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Analysis on Spatial Distribution and Influencing Factors of Rural Tourism Characteristic Villages in Henan Province

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Abstract: In this paper, the spatial distribution situation and influencing factors of 585 rural tourism characteristic villages in Henan Province are analysed based on global autocorrelation index, average nearest neighbor index, kernel density analysis and Geodetector, and the following conclusions are drawn: (1) The spatial autocorrelation index of rural tourism characteristic villages in Henan Province is 0.224, the average nearest neighbor index is 0.636, and the coefficient of variation is 241.5%. The agglomeration characteristic of northern Henan, central Henan and southern Henan are obvious. It has the spatial distribution characteristic of ' near mountains, around cities and along roads '. (2) The results of factor detector show that the number of road mileage, tourism income, number of A-level scenic spots, expenditure on agriculture, forestry and water affairs and air quality have a great influence on the spatial distribution of rural tourism characteristic villages. (3) The results of interaction detector show that the interaction results of influencing factors are all enhanced, and the interaction between GDP and tourism income is the strongest. (4) The results of ecological detector show that the influence of river system (X_2), the number of road miles (X_5), the number of A-grade scenic spots (X_6) and income from tourism (X_{11}) are significantly different from the other factors.

1. Introduction

Consolidating and expanding the results of poverty eradication and rural revitalization is a major strategic plan in the 14th Five-Year Plan period. Rural tourism, with its strong industrial correlation, high degree of industry integration and outstanding comprehensive benefits, has become an important grasp for the implementation of this strategy.[1]. The Central Document No. 1 of 2023 once again focuses on rural tourism, strategically depicting rural revitalization and cultural tourism industry from multiple dimensions, emphasizing the promotion of high-quality development of rural industries, with rural tourism bearing the brunt. Rural tourism not only firmly grasp the current tourism hotspot, but also the potential growth point of the tourism economy and the national strategy to explore the focus point on the height of the beneficial. Rural tourism in Henan Province has not been developed

for a long time. With the support of policies and government, the scope, types and quantity of rural tourism have been expanding, but due to the lack of unified planning and management, the phenomenon of disorganized spatial distribution and uneven quality has emerged. Research on the spatial layout and influencing factors of rural tourism in Henan Province is beneficial to the sustainable development of rural tourism in Henan Province, and is an important guarantee for driving high-quality rural development and rural revitalization[2].

Overseas research on rural tourism started earlier and has now established a more complete research system, mainly focusing on the definition of rural tourism[3], spatial patterns[4], driving mechanisms[5] and other aspects to explore. Domestic research on rural tourism originated in the 1990s and is dominated by development models[6], development problems and countermeasures[7], and development-driven mechanisms[8]. The focus of research in recent years has gradually shifted to the study of the spatial distribution of rural tourism and the factors influencing it. The research methods involve mean nearest neighbor index[9], kernel density estimation method[10], network dimensional analysis[11], correlation analysis[12]and other methods. There is still much room for research on the factors influencing the spatial layout of rural tourism.

In May 2020, the General Office of the Henan Provincial People's Government issued the "General Office of the Henan Provincial People's Government on accelerating the development of rural tourism," proposing "from the market, strengthen planning to lead, enrich product supply, improve infrastructure, optimize the rural tourism environment, create a rural tourism development system based on rural tourism demonstration counties (cities, districts), ecological demonstration townships (towns), rural tourism characteristic of the village." This paper selects 585 rural tourism characteristic villages announced by the Department of Culture and Tourism of Henan Province from 2018-2021 as research samples, reveals the spatial layout of rural tourism characteristic villages in terms of spatial distribution correlation, spatial distribution type, and spatial distribution density using global autocorrelation index, nearest neighbor index, and kernel density analysis, and analyzes the influencing factors affecting their spatial layout using Geodetector, with a view to providing reference for promoting the development of rural tourism in Henan Province.

2. Materials and Methods

2.1 Data Sources

Rural tourism characteristic village in Henan Province refer to villages with distinctive tourism characteristic, rich in cultural tourism resources, harmonious ecological environment, orderly organization and management, certain infrastructure and reception service capabilities, and certain tourism scale, benefits and market attractiveness[13]. The data of rural tourism characteristic villages used in this paper were obtained from the "List of Rural Tourism Featured Villages in Henan Province" published by the Department of Culture and Tourism of Henan Province from 2018-2021, integrating the above data to obtain a total of 585 rural tourism featured villages in Henan Province. The village coordinates are extracted by "Baidu Map API Coordinate Picker". The vector data used are derived from the National Geographic Information Resource Catalog Service and the Open Street Map dataset. The statistical data used are derived from the ' Henan Statistical Yearbook '.

2.2 Research Method

2.2.1 Global Autocorrelation Index

The global autocorrelation index is an important indicator to measure the spatial correlation, which is used to indicate the overall trend of the spatial correlation of rural tourism characteristic villages in

the study area. The calculation formula is:

$$I = n\frac{\sum_{i=1}^{n}\sum_{j=1}^{n}\omega_{ij}\sum_{j=1}^{n}\left(x_i-\bar{x}\right)\left(x_j-\bar{x}\right)}{\sum_{i=1}^{n}\sum_{j=1}^{n}\omega_{ij}\sum_{j=1}^{n}\left(x_j-\bar{x}\right)^2} \tag{1}$$

In formula (1), x_i and x_j are the observations of study object i and j, respectively. $\bar{x}$ is the average of x_i observations. ω_{ij} is the spatial vector matrix; n is the total number of samples. When I is positive, it indicates a positive correlation in space, when I is negative, it indicates a negative correlation in space, when I is 0, it indicates a random distribution in space[14].

2.2.2 Average Nearest Neighbor Index

The nearest neighbor distance can measure the spatial proximity of rural tourism characteristic villages. The average nearest neighbor index R can reflect the spatial distribution characteristics of rural tourism characteristic villages, that is, the ratio of ' average observed nearest neighbor distance ' to ' theoretical average nearest neighbor distance '. The calculation formula is:

$$R = \frac{\overline{r_1}}{r_0} = \frac{1}{n}\sum_{i=1}^{n}d_i \Big/ \frac{1}{2\sqrt{n/A}} \tag{2}$$

In formula (2), $\overline{r_1}$ is the average observed nearest neighbor distance of tourist villages. r_0 is the theoretical average nearest neighbor distance. d_i is the distance from the i th rural tourism characteristic village to its nearest neighbor in the study area. n is the number of rural tourism characteristic villages in the study area. A is the area of Henan Province. When R = 1, the rural tourism characteristic villages are randomly distributed; when R > 1, the rural tourism characteristic villages tend to be evenly distributed; when R < 1, the rural tourism characteristic villages tend to cluster distribution[15].

2.2.3 Kernel Density Analysis

Kernel density analysis is used to identify the spatial agglomeration area of rural tourism characteristic villages. The kernel density estimation method assumes that events can occur at any location in geographic space, but have different probabilities of occurring at different locations[14]. The kernel density value reflects the degree of agglomeration in the spatial distribution of the object of study. The calculation formula is:

$$f\left(x\right) = \frac{1}{nh}\sum_{i=1}^{n}k\left(\frac{x-x_i}{h}\right) \tag{3}$$

In formula (3), $f(x)$ is the kernel density value of the rural tourism characteristic villages. n is the number of rural tourism characteristic villages within the search radius. h is the search radius. k is the weight value. $(x - x_i)$ is the distance from the rural tourism characteristic village x to the sample tourist village x_i[16].

2.2.4 Geodetector

Geodetector is a statistical method for detecting spatial differentiation and revealing the driving forces behind it. The core idea is that if an independent variable has a significant effect on the dependent variable, then the spatial distribution of the independent and dependent variables should

have similarity. Geodetector consists of four parts, factor detector, interaction detector, risk detector and ecological detector. Among them, factor detector and interaction detector use q-statistic to measure the explanatory power of factor X to dependent variable Y. The range is [0, 1]. The larger the q-statistic, the stronger the explanatory power of independent variable X on the dependent variable Y and vice versa. The calculation formula is:

$$q = 1 - \frac{\sum_{h=1}^{L} N_h \sigma_h^2}{N\sigma^2} \tag{4}$$

In formula (4), N_h is the number of layers h, σ_h^2 is the variance of the detection factor layer, N is the number of units in the whole region, σ^2 is the variance of the number of elements in the whole region[17]. Since traditional Geodetector requires human settings for discretization of continuous variables and suffer from subjectivity and poor discretization, this paper uses optimal parameters-based geographical detector to select the combination of parameters with the highest q-statistic for spatial discretization with the help of the GD package in the R language.

3. Spatial Layout of Rural Tourism Characteristic Villages in Henan Province

3.1 Spatial Distribution Type

The global autocorrelation index value of rural tourism villages in Henan Province is calculated as 0.224>0. The Z score is 4.813>1.650, with positive values, and the test results show significant, indicating that the spatial distribution of rural tourism characteristic villages in Henan Province shows positive spatial correlation. That is whether it is more distributed or less distributed, there is a trend of agglomeration in space. Through the average nearest neighbor analysis, the average observation distance of rural tourism characteristic villages in Henan Province is 7170 m, the expected average distance is 11282 m, and the average nearest neighbor index is 0.636, indicating that rural tourism characteristic villages in Henan Province have the characteristics of agglomeration distribution. In order to verify the accuracy of the conclusion obtained by the average nearest neighbor index, the coefficient of variation (CV) verification based on the area of Voronoi polygon is introduced. The CV value is 241.5 %, which is much larger than 64 %, which once again confirms the conclusion that the rural tourism characteristic villages in Henan Province are clustered. This spatial agglomeration feature is conducive to internal cooperation between villages and the joint use of external resources to obtain agglomeration benefits[18].

3.2 Spatial Distribution Pattern

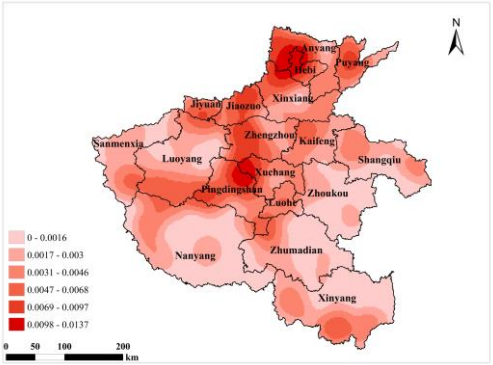

Figure 1: Kernel Density Estimation.

In order to reveal the spatial distribution agglomeration area of rural tourism characteristic villages, the kernel density analysis tool is used to visualize the spatial distribution pattern of rural tourism characteristic villages in Henan Province (Figure 1). Rural tourism characteristic villages in Henan Province show a 'multi-core point' agglomeration distribution structure. The agglomeration characteristics of Anyang-Hebi-Xinxiang in northern Henan, Zhengzhou-Pingdingshan-Xuchang in central Henan, and Xinyang in southern Henan are obvious, and the agglomeration effect in eastern Henan is weak. In general, the spatial distribution of rural tourism characteristic villages in Henan Province is uneven, showing a distribution pattern of "large scattering and small clusters", with significant differences between municipalities.

3.3 Spatial Distribution Characteristics

3.3.1 Near Mountains

Topography is an important factor influencing land use patterns and village distribution[19]. Overlaying the kernel density of rural tourism characteristic villages in Henan Province with the distribution of mountain ranges (Figure 2). It can be seen from the figure that most of the rural tourism characteristic villages in Henan Province are distributed in mountainous areas with fluctuating terrain. It includes Taihang Mountain in the north of Henan Province, Xiaoqinling Mountain, Wangwu Mountain, Xiaoshan Mountain, Funiu Mountain in the west, Tongbai Mountain, Dabie Mountain in the south and Songshan Mountain in the middle. By extracting the elevation information of rural tourism characteristic villages from DEM data, we get that rural tourism characteristic villages in Henan Province are distributed at an altitude of 32-1315m, with an average elevation of 270m. According to the ' First National Geographic Conditions Census Bulletin', the areas below 1000 m above sea level are called low altitude areas. The number of rural tourism characteristic villages in low altitude areas is 531, accounting for 97.43 % of the total, indicating that rural tourism characteristic villages in Henan Province are more inclined to be distributed in low altitude mountainous areas.

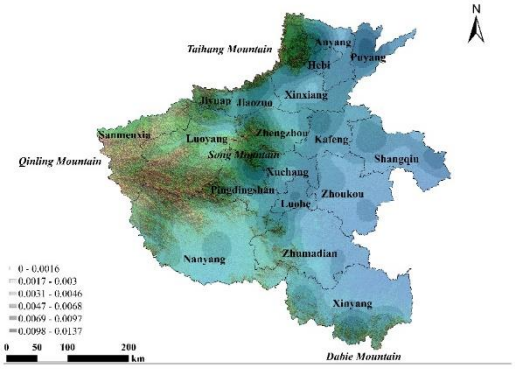

Figure 2: Kernel density of rural tourism characteristic villages and mountains.

3.3.2 Around Cities

Taking the location of district government as the representative of urban area, the number of rural tourism characteristic villages in different distance ranges is calculated by buffer analysis (Figure 3). The results show that 538 rural tourism characteristic villages are covered within 30 km from each district government, accounting for 91.96 % of the total, indicating that rural tourism characteristic villages are mainly concentrated around the city. Among them, the number of rural tourism characteristic villages within the 10~15km range is the largest, accounting for 25.47% of the total.

This area is mostly a transition zone between the city and the countryside, with rich natural landscapes and convenient travel conditions, which can meet the tourist demand of escaping the fast-paced life in the city and getting close to nature. When the distance is greater than 15 km, the number of rural tourism characteristic villages will decrease with the increase of distance, which is in line with the view of Wu Bihu et al[20] that the farther the distance from the city, the less the distribution of rural tourism destinations. The villages close to the city can rely on their superior location conditions to make the rapid development of rural tourism. The villages far away from the city will increase the time cost and consumption cost of tourists, reduce the enthusiasm of tourists, and thus affect the spatial distribution of rural tourism characteristic villages.

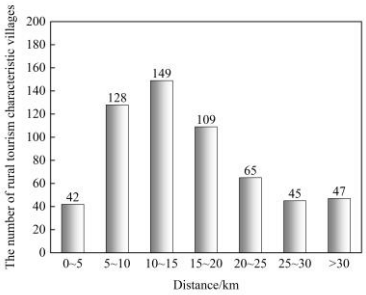

Figure 3: Distance between rural tourism characteristic villages and urban area.

3.3.3 Along Roads

Buffer zone analysis of major roads, such as motorways, national roads and provincial roads, and calculate the distance between the rural tourism characteristic village and the main roads (Figure 4). The results show that 316 rural tourism characteristic villages are clustered within 2 km of the major roads, accounting for 54.02 %, and only 18 rural tourism characteristic villages are located 10 km away from the main roads. It can be seen that the spatial distribution of rural tourism characteristic villages shows a significant spatial distance decay pattern centered on major roads, the closer the distance to the major roads, the greater the number of rural tourism characteristic villages, and conversely the further the distance from the main roads, the smaller the number of rural tourism characteristic villages.

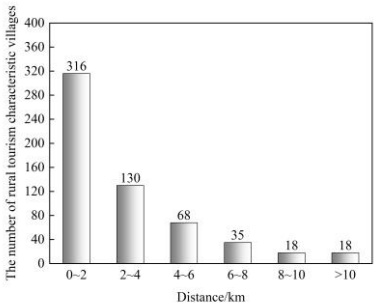

Figure 4: Distance between rural tourism characteristic villages and main traffic lines.

4. Analysis on the Influencing Factors of Spatial Distribution of Rural Tourism Characteristic Villages in Henan Province

4.1 Indicator Construction and Processing

According to the theory of cultural ecology, the emergence and development of cultural things are

influenced by natural and social factors[1]. Drawing on existing research[12, 21], Refer to the recommended conditions of rural tourism characteristic villages in Henan Province, this section mainly analyzes 12 indicators as influencing factors from the three dimensions of nature, society and economy, and preprocesses the data.

4.1.1 Nature Factors

Altitude (X_1) affects the formation and distribution of rural tourism resources to a certain extent, thus affecting the formation of rural tourism characteristic villages. The river system (X_2) can not only provide water for agricultural production and ecological construction in surrounding villages, but also develop rural tourism projects such as boating and fishing. Good air quality (X_3) can enhance the tourist experience in the process of rural tourism. Forest-coverage rate (X_4) is an important index to measure the natural ecological environment of the region. Good greening and beautification effect is a basic condition for recommending rural tourism characteristic villages.

4.1.2 Social Factors

The number of road miles (X_5) reflects the regional transport development, the road network is the basis for the development of rural tourism, playing the role of a bridge connecting the source and destination, and is an important part of rural tourism sites. The number of A-grade scenic spots (X_6) can reflect the tourism resource endowment of the region, A-grade scenic spots have rich tourism resources and good brand effect, and nearby villages can rely on A-grade scenic spots to achieve linkage development. The number of urban resident population (X_7) reflects the potential scale of rural tourism visitors in the region, the more urban resident population, the larger the potential source of visitors. Agriculture, forestry and water conservancy (X_8) refers to the funds used by local finance to support agricultural production and rural construction. Active financial support can accelerate the development of rural tourism in the region.

4.1.3 Economic Factors

Gross domestic product (X_9) reflects the overall economic development level of the region, the higher the level of economic development, the stronger the promotion effect on rural tourism development. The contributions of three strata of industry to the increase of the gross domestic product (X_{10}) reflects the development level and industrial structure of the tertiary industry in the region. As a new industry in the tertiary industry, the development of the tertiary industry will inevitably affect the development of rural tourism. Income from tourism (X_{11}) can reflect the level of regional tourism development. The development of rural tourism is inseparable from the support of the overall tourism industry in the region. The more developed the local tourism industry, the stronger the support for the development of rural tourism. Per capita net income of urban residents (X_{12}) can influence the travel willingness and consumption ability of tourists, thus affecting the development of rural tourism.

4.1.4 Data Preprocessing

The Geodetector requires that if the independent variable X is a numerical quantity, the data needs to be discretized. With the help of the GD package in the R language, the independent variables are mainly set into several classes using the equal breaks method, natural breaks method, quantile breaks method and geometric breaks method, and the q-statistic are calculated for different classification methods and different intervals, and the combination of parameters with the highest q-statistic is selected. ArcGIS software is used to grid Henan Province, and the fishing net is set to 5km × 5km to

generate 6621 grids. Then, the kernel density value of rural tourism characteristic villages in each grid point area and the type value of influencing factors are matched as the dependent variable Y and independent variable X of the Geodetector respectively.

4.2 Analysis of Factor Detector

The results of factor detector (Table 1) show that all factors have a significant effect on the spatial distribution of rural tourism characteristic villages. The influence of each factor on the spatial distribution of rural tourism characteristic villages, in descending order, is: Number of road miles (X_5) > Income from tourism (X_{11}) > Number of A-grade scenic spots (X_6) > Agriculture, forestry and water conservancy (X_8) > Air quality (X_3) > Gross domestic product (X_9) > Altitude (X_1) > Per capita net income of urban residents (X_{12}) > The contributions of three strata of industry to the increase of the gross domestic product (X_{10}) > Forest-coverage rate (X_4) > Number of urban resident population (X_7) > River system (X_2).

Table 1: Influencing factors and result of factor detector.

Indicators Dimension	Index Selection	Representative Symbol	q-statistic	P-statistic	Order
Natural Factors	Altitude	X_1	0.135	0.000	7
	River System	X_2	0.017	0.000	12
	Air Quality	X_3	0.175	0.000	5
	Forest-coverage Rate	X_4	0.074	0.000	10
Social Factors	Number of Road Miles	X_5	0.368	0.000	1
	Number of A-grade Scenic Spots	X_6	0.226	0.000	3
	Number of Urban Resident Population	X_7	0.062	0.000	11
	Agriculture, Forestry and Water Conservancy	X_8	0.191	0.000	4
Economic Factors	Gross Domestic Product	X_9	0.151	0.000	6
	The Contributions of Three Strata of Industry to the Increase of the Gross Domestic Product	X_{10}	0.085	0.000	9
	Income from Tourism	X_{11}	0.255	0.000	2
	Per Capita Net Income of Urban Residents	X_{12}	0.128	0.000	8

In general, social factors have the strongest influence on the spatial distribution of rural tourism characteristic villages, followed by economic factors and the weakest natural factors. Specifically, the most influential of the natural factors is air quality (X_3), which is the most direct representation of the good or bad ecological environment of the region, and a good ecological environment is one of the recommended conditions for rural tourism characteristic villages in Henan Province. The most influential of the social factors is the number of road miles (X_5). The traffic road network is the channel and bridge connecting rural tourism characteristic villages and the source of tourists, and the accessibility of the road network determines how convenient it is for tourists to travel to rural tourism characteristic villages. Good traffic conditions not only enhance the tourist experience of tourists, but also prolong their stay in rural tourism characteristic villages, especially in the early stage of rural tourism development, which will directly affect their choice of tourist destinations. The most influential of the economic factors is income from tourism (X_{11}), which can reflect the development level of the regional tourism industry as a whole. As an important part of the regional tourism industry, the higher the level of tourism development, the better the tourism service system and the stronger the tourism attractiveness, thus providing good support conditions for the development of rural tourism. In addition, number of A-grade scenic spots (X_6) and agriculture, forestry and water conservancy (X_8) also have a significant influence on the spatial distribution. The development and

improvement of A-grade scenic spots can bring a large number of visitors to the surrounding villages, while the surrounding villagers can rely on the market advantages brought by A-grade scenic spots to develop a variety of rural tourism products, thus driving the development of rural tourism. The more expenditure on agricultural, forestry and water conservancy, the better the catering and accommodation environment, medical and health assistance, and aspects of infrastructure development at rural tourism sites, which is conducive to the overall efficiency of rural tourism.

4.3 Analysis of Interaction Detector

Using Origin to draw a heat map to reflect the magnitude of the influence of each factor on the spatial distribution of rural tourism characteristic villages at linear and equal intervals on the map (Figure 5). The results show that the influence of the interaction of different factors on the rural tourism characteristic villages is greater than that of the interaction alone, except for the interaction of altitude (X_1) and the number of A-grade scenic spots (X_6), air quality (X_3) and the number of road miles (X_5) and the number of road miles (X_5) and the per capita net income of urban residents (X_{12}), which show Bi-variable enhance, the other interactions show Nonlinear-enhance. This indicates that the interaction of any two factors in the 12 factors has a more significant influence on the spatial pattern of rural tourism characteristic villages. That is to say, the spatial distribution of rural tourism characteristic villages is affected by different factors in different dimensions.

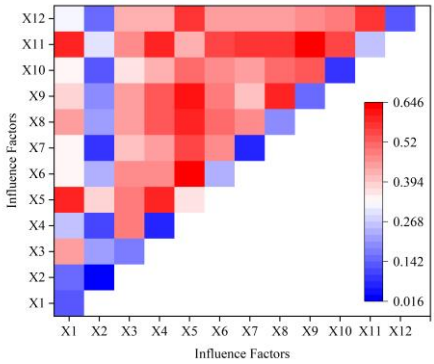

Figure 5: Result of interaction detector.

Specifically, the interaction between gross domestic product (X_9) and income from tourism (X_{11}) has the strongest influence on the spatial distribution of rural tourism characteristic villages, with the highest q-statistic of 0.645, significantly higher than the sum of the q-statistic of gross domestic product (X_9) and income from tourism (X_{11}). Among the interactions with q-statistic greater than 0.5, the number of road miles (X_5) is the most frequent, further demonstrating the importance of accessibility to the spatial distribution of rural tourism characteristic villages.

4.4 Analysis of Ecological Detector

Ecological detector is used to compare whether there is a significant difference in the impact of the two factors on the spatial distribution of rural tourism characteristic villages. The results show (Table 2) that the influence of river system (X_2), the number of road miles (X_5), the number of A-grade scenic spots (X_6) and income from tourism (X_{11}) are significantly different from the other factors. The number of road miles (X_5), the number of A-grade scenic spots (X_6) and income from tourism (X_{11}) are significantly more influential than the other factors, and the influence of river system (X_2) is significantly lower than the influence of the other factors.

Altitude (X_1) compared with gross domestic product (X_9) and per capita net income of urban residents (X_{12}), air quality (X_3) compared with agriculture, forestry and water conservancy (X_8) and

gross domestic product (X_9), forest-coverage rate (X_4) compared with the number of urban resident population (X_7) and the contributions of three strata of industry to the increase of the gross domestic product (X_{10}), the number of urban resident population (X_7) compared to the increase of the gross domestic product (X_{10}), and gross domestic product (X_9) compared to the per capita net income of urban residents (X_{12}) on the spatial distribution of rural tourism characteristic villages is not significantly different.

Table 2: Result of risk area detector.

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
X_1												
X_2	Y											
X_3	Y	Y										
X_4	Y	Y	Y									
X_5	Y	Y	Y	Y								
X_6	Y	Y	Y	Y	Y							
X_7	Y	Y	Y	N	Y	Y						
X_8	Y	Y	N	Y	Y	Y	Y					
X_9	N	Y	N	Y	Y	Y	Y	Y				
X_{10}	Y	Y	Y	N	Y	Y	N	Y	Y			
X_{11}	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
X_{12}	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	

5. Discussions and Conclusions

This paper takes 585 rural tourism characteristic villages in Henan Province as the research object, and uses global autocorrelation index, average nearest neighbor index, kernel density analysis and Geodetector to study the spatial layout and influencing factors of rural tourism characteristic villages. The main findings are as follows:

(1) The global autocorrelation index value is 0.224. The average nearest neighbor index is 0.636, and the coefficient of variation CV value is 241.5%. These indicate that rural tourism characteristic villages in Henan Province show positive spatial correlation and clustering distribution characteristics. From the spatial distribution pattern, the spatial distribution of rural tourism characteristic villages in Henan Province presents a ' multi-core point-like ' agglomeration distribution structure, forming three high-density agglomeration areas in northern, central and southern Henan. The whole shows the distribution characteristics of near mountains, around cities and along roads.

(2) The results of factor detector show that the spatial distribution of rural tourism characteristic villages is the result of several factors, among which social factors are the most influential, followed by economic and natural factors. The maximum q-statistic is the number of road miles (X_5) and the smallest for the river system (X_2). Air quality (X_3), the number of road miles (X_5) and income from tourism (X_{11}) are the most influential of the natural, social and economic factors respectively.

(3) The results of interaction detector show that the interaction of different factors showed Bi-variable enhance or Nonlinear-enhance, and the Nonlinear-enhance is mostly, indicating that the spatial distribution pattern of rural tourism characteristic villages in Henan Province is formed by the interaction of several factors. Among them, the strongest interaction is between gross domestic product (X_9) and income from tourism (X_{11}), with q-statistic of 0.645. Among all the interactions, the q-statistic of the interaction with road miles (X_5) is larger, which further indicates that the development of transportation has an important role in promoting rural tourism.

(4) The results of ecological detector show that the influence of river system (X_2), road miles (X_5), number of A-grade scenic spots (X_6) and income from tourism (X_{11}) are significantly different from the other factors.

Due to the availability of data, the selection of potential influencing factors is only explored for

some factors in three dimensions: natural, social and economic, but not for climate and policy, which need to be improved and updated in future studies.

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