

Study on spatial form evolution of Scenic Spots and Tourists ' Perception under the transformation of Traffic network— A Case Study of Shaoshan Scenic Spot

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Abstract—In recent years, the rapid development of high-speed railway and railway network have largely affected the spatial pattern of tourism, thus affecting the distribution of tourism flows. Taking Shaoshan Scenic Area as an example, this paper uses space syntax to analyze the evolution of traffic location under the background of the change of traffic network structure in Hunan Province, and uses questionnaire survey to analyze the change of tourists' perceived distance. Research shows that the traffic accessibility of Shaoshan Scenic Area, which belongs to Xiangtan City, has been significantly improved after the opening of high-speed rail, indicating that it has better traffic location conditions. In addition, there is little difference between tourists' time distance perception and actual distance perception of the route ' Changsha-Xiangtan ', and the scores of the two distance perceptions of the route are more than four points, indicating that there is no obvious difference in time perception and space perception between the two destinations. And this paper puts forward relevant suggestions for the development of tourism in Shaoshan Scenic Spot.

Keywords— *Shaoshan scenic spot; traffic location; tourist perception distance*

I. INTRODUCTION

¹High-speed railway is a technological revolution in the transportation industry and an important ' engine ' to promote tourism development. In recent years, with the gradual formation of high-speed railway network, China has entered the era of high-speed railway. The spatial-temporal compression effect of high-speed railway has a significant impact on the pattern of regional traffic accessibility[1、2].With the ' space-time compression ' process brought by high-speed rail, the spatial distance of tourists increases gradually, that is, the radius of tourists will gradually increase [3、 4].The urban location advantages of each scenic spot will also change accordingly under the influence of the change of high-speed railway network structure. The rapid development of high-speed railway has ' siphon effect ', ' diffusion effect ' and ' corridor effect ' on different tourist destinations, which further affects the change of tourists ' perception distance of scenic spots. In the face of the background of the rapid development of high-speed rail, tourist attractions need to seize the opportunities brought by

high-speed rail combined with their own advantages, and actively take countermeasures from the aspects of transportation, tourism service facilities and cooperation, strengthen publicity, improve visibility and promote the overall development of the tourism industry.

Traffic plays an important guiding role in tourism flow. As a new geographical element in China in recent years, high-speed railway has a significant impact on tourism. And many studies focus on the impact of high-speed railway on the spatial structure of tourism flow, tourism spatial structure, tourism accessibility and tourism destination choice. Taking Huangshan City as a case site, Li Lei et al. studied the evolution process of tourism spatial structure of typical tourist cities in the era of high-speed railway networking through observations, surveys and predictions at four time points: before the opening of the high-speed railway, just after the opening, two years of operation and the formation of the high-speed railway network, combined with survey questionnaires and route data from online tourism websites [5].Wang et al. used GIS spatial analysis method to measure the impact of high-speed railway on the accessibility of tourism transportation in Northeast cities, and then analyzed the characteristics and changes of tourism market in Northeast cities under the network of high-speed rail[6].Using Arc GIS software, Li Baochao et al. explored the impact of high speed rail on tourism accessibility and regional tourism linkages within the region from two research perspectives: tourism destinations and sources[7].Wang Degen et al. obtained the main factors influencing the choice of tourist destinations through factor analysis and dimensionality reduction, including four indicators such as travel time, tourism resource endowment of tourist places, transportation accessibility of tourist places, and service facility system of tourist places; thus, they constructed a tourism demand-supply gravitational model to measure the degree of influence of the main factors on tourists' choice of travel destinations under the conditions of high speed rail The model was then constructed to measure the degree of influence of major factors on tourists' choice of travel destinations under high-speed rail conditions [8].

Taking Shaoshan scenic area as an example, this paper uses space syntax to analyze the evolution of Shaoshan scenic area location under the background of the change of traffic network structure in Hunan Province, and uses questionnaire survey method to analyze the change of tourists ' perceived distance.

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II. RESEARCH METHODS

The research methods used in this paper include the space syntax method, GIS integration and questionnaire survey. The space syntax is a set of theoretical tools for the in-depth quantitative description of spatial morphology. The results of existing studies prove that the integration values in the spatial syntax morphological variables can predict the spatial distribution of pedestrian flows, perhaps not as accurately as by gravity models, but the spatial syntax is very simple and easy to use, and is suitable for analysing not only road traffic, but also railways and other railways. Space syntax and ArcGIS are used to analyze the structural characteristics of the high-speed railway network in Hunan Province and the evolution of the traffic location of Xiangtan City where Shaoshan Scenic Spot is located. A simple random sampling method was used to carry out a questionnaire survey on famous scenic spots. The demographic characteristics, general behavior characteristics, traffic preferences, travel motivation and consumer behavior characteristics of tourists were investigated to analyze the change of tourists' perceived distance in Shaoshan scenic spot.

On the basis of relational graph, space syntax develops a series of morphological variables based on topological calculation, such as Connectivity Value, Control Value, Depth Value, Average Depth Value and Relative asymmetry. Connectivity value refers to the number of other spaces intersected with a certain space, or the number of other nodes adjacent to a certain node. In this paper, the total number of nodes directly connected to the i space station is used to replace the total number of nodes directly connected to the i space station to correct the connection value. Control value represents the degree of control a space has over the spaces intersecting that space. Depth value specifies the distance between two nodes as one step, and the shortest distance (i.e. the minimum number of steps) from one node to another is the depth value between these two nodes. Average Depth Value is the average value of the shortest path (i.e. the minimum number of steps) from a node to all other nodes in the system. Relative asymmetry, Since the size of the average depth value is largely determined by the number of nodes in the system. In order to remove the interference of the number of elements in the system, P. Steadman improved the calculation method by normalising it with the asymmetry value. The reachability indicator, which takes the inverse of RA, is called integration value and is the most widely utilised morphological variable in the process of space syntactic analysis.

III. OVERVIEW OF THE STUDY AREA

Shaoshan is located at the junction of Xiangxiang, Ningxiang and Xiangtan, 40 kilometres from Xiangtan and 120 kilometres from Changsha, with a population of 100,000, and is now part of Xiangtan City. Shaoshan Scenic Area, a national AAAAA level tourist attraction, its main attractions include Mao Zedong's former Residence, Copper statue of Mao Zedong, Mao Zedong Memorial Hall, Mao Zedong relic Museum and other humanistic landscapes, as well as natural landscapes such as Shaoshan Dripping Water Cave, Wulongshan Dajie Temple and Fairy Hill, which are national key scenic spots, national key cultural relics protection units It

is also a national famous revolutionary memorial site, a national red tourism classic scenic spot, and a national patriotic education base.

According to the questionnaire survey, among the 130 people who chose the travel route "Changsha City-Xiangtan City", the number of people who chose Mao Zedong's former Residence as a tourist attraction was 64; the number of people who chose the Pan Long Grand View Garden as a tourist attraction was 34; the number of people who chose Peng Dehuai's former Residence as a tourist attraction was 1; the number of people who chose Qi Baishi's former Residence as a tourist attraction was 9; the number of people who chose other options was 13. The number of people who chose Peng Dehuai's residence as a tourist attraction was 1; the number of people who chose Qi Baishi's residence as a tourist attraction was 9; the number of other choices was 13, of which Shaoshan Scenic Area is a national 5A-level scenic spot; Xiangtan Pan Long Grand View Park and Peng Dehuai Memorial Hall are both national 4A-level scenic spots. It can be found that 5A and 4A scenic spots or attractions are the main tourist destinations for tourists traveling in Xiangtan City, among which the number of tourists who choose Shaoshan Scenic Area as their tourist destination is close to half of the total number.

Shaoshan Station and Shaoshan South Station, high-speed railway stations, are located in Xiangtan City, so this paper analyzes the network structure characteristics by city area. Through the website, the railroad lines through Hunan Province include Beijing-Guangzhou High-Speed Railway, Shanghai-Kunming high-speed railway, Hengyang-Liuzhou Railway, Beijing-Guangzhou railway, Shimen-Changsha Railway, Shanghai-Kunming railway, Luoyang-Zhanjiang Railway, Jiaozuo-Liuzhou Railway, Chongqing-Huaihua Railway, etc., as well as the main stations included in each city and state, the frequency information of each city and state with its neighboring cities and states, the type of railroad, and the shortest time of each railroad type. The HSR stations in Xiangtan include Xiangtan North Station, Xiangtan Station, Shaoshan South Station, Shaoshan Station, and Xiangxiang.

IV. USING THE ANALYSIS OF TRAFFIC LOCATION EVOLUTION IN SHAOSHAN SCENIC AREA

A. Accessibility evaluation of Xiangtan before and after the opening of high-speed railway

In this paper, Average Depth Value of each city node is calculated by space syntax, and then the accessibility index value of Xiangtan City is calculated. The accessibility indexes before and after the opening of high-speed rail in Xiangtan City are 0.136, 0.381 respectively.

B. Accuracy verification of spatial characteristics of high-speed rail network

1) Prediction of the total number of tourists. The above space syntax has been used to modify the accessibility model of railway network in Hunan Province, and the accessibility value of each city's station is calculated. Then, the accuracy of the modified model is verified by the correlation between the corrected accessibility value after the opening of high-

speed rail and the railway passenger volume and the total number of tourists (the statistical data of railway passenger volume and the total number of tourists come from the statistical yearbook of Hunan Province or the statistical bulletin of each city and state) to study the impact of the railway network between cities on urban population flow. The study collects and analyzes the relevant data of various cities in Hunan Province. Due to the research needs, this paper only lists the relevant data analysis results of Xiangtan City. Xiangtan railway passenger volume in 2016 was 20.3 million. The total number of tourists received in Xiangtan from 2009 to 2015 is shown in table I.

TABLE I. TOTAL NUMBER OF TOURISTS (TEN THOUSAND) IN XIANGTAN CITY FROM 2009 TO 2015)

cities and states	2009	2010	2011	2012	2013	2014	2015
Xiangtan	1244.35	1634.65	1837	2230.96	2650.11	3089.71	3787

The exponential smoothing method is a common method in the time series analysis forecasting method, and this paper mainly uses the forecasting module of SPSS software to forecast the total number of tourists received in 2015 without the influence of traffic factors before the opening of the Shanghai-Kunming high-speed railway, using the actual value of the total number of tourists received in each city and state from 2011 to 2014 as the base data. By comparing the predicted value of the total number of received tourism in Xiangtan in 2015 and the actual value of the total number of received tourism in 2015, that is, the change of the total number of received tourism due to the traffic factor only can be obtained, as shown in Table II.

TABLE II. FORECAST AND ACTUAL NUMBER OF TOURIST RECEPTIONS (TEN THOUSAND)

cities and states	Prediction value of total number of tourists in 2015	Actual value of total number of tourists in 2015	Changes in Total Number of Reception Tourism Caused by Traffic Factors
copy	3529.31	3787	257.69

2) Correlation analysis between accessibility correction value and railway passenger volume. Considering the specificity of Changsha, Zhuzhou and Xiangtan cities among cities in Hunan Province and the validity and reliability of the study, Changsha, Zhuzhou and Xiangtan cities will be taken as a whole in the correlation analysis here. Then, SPSS was used to calculate the correlation coefficient between the corrected accessibility value and railroad passenger volume after the opening of high-speed railway, and the Pearson correlation coefficient was 0.091, indicating that the corrected accessibility value and railroad passenger volume were significantly correlated at 0.01 level (two-sided). This means that the corrected accessibility values of the spatial syntax and the railway passenger volume are correlated, which means

that the corrected accessibility is related to the passenger volume due to traffic conditions, indicating that spatial relations can influence people's spatial behavior.

3) Correlation analysis between the accessibility correction value before and after the opening of high-speed railway and the total number of tourists. SPSS was used to calculate the correlation coefficients between the corrected accessibility values and the total number of tourists received before the opening of the high-speed rail. The correlation coefficient between the corrected accessibility value before the opening of high-speed rail and the total number of tourists received was 0.979. The corrected accessibility value before the opening of high-speed rail and the total number of tourists received due to traffic factors were significantly correlated at the level of 0.01 (two-sided), that is, the corrected accessibility value of spatial syntax and the total number of tourists received were correlated, and the corrected accessibility value could reflect the accessibility of each city to the outside world. The corrected accessibility values reflect the accessibility of each city to the outside world. The correlation coefficient between the corrected accessibility value and the total number of tourists received after the opening of high-speed railway is 0.848, and the corrected accessibility value and the total number of tourists received due to traffic factors after the opening of high-speed railway are significantly correlated at the level of 0.01 (two-sided), which means that the corrected accessibility is related to the tourist flow due to traffic conditions, which means that the spatial layout of the traffic network can influence people's spatial behavior, and thus also affects tourists' destination choice behavior.

C. Analysis of high-speed rail effect and traffic location evolution in Xiangtan City

This paper can reflect the accessibility of each city ' s transportation network by the revised accessibility value. By comparing the accessibility ranking of Xiangtan City before and after the opening of high-speed railway, as well as the changes in the total number of tourists before and after the opening of high-speed railway, this paper explores the high-speed railway effect and the evolution of traffic location in Xiangtan City. The changes in the total number of tourists and accessibility in Xiangtan City before and after the opening of high-speed rail are shown in Table 3.

TABLE III. CHANGES IN THE TOTAL NUMBER OF TOURISTS AND ACCESSIBILITY BEFORE AND AFTER THE OPENING OF HIGH-SPEED RAIL IN XIANGTAN CITY

cities and states	total number of visitors (ten thousand) received in 2009	Ranking in Hunan Province	total number of visitors (ten thousand) received in 2015	Ranking in Hunan Province
Xiangtan	1244.35	4	3787	6
cities and states	accessibility in 2009	Ranking in Hunan Province	accessibility in 2015	Ranking in Hunan Province

cities and states	total number of visitors(ten thousand) received in 2009	Ranking in Hunan Province	total number of visitors(ten thousand) received in 2015	Ranking in Hunan Province
Xiangtan	0.136	3	0.381	2

Firstly, from the perspective of space-time compression degree of high-speed railway, Changsha and Xiangtan are cities along the Shanghai-Kunming high-speed railway, and the compression is obvious. The diffusion effect of high-speed railway strengthens the relationship between Changsha, the regional core tourist destination, and the marginal tourist destination. Secondly, it can be found that the accessibility ranking of Xiangtan City has risen after the opening of high-speed railway. Considering the interaction of cities along the Shanghai-Kunming high-speed railway, it can be found that the node of Changsha City is the passenger flow to Xiangtan City, that is, there is a diffusion effect from Changsha to Xiangtan City. In addition, the accessibility ranking of Xiangtan City has increased, and it has a better traffic location, so Shaoshan Scenic Area has a better traffic location after the opening of high-speed railway.

V. DIFFERENCE ANALYSIS OF TOURISTS' PERCEPTION DISTANCE IN SHAOSHAN SCENIC SPOT

The above paper compared the changes of different destination morphological variables values as well as the changes of passenger volume and total number of tourist receptions before and after the opening of high-speed rail based on the spatial syntax correction model, and specifically analyzed the type of high-speed rail effect and the evolution of location in Xiangtan. Based on this, the questionnaire survey is launched next and SPSS mathematical analysis software is used to do the basic analysis of the questionnaire data and to analyze the changes of tourists' perceived distance before and after the opening of the high-speed railway.

A. Statistical characteristics of questionnaire data

The interviewees are mainly tourists who live in Changsha or transfer in Changsha and intend to travel to Xiangtan, Loudi, Shaoyang and Huaihua cities for tourism activities. Therefore, Changsha was chosen as the research city and Changsha South Station was chosen as the research site. The research time was chosen for a 3-day long holiday, and the May Day 2018 long holiday was chosen for April 29th-May 1st. A total of 700 copies, of which 506 are valid questionnaires, with a valid recovery rate of 72%. Among the 506 questionnaires, 47.20% were men and 52.8% were women; 51% were under the age of 36, 49% were 36 and above; 63.87% were educated in college and below, 36.13% were bachelor and above; 50.73% were working in enterprises and institutions, 49.27% were freelance, etc.; the monthly income was below RMB 4,000 49.09%, 4,000 yuan and above accounted for 50.91%; residence in Hunan

Province accounted for 63.63%, other areas accounted for 36.37%; tourists travel purpose accounted for 16.06% of business meetings, 39.09% of sightseeing tours, 13.03% of vacation and recuperation, 19.7% of visiting friends and relatives, 12.12% of other purposes.

B. Comparative Analysis of Time Distance Perception and Actual Distance Perception of High Speed Railway

This paper takes Xiangtan City, a city along the Shanghai-Kunshan high-speed railway in Hunan Province, as an example, and compares tourists' distance perceptions of the same travel path, namely "Changsha City - Xiangtan City". A 5-point Likert scale was used to quantify the tourists' perception of the time distance and the actual distance of the four travel paths, which were classified into five levels from "very far" to "very close". Table 4 shows the following.

TABLE IV. LIKERT 5 SCALE

cities and states	1	2	3	4	5
distance perception	Very far	far	general	close	very close

1) High-speed rail time perception distance. From the survey results, we can learn that the time taken from Changsha to Xiangtan by high-speed rail is about 14 minutes, which tourists think is a very close time distance with a statistical score of 4.52. Overall, the statistical score is above 3.5, and tourists think it does not take too long to travel from Changsha City to Xiangtan City by high-speed railway.

2) Real distance perception of high-speed railway. The actual distance from Changsha High Speed Railway Station to Xiangtan High Speed Railway Station is about 23.8 km; as the actual distance gets farther, visitors' perception of the actual distance scores lower and lower. The actual distance from Changsha to Xiangtan is perceived by tourists as close, with a score of more than 4. It is in the category of close, and tourists perceive the distance between the two cities as far.

3) Comparative analysis of distance perception. In order to clearly compare the differences between tourists' perceptions of temporal distance and actual distance for the same travel path, the statistical scores of both are analyzed together in this paper. The difference between the time distance perception and the actual distance perception of the route "Changsha - Xiangtan" is not significant, and both distance perception scores of the route are over four, indicating that the difference between the time perception and the spatial perception of these two tourist destinations is not significant. Although spatial distance as an objective existence with natural geographical properties does not change due to high-speed rail connection, the connection of high-speed rail does affect the perception of tourists' temporal distance, which in turn leads to a shortening of psychological distance. It is because of the "distance reduction" feature among cities along high-

speed rail lines that the accessibility, openness and nodality of small and medium-sized cities along high-speed rail lines are highlighted, and the development potential of large cities to small and medium-sized cities along the lines is driven by the diffusion effect of high-speed railway.

V. CONCLUSIONS AND SUGGESTIONS

A. Conclusions

Firstly, this paper analyzes the change of traffic network pattern in Hunan Province, and introduces the train and time information in railway traffic into the spatial syntactic morphological variable value. By modifying a series of morphological variables such as Connectivity Value, Control Value, Depth Value, Average Depth Value and Relative asymmetry in the spatial syntactic model, the accessibility of each station of high-speed railway network in Hunan Province is quantitatively discussed. It is found that the traffic accessibility of Shaoshan Scenic Area, which belongs to Xiangtan City, has been significantly improved after the opening of high-speed rail, indicating that it has better traffic location conditions. In addition, there is little difference between tourists' time distance perception and actual distance perception of the route ' Changsha-Xiangtan ', and the scores of the two distance perceptions of the route are more than four points, indicating that there is no obvious difference in time perception and space perception between the two destinations.

B. Recommendations

1) Correctly treat the effect of high-speed rail and give full play to its advantages to find countermeasures for the development of inter-city joint tourism. From the above analysis, it can be seen that Xiangtan City is a city along the Shanghai-Kunming high-speed railway, which is affected by the diffusion effect of the high-speed railway and is a direct beneficiary city of the opening and operation of the high-speed railway. The diffusion path of tourism flow is Changsha City - Xiangtan City, and among the tourist scenic spots in each city, Shaoshan Scenic Area in Xiangtan City and Shaoyang City's Used Mountain Scenic Area are 5A grade scenic spots, respectively. It is an important scenic spot to attract tourists for tourism activities. Therefore, the 5A scenic spots in the cities along the high-speed railway can be used as the basis to link the tourism resources of the cities along the route and drive the development of 4A scenic spots such as Pan Long Grand View Garden, Peng Dehuai Memorial Hall, Qi Baishi's former residence, Meishan Dragon Palace, Zi Magjie Terraces, Zeng Guofan's former residence, Qian Yang Ancient City and Hong Jiang Ancient City, forming a special tourism with interconnection between several scenic spots and several cities to improve the tourism revenue of Hunan Province. In addition, cities along the high-speed railroad should likewise improve the tourism attractiveness of this city, for example, Xiangtan City should focus on building a red tourism brand with Shaoshan as the core. According to the local conditions, a series of tourism development measures and related policies should be taken from the actual situation to enhance the

overall taste of the city and highlight the theme of urban tourism.

2) Increased publicity of high-A scenic spot to enhance its attraction. The popularity of scenic spots or attractions in tourism destinations is an important factor in attracting traffic, and tourists are more inclined to choose high A-grade scenic spots for touring activities. Therefore, Shaoshan Scenic Area in Xiangtan City should focus on enhancing the attractiveness of the tourist destination and strengthening tourism promotion. According to the questionnaire analysis found that young and middle-aged tourists, tourists with higher education level and high actual income travel relatively more often, so this kind of tourists should be an important group targeted by publicity and marketing, so in terms of publicity means, should be more inclined to social networks. For example, in recent years by the majority of young and middle-aged friends favorite social software, such as WeChat, microblogging, live software, etc., through these media means to expand the visibility and influence of Hunan Province tourist attractions or attractions, to establish a good image of the tourist destination.

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