourism. It is actually divided into today's new countryside, rural ecological park, and rural ecological environment protection [4]. Second, the role of rural tourism landscape. Actually divided into agricultural industry type, appreciation type, shop type, renovation type, appreciation type, and so on. Third, according to the scale of rural tourism enterprises. Rural tourists are generally classified in

accordance with holiday tourism destinations, such as holiday tourism, leisure and entertainment types, participation, feeling, culture and art, game and entertainment types, culture and education, and return to nature. The areas attracting rural tourists are divided into young people, youth, middle-aged, and elderly people. Fourthly, the development trend of agricultural and animal husbandry vacation tourism is divided into natural and urban. Figure 1 shows that, through to the hierarchical cluster analysis, scientific research on the development trend, industry market prospects and current situation of rural tourism, and the formulation of technical routes can better build the characteristic index value management system of rural tourism. Rural tourism is based on the hierarchical clustering analysis algorithm to create the characteristics of rural tourism, and the weight value of the regionalization index value to establish the basis for the classification of rural tourism characteristics [5].

In terms of research data at this stage, in order to ensure the accurate division of rural tourism characteristics, we can only make rational use of hierarchical cluster analysis. Firstly, ensure the rationality of the subalgorithm for optimizing rural tourism characteristics. Secondly, the classification index system of rural tourism characteristics can be constructed based on hierarchical cluster analysis. Finally, through to the knowledge recognition algorithm of hierarchical cluster analysis, the feature can be clearly divided into index weights.

2. Design of Rural Tourism Feature Division Method

2.1. Hierarchical Cluster Analysis Identification Algorithm. Usually the process of cluster analysis includes four parts: (1) Feature acquisition and selection. (2) Calculating the similarity between data objects. (3) Clustering algorithm for grouping. (4) Clustering result display.

We need to make judgments based on certain criteria, and through similarity metrics, we can understand the degree of similarity or difference between objects. Generally speaking, there are various methods used to measure the similarity or difference between data objects such as Euclidean distance, Marxian distance, cosine distance, Jaccard similarity coefficient, Dice coefficient, and correlation coefficient.

Each of these distances is described below.

Given a data set $Z = \{z_1, z_2, \dots, z_N\}$, where each data is a vector with d -dimensional attributes.

- (1) Euclidean distance. The Euclidean distance, also called Euclidean distance, is defined as

$$d(z_u, z_w) = \sqrt{\sum_{j=1}^d (z_{u,j} - z_{w,j})^2} = \|z_u - z_w\|. \quad (1)$$

Euclidean distance is simple and most commonly used, but it treats the differences between different attributes of a sample as equivalent, which sometimes does not work for high-dimensional data.

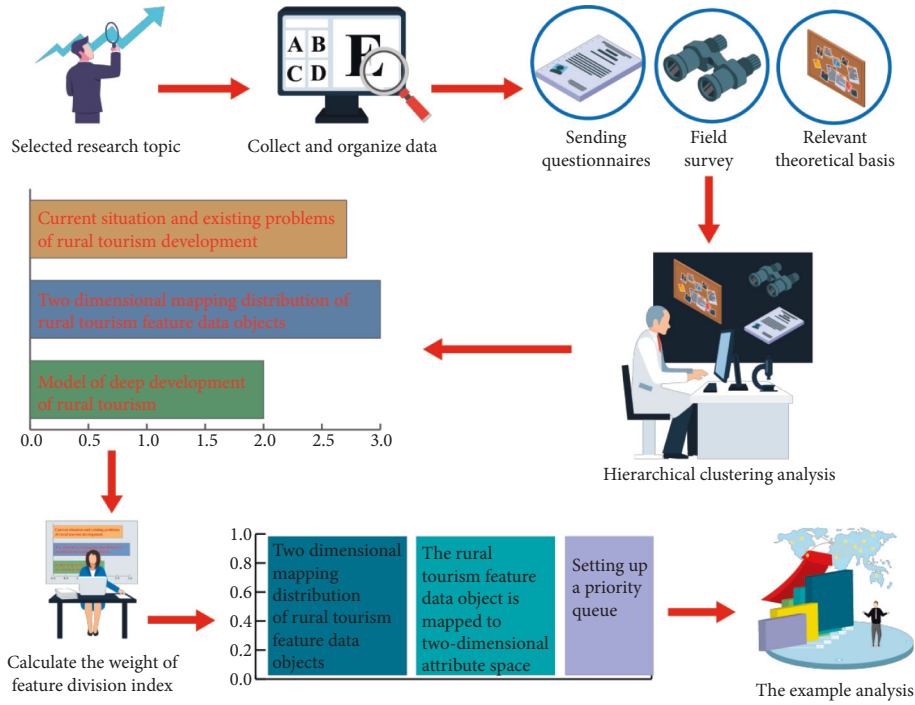


FIGURE 1: Technical route by analyzing the development status of rural tourism and current problems, the construction of the indicator system of rural tourism characteristics is completed.

(2) Cosine distance. The cosine distance is defined as follows:

$$\langle z_u, z_w \rangle = \frac{z_u \cdot z_w}{|z_u| |z_w|} \quad (2)$$

The cosine distance is calculated by considering two data objects as two vectors and dividing the product of these two vectors by the product of the modulus of these two vectors, that is, the cosine of the angle between these two vectors is used as the similarity measure between them, and a larger value means that the two objects are more similar.

(3) Marcan distance. The Marcan distance is defined as follows:

$$d_M(z_u, z_w) = (z_u, z_w)^{-1} (z_u, z_w)^T. \quad (3)$$

The difference between Mahalanobis distance and Euclidean distance lies in the fact that it considers the relationship between each property of the data information object. In the process of specific cluster analysis, in addition to the above interval measurement method, similar coefficients are also used, such as Jaccard similar coefficient, Dice coefficient, correlation, and other numbers. The larger the value of similarity coefficient is, the higher the similarity value between two data information objects is, and vice versa.

(4) The Jaccard similarity coefficient is defined as follows:

$$J(z_u, z_w) = \frac{|z_u \cap z_w|}{|z_u \cup z_w|}. \quad (4)$$

The Jaccard similarity coefficient is actually the ratio of the intersection of attributes to the concatenation of attributes between two data objects.

(5) The Dice coefficient is defined as follows:

$$\text{Dice}(z_u, z_w) = 2 \times \frac{\text{comm}(z_u, z_w)}{\text{len}(z_u) + \text{len}(z_w)}, \quad (5)$$

where $\text{comm}(z_u, z_w)$ is the set of characters, the number of identical characters in z_u, z_w , $\text{len}(z_u)$ and $\text{len}(z_w)$ are the set of characters, and z_u, z_w is the total number of characters each has.

(6) Correlation coefficient. The correlation coefficient is defined as follows:

$$r(z_u, z_w) = \frac{\sum_{k=1}^d (z_{k,u} - \bar{z}_u)(z_{k,w} - \bar{z}_w)}{\sqrt{\sum_{k=1}^d (z_{k,u} - \bar{z}_u)^2 (z_{k,w} - \bar{z}_w)^2}} \quad (6)$$

The correlation coefficient uses the product-difference method in the calculation process to express the similarity between two objects in terms of the standardization of the product of the difference between the variables and the mean.

2.2. Construction of Rural Tourism Characteristic Classification Index System. The development trend rate of a region is greatly harmed by the characteristic factors of rural tourism, resulting in widespread asymmetry and seriously jeopardizing the economic benefits of rural tourism [6]. The main characteristics of rural tourism can be divided into two levels: indoor space and relative density. When dividing the interior space, according to its characteristics, we should pay close attention to its fairness, further divide the level, and actively find other similar goals. When dividing by relative density characteristics, attention should be paid to the close relationship with the fashionable level of the gathering area. On the basis of hierarchical cluster analysis, it is necessary to carry out analysis and scientific research on the development trend, industrial market prospect, and characteristic division of rural tourism. One is to ensure the rationalization of hierarchical clustering identification algorithm to improve the characteristics of rural vacation tourism; Secondly, according to the hierarchical cluster analysis, the management system of the classification index value of rural vacation tourism characteristics is built. Third, through to the professional knowledge of hierarchical clustering analysis, ant colony algorithm is identified and the weight value of feature division index is created.

The vigorous development trend of rural tourism, first of all, to construct the value system of the value of the classification index value of the characteristics of rural vacation tourism, and secondly, it must be carried out according to the method of hierarchical cluster analysis. Rural tourism system is multilevel and comprehensive, including rural tourism system, potential user system of tourists, and available system of government departments and institutions. Only by maintaining the development trend of each system software, can we ensure customer satisfaction and improve social benefits. On the basis of hierarchical cluster analysis and professional knowledge identification, this paper analyzes the frequency data of rural tourism field, divides the characteristics of tourism vacation, sorts out the more frequent characteristic classification indexes, analyzes the current situation of rural tourism, and consults in rural tourism field. In accordance with scientific, reasonable, and powerful standards, the detailed situation of the development trend of rural tourism is analyzed to create the characteristics of rural tourism. The index system of feature division is shown in Table 1.

Based on the hierarchical cluster analysis knowledge identification, the classification of rural tourism features is greatly affected by the accuracy of the weight index, so it is very important to select the feature classification index. In this paper, rural tourism features are divided into four categories: industry-driven, social effect, infrastructure construction, and human environment, and 16 specific feature classification indicators are divided on this basis, thus constituting a feature classification system with hierarchical structure [7–9].

2.3. Characteristic Division Index Weight. The chromatographic cluster analysis method has the characteristics of quantitative and qualitative. It establishes an orderly

TABLE 1: Subindex system of rural tourism characteristics.

Target layer	Standard layer	Index layer
Rural tourism characteristics	Cultural environment	Appropriate travel time
		Biological resources
		Topographic resources
		Historical resources
	Infrastructure	Organizational resources
		Boarding and accommodation
		Medical and health work
		Convenient transportation
	Social results	Reputation
		Economics
		Leisure time
		Education
	Industry driven	Urban rural integration
		Policy preference
		Characteristic town
		Poverty driven

structure, reasonably divides the problems that need to be solved, and compares the index items with the same characteristic level, so as to accurately obtain the index value. In addition, the attribute of weight distribution index should be calculated to test its consistency, so as to lay a theoretical foundation for the division of index weight. As shown in Figure 2, the hierarchical cluster analysis method is further clarified [10].

The weight of characteristic division index is as follows, which can be calculated by root square method. First, calculate the number obtained by multiplying each element in matrix A :

$$M_i = \prod_{j=1}^n a_j \quad (i = 1, 2, 3, \dots, n). \quad (7)$$

Then, calculate the n roots of M_i . According to M_i ,

$$\bar{W}_i = \sqrt[n]{M_i}. \quad (8)$$

Then, normalize the root of M_i and obtain the eigenvector required by W_i :

$$W_i = \frac{\bar{W}_i}{\sum_{j=1}^n \bar{W}_j}. \quad (9)$$

Finally, the maximum characteristic value of rural tourism is calculated:

$$\lambda_{\max} \approx \sum_{i=1}^n \frac{(AW)_i}{nW_i}, \quad (10)$$

where $(AW)_i$ represents I component vectors of the eigenvector aw . When calculating the weight of special-purpose rural tourism characteristic distribution indicators, the relative importance of indicators to characteristic distribution should be evaluated through to the scale method [11]. Hierarchical cluster analysis software is helpful to calculate the weight of feature sharing index and test its correlation.

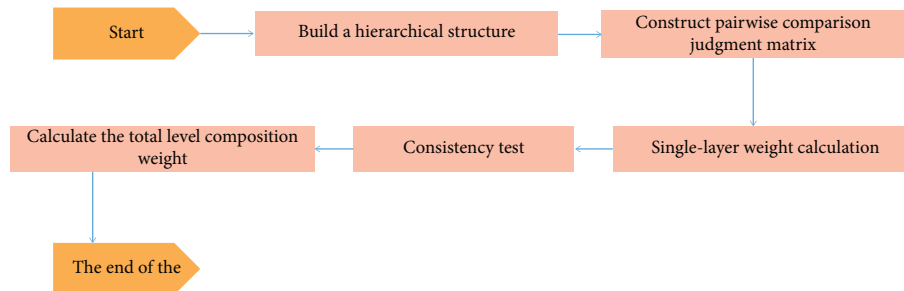


FIGURE 2: The principle of hierarchical cluster analysis. Hierarchical cluster analysis is an analysis method that combines qualitative and quantitative analysis.

For the calculation of total weight, it is necessary to check whether the division of single-layer attribute indicators is consistent. When the knowledge recognition algorithm of hierarchical clustering analysis defines the weight of feature division index, its scale should be divided into 1–9 levels before calculating the weight value. Based on the traditional rural tourism division method, we continue to optimize and innovate, and realize the rural tourism feature classification through the hierarchical clustering method.

2.4. Optimization of Rural Tourism Feature Subalgorithm.

The traditional rural feature division algorithm has n m -dimensional rural tourism feature data objects in the data set, and $S_i(x_1, x_2, x_3, \dots, x_m)$, $i = 1, 2, 3, \dots, n$ maps the rural tourism feature data objects in the two-dimensional attribute space.

The traditional rural tourism feature division algorithm is divided into the following steps.

Through the following five steps, the traditional rural tourism feature algorithm can be divided reasonably.

Step 1: Sort all data in the rural tourism feature data set from small to large through to the data distance.

Step 2: Identify and integrate two relatively close priority rural tourism feature cluster objects.

Step 3: Change the initial priority.

Step 4: If the number of feature clustering objects in the rural tourism feature data set does not meet the segmentation index standard or is greater than 1, you need to return to step 2.

Step 5: Return to the cluster diagram to sort the characteristics of rural tourism.

According to the traditional rural tourism splitting algorithm, step 3 is the most important step in the whole algorithm. If the complexity of computing time can be reduced, the overall performance of rural tourism segmentation algorithm can be improved. Based on the traditional rural tourism feature sharing algorithm, the calculation time complexity is optimized [12]. The rural tourism feature data set includes N two-dimensional $S_i(x, y)$, $i = 1, 2, 3, \dots, n$ feature data objects. Divides the rural tourism feature data set into areas a and b , and the x -axis shows the overlapping area with width L .

In the area overlapping with the width L , the specific data object is not only in area a , but also in area B , the width of the data object. The distance between the overlapping data object and part B data object must be greater than the width of the overlapping area. Considering specific data objects with less than l or equal composite spacing, it is not necessary to evaluate whether the two can be combined [13]. Two attribute data objects can be removed from the priority, and the recovery time can be reduced by adjusting the priority accordingly. The optimal algorithm of rural tourism feature segmentation can be divided from the following three stages. In the first stage, the rural tourism characteristic data set should be divided into P-zone, the data object should be given priority, and the program should be started through P-zone; in the second stage, n feature data objects should be clustered; in the third stage, K clusters should be recombined and adjusted to promote the formation of new clusters. The optimization of rural tourism sharing algorithm can be divided into the following nine steps [14].

Step 1: Select the rural tourism information package sharing function.

Step 2: Divide n objects with similar feature attributes into P regions.

Step 3: Call Subroutine startup priority and set the priority of each area.

Step 4: whileDist(C_1, C_2) < L .

Step 5: Among the P priority queues, select the two clusters with the closest distance and calculate the minimum value Dist(C_1, C_2).

Step 6: If Dist(C_1, C_2) > L , jump out of the program.

Step 7: Otherwise, merge C_1 and C_2 .

Step 8: If C_1 and C_2 do not exist in the overlapping area with width L , the priority queue of C_1 and C_2 should be modified appropriately.

Step 9: Otherwise, modify the other two priority queues.

Hierarchical cluster analysis can not only construct the classification index system of rural tourism characteristics, but also ensure the rationality of optimizing the subalgorithm of rural tourism characteristics. At the same time, through to the knowledge recognition algorithm of hierarchical cluster analysis, the index weight of feature division

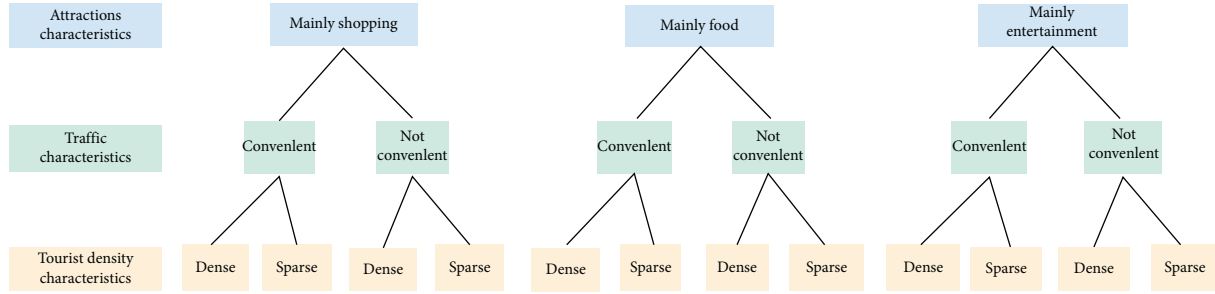


FIGURE 3: Classification of rural tourism characteristics, based on the regional scientific research on rural tourism and the natural infinite spring features of rural tourism in unique big cities.

can be defined, which is conducive to the effective division and study of rural tourism features [15].

3. Experimental Analysis

With the improvement of the satisfaction rate of tourists to the rural vacation tourism and transaction, the traditional way of zoning the characteristics of rural vacation tourism cannot meet the needs of tourists. The following is a comparative test of rural GDP by applying the traditional feature classification method of rural vacation tourism and its feature classification method based on hierarchical cluster analysis and specific professional knowledge.

3.1. Experimental Steps. Based on the regional scientific research on rural tourism and the natural infinite spring features of rural tourism in unique big cities, rural tourism features are divided into three categories, as shown in Figure 3.

On the basis of hierarchical cluster analysis, the characteristics of rural tourism are divided into categories, so as to deduce the specific characteristics of rural tourism. In the process of calculating the weight value of various businesses of rural tourism, the network should be taken as the unit to calculate the scores in terms of per capita consumption level, GDP index, tourist density, scenic spot service, etc. [16]. The weight of each business of rural tourism shall be calculated by combining the production price index and Moran index of tourist attractions. The calculation results are shown in Tables 2 and 3.

Calculate the weighted scores of each grid of rural tourist attractions and divide the rural tourism characteristics by statistical grouping method [17].

3.2. Analysis of Experimental Results. The characteristic division results of rural tourism density can be obtained from two characteristic division methods. Five scenic spots are randomly selected from the division results and their total daily average income is calculated. The statistical results are shown in Table 4.

The statistical results are analyzed and divided. According to the two characteristics, the average daily income of different rural tourist attractions is also different, and the income is generally not high [18]. Different from the traditional classification method of rural tourism

TABLE 2: Weight values of various business types in rural tourist attractions.

Format	Total POI	Weight value
Food	2101	0.452012
Shopping	2005	0.298012
Hotels	278	0.044012
Leisure and entertainment	753	0.124012
Business buildings	36	0.006012

TABLE 3: Weight values of each indicator of rural tourism.

Index	Total POI	Weight value
Tourist density	0.876	0.1221111
Per capita spending power	0.91	0.1271111
Scenic service	0.903	0.1261111
Traffic service	0.9	0.1251111
The scenic area per capita GDP	0.89999	0.1251111

TABLE 4: Average daily total income of rural tourist attractions.

	Traditional rural tourism characteristics classification method	Rural tourism characteristics classification method based on hierarchical cluster analysis
Attraction 1	27,800 yuan	87,900 yuan
Attraction 2	17,800 yuan	75,600 yuan
Attraction 3	47,500 yuan	89,800 yuan
Attraction 4	52,200 yuan	95,400 yuan
Attraction 5	31,400 yuan	89,900 yuan

characteristics, hierarchical cluster analysis can not only significantly improve the daily average total income of rural population, but also make the distribution of tourists more reasonable and scientific. In order to promote the development of rural tourism, the tourism management department allocated 261,900 yuan.

The main factors causing the above phenomena are: the difference of passenger flow time series in rural tourist attractions, geographical concentration index, average market distance, etc. Firstly, in terms of the characteristics of passenger flow time series, it is an effective proof to divide rural tourism. Converting the original passenger flow data can not only fully display the characteristics of passenger flow time

series, but also detect the changes of passenger flow time series in time. Therefore, it is very important to classify rural tourist attractions scientifically [19]. Secondly, in terms of geographical concentration index, it has become a conventional way for the tourism industry to divide natural scenic spots, while the average market distance method is usually used to determine the mineral attraction and market characteristics. The above method only takes the accuracy of data analysis as the standard. By making full use of the response time and high-precision data information of mobile broadband network operators, this paper shows that the characteristics of interior space of rural tourism vacation not only promote the filling of data information lacking in traditional methods, but also enhance the certification of time rationality system zoning method. This paper tries to categorize rural vacation tourism in different ways, test the reasonable interior space layout of rural scenic spots, the time of people flow and the value of sales market temptation index, and distinguish the advertising methods, products and current standards and policies based on the test values. Through the increase of a variety of rural vacation tourism websites, promote the multilevel development trend of tourism vacation scientific research, and promote the development trend of rural transformation and physical and mental health of rural scenic spots. The effective systematic zoning of rural tourist attractions has the key practical significance and the basic theoretical and practical significance. Scientific research and discussion of rural transformation development strategy and rural tourism holiday marketing help farmers to achieve common prosperity and other multilevel issues. There are many aspects of this article that need to be improved. We must think and analyze rural vacation tourism from multiple aspects and directions [20].

4. Conclusion

According to the professional knowledge identification standard of hierarchical cluster analysis, the characteristics of rural tourism are finely divided. Rural tourists can visit different tourist attractions together, and the relative density is high, which improves the flow of people in rural tourism. Naturally, compared with traditional rural tourist attractions, the average daily profit of tourist attractions has been greatly improved. Through to the characteristic classification data of rural tourism analysis in this paper, it can be seen that the average daily growth income of rural tourism has reached 261,900 yuan, which provides a great boost to the development of rural tourism in China. Therefore, a deeper interpretation of hierarchical cluster analysis method is not only conducive to effective division and study of rural tourism characteristics, but also conducive to the growth of rural tourism economic benefits. The differences in time series of rural tourist flows, geographic concentration index, and market average distance are consistent for the following reasons: first, the characteristics of time series of tourist flows are the effective basis for classifying rural tourism. The large number of rural tourist attractions increases the difficulty of distinguishing the characteristics of time series. The transformation of original passenger flow data can fully

show the characteristics of passenger flow time series and make the classification of tourist attractions more scientific. Second, by dividing the structural features of rural tourist flow space, the feasibility of time series feature division method can be further verified.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

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