Location Selection of Tourism and Leisure Areas Based on GIS

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Abstract: The concept of tourist leisure area is of strategic significance to tourist cities, and directly related to the development of urban tourism economy. This study takes Taishan District of Tai'an City as an example, using ArcGIS analysis method (superposition analysis, buffer analysis), referring to the relevant tourism data of Tai'an City, to analyze the road accessibility and its impact scope of the important scenic spots in the region. Thus, a suitable area can be developed or transformed into a tourist leisure area with the highest accessibility for tourists to travel to various scenic spots. Comprehensive analysis of the importance of each participating area in the local area according to the development of the scenic spot, selected the intersection of Tianzhufeng Road and Dongyue Street as the location of the tourist area of Taishan District. The site selection can not only expand the influence of the Flowering Scenic Spot and the Tai'an Underground Rift Valley Scenic Spot in Tai'an Tourism, but also promote the economic development in the eastern part of Mount Taishan. The research results can provide a reference for the future location, construction and development of Tai'an Tourism and Leisure Zone, and promote the development of local tourism.

1. Introduction

Tai'an City is located at the foot of Mount Tai. It is built in accordance with the mountains and integrates the mountain cities. As a well-known city based on Mount Tai tourism and Confucius and Mencius culture, the development of tourism is an important driving force for Tai'an's economic and social development. According to the statistics of Tai'an Tourism and Culture Bureau in 2018, there were 75.8943 million tourists both at home and abroad in Tai'an City, and the total amount of tourism consumption was 84.767 billion yuan. In the “Four-year Plan of Action for the Reform and Development of Tourism Industry in Tai'an City (2017-2020), issued by the local government, the plan of”one place, one district and one center”is pointed out, which shows the importance of tourism in Tai'an's economic development. Compared with Tai'an, which has similar natural tourism resources, Tai'an is rich in tourism resources but not fully and reasonably exploited. It is at a disadvantage in the rapid development of tourism in China. The existing problems of Tai'an's tourism industry are not only manifested in the singleness of tourism resources propaganda and tourism routes, but also in the lack of a sound and perfect tourism service system in food, housing, transportation, travel, shopping and entertainment related to the tourism industry [1]. This not only restricts the growth of local residents' income, but also limits the overall economic and social development of Tai'an City. In 2013, the State Council issued the “Outline of National Tourism and Leisure Zones (2013-2020)” to promote the development of the tourism and leisure industry. The National Tourism and Recreation Area is between the natural protection zone and the urban development zone. It aims to release the daily leisure needs of the near and middle journeys. The leisure industry is the core, and the tourism and leisure services for the public are the main contents. A composite development area that combines the characteristics of the main functional area of the country and the special functional area of the industrial economy [2]. At the end of 2017, the Chaohu Lake National Tourism and Leisure Zone was completed and became the country's first national tourism and leisure area. The development of Tai'an City in this direction can not only balance the development and protection of Taishan's natural and human resources, but also guide the development of tourism and leisure elements and the development of tourism industry, which

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can become a new direction for the development of tourism industry in Tai'an.

In recent years, geographic information system (GIS) has been widely used to solve complex space problems such as accessibility of tourist attractions [3], urban planning [4], surveying and mapping [5]. GIS has long been a technology and tool for organizing and managing spatial data [6]. This paper intends to use the buffer analysis, overlay analysis and accessibility analysis techniques in ArcGIS to integrate the four grades of 4A and above in Flowering Scenic Spot, Taishan Fangte Happy World, Taishan Underground Rift Valley, Tianwai Village and Dai Temple. The distribution of tourist attractions. This paper chooses the suitable location of Taishan tourism leisure area and analyses its traffic accessibility, and then compares its weight in urban tourism industry. It is concluded that the intersection of Tianzhufeng Road and Dongyue Avenue is the focus of tourism industry development in Taishan District, and it can be used as the site selection area of tourism and leisure area in Taian City in the future, so as to improve the comprehensive competitiveness of tourism development in Taian City.

2. Overview of the research area

Tai'an City lies between 116 20'- 117 59', 35 38'- 36 28'. Located in the central part of Tai'an City, Taishan District is the residence of Tai'an Municipal Party Committee and government. It is the political, economic, scientific and technological, cultural and tourism center of the whole city. It is bounded by Daiyue District of Tai'an City on three sides of the east, West and south. In this study, the North-Xintai Expressway, the South-Taishan Expressway, the East-Wenhe Expressway and the West-Jingtai Expressway are selected as the study areas, with a total area of about 260.39 square kilometers.

3. Research method

3.1. Data sources

Download OSM map data of Tai'an City in OpenStreetMap (OSM) and improve the downloaded road data through the bottom map of ArcGIS, China Online Community, and draw the research area according to the bottom map. According to the road conditions in Tai'an city, the roads are divided into main road and sub-main road. Five scenic spots of Taishan Mountain, i.e., Fangte Happy World of Taishan Mountain, underground rift valley of Taishan Mountain, Tianwai Village,Flowering Scenic Spot and Dai Temple, and high-speed railway station are marked out separately (Fig. 1).

Fig.1. Distribution of roads and scenic spots

3.2. Analytical methods

1) Buffer analysis [7], superposition analysis

Buffer is the service radius of geospatial target. According to the attribute of the selected area, setting the radius, the buffer area used in this paper is a new polygon consisting of the scenic area and the outward extension of the main road.

Superposition analysis can connect two or more data levels with mathematical relations, extract the information of the relationship between points and lines and planes in spatial analysis, and analyze the attributes of spatial information implicit in raster data structure [4].

Buffer zone analysis: delimit the location of each scenic spot and station, and express the fantastic time scenic spot, Flowering Scenic Spot, underground rift valley, tianwai village and Dai Temple in Tai'an City with face elements respectively. Use the buffer analysis function of the analysis tool module in ArcGIS to create a buffer layer. Through the data obtained in the Baidu map API and the current status of tourism in Tai'an, the arrival time is estimated, and the appropriate distance is calculated by the time. The driving speed is buffered and analyzed according to the provisions of the Highway Engineering Technical Standard (JTGB01-2003). The maximum buffer radius is set to 5 km, and 5 buffers are generated.

Overlay analysis: Convert the buffer to a shapefile and overlay it with the main traffic lane. This can filter out many invalid buffer areas to facilitate subsequent selection of the location area.

According to the actual situation in Tai'an, the number of residents and shops on both sides of the main road is much higher than that on the sub-main road, so the buffer zone previously obtained will be intersected with the main road (Taiming Road, Dongyue Street, Longtan Road, etc.) to obtain several sections of the area. Then the buffer analysis of line elements is carried out, and a distance of 1 km is set as the buffer radius to get the buffer layer [8]. Finally, the reference area is selected according to the economic situation on the spot. It is suitable for locating around the main road, so the buffer analysis of the linear area is the reference area. Finally, through the network analysis of its traffic accessibility, the final location.

2) Accessibility analysis[9]

This paper uses the analysis of the traffic accessibility of the selected tourist leisure areas to determine the applicability of the location, and ultimately to select the location of the tourist leisure areas.

Reachability analysis: Vectorization processing is carried out according to the road drawn and network data sets are constructed. Prepare the shape file of the area vectorized road, and assign the vectorized road to the basic field attributes needed for network analysis. Finally, the network connectivity is set up, and the resistance value is set by the average travel time to construct the network data set. According to the actual situation of Tai'an City, all roads are allowed to pass in both directions.

Delimitating the service scope of leisure area refers to the scenic area that can be reached at a certain distance or time from the designated area. In this study, passenger travel is conducted as a way of travel for tourists. The travel time of 10~15 min, 15~20 min and 20~25 min is used as the accessibility index from the selected area to the scenic spots. Excellent, good, and generally evaluated. Use ArcGIS to establish a service area analysis layer, set the impedance to 10 min, 15 min, 20 min, 25 min, and generate the regional service range within 4 time indicators [10].

3) Research content and data analysis

In order to obtain more favorable tourism and leisure zones for the development of tourism industry in Taishan District, after analyzing the buffer zones of the overlapped regions, the selected regions and the construction situation of Taian City were selected. The total area of effective buffer zone is 168.6 km_except for government office building area, non-occupied and protected areas (such as basic farmland, Taishan Nature Reserve, etc.), public service areas such as schools and hospitals, etc. (Table 1).

Table 1 Distribution of Effective Buffer Zones in Scenic Spots

Scenic spot	Effective buffer area/km²	Proportion/%
Tianwai Village	26.8	15.9%
Dai Temple	26.8	15.9%
Mount Tai Fante's Happy World	27.6	16.3%
Underground Great Rift Valley in Mount Taishan	43.7	25.9%
Flowering Scenic Spot	43.7	25.9%

The results of the buffer zone show that the distance between Tianzhufeng Road and Dongyue Street is the shortest and has a certain residential and commercial basis. The scenic spots of Flowering Scenic Spot and the scenic spots of Taishan Underground Rift Valley can be completed in one day, so this area can be used as a candidate area. At the intersection of Ronggushi Street and Puzhaoshi Road, Tianwai Village and Dai Temple scenic spot at the entrance of Mount Tai need less time and the surrounding residents are more likely to form a commercial district, so it can also be used as a candidate area. Taishan Fangte Happy World is relatively moderate in the distance between the two regions, there is no obvious advantage, so it is no longer analyzed. It can be seen from Table 1 that the proportion of the Taishan underground rift and the Flowering Scenic Spot is half of the total area, but the annual turnover and passenger flow of the tourist attractions in Tai'an City issued by the Taian Tourism and Culture Bureau in 2018 are known. The influence is far less than the other three scenic spots. The reason is because the Taishan underground rift and Flowering Scenic Spot are located in the eastern part of the Taishan Mountainwith with more woodland villages, with poor economic and construction, and development in tourism-related food, housing, travel, tourism, shopping and entertainment industries. Also very backward. When selecting tourist and recreation areas, the eastern villages should be densely populated, with many residents and development potentials as an important reference for site selection.

Tai'an is built on the mountain. The roads in the urban area are steep. Tourists usually choose to take the bus or taxi to reach the scenic spot when they are not familiar with Taian traffic. They do not consider bicycle-type transportation and walking, so they only analyze the motor vehicles (bus,Accessibility of cars, taxis, etc.). According to the time accessibility analysis of scenic spots in Wuhan highway transportation network as a reference standard [10], combined with the selected area and the status quo of the annual number of tourists in the scenic spots counted by Tai'an Tourism Bureau [11]. Estimate the psychological period value of tourists'arrival time, because in order to express it more objectively, it is expressed by distance (Table 2).

Table 2 Psychological Expected Distance and Actual Distance of Visitors to Scenic Spots

Name of scenic spot	Maximum Expected Distance/km	The shortest distance from the railway station to the place/km	The shortest time from the railway station to the place/min
Tianwai Village	10	3.7	11
Dai Temple	10	2.7	10
Mount Tai Fante's Happy World	10	11	23
Underground Great Rift Valley in Mount Taishan	10	17	33
Flowering Scenic Spot	10	12	28

From Table 2, it can be seen that the minimum time spent to Tianwai Village and Dai Temple

Scenic Spots at the entrance of Mount Tai in the intersection area of Ronggushi Street and Puzhao Temple Road is beneficial to the formation of the business district. However, if visitors only use the area around the intersection of Ronggushi Street and Puzhaoshi Road as a place of rest, catering and entertainment, three scenic spots will exceed the maximum distance expected by tourists. The intersection of Tianzhufeng Road and Dongyue Street is the intersection of three scenic spots. There are more places to use and nearby residents, and there are also commercial buildings based on Wuyue Plaza. It is more suitable as a site for selection (Figure 2).

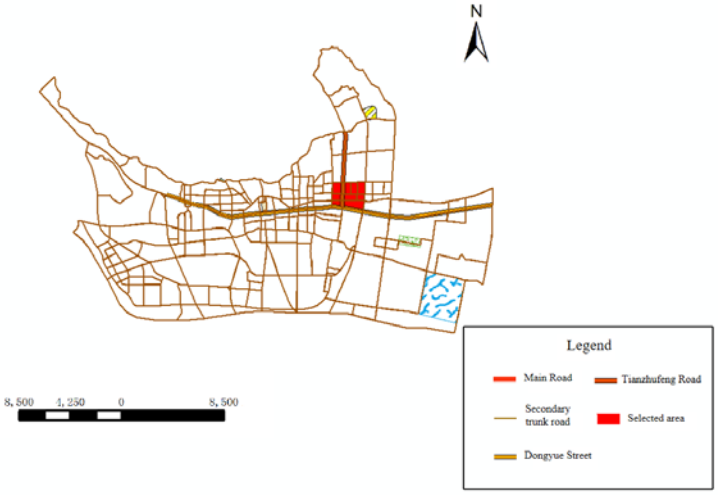

Fig. 2. Location area

The regional accessibility analysis of this area shows that the mode of motor vehicle travel is greatly affected by the urban road grade, and the speed of motor vehicle travel varies greatly under different road grades. According to the classification of road grade in Tai'an city, it can be divided into two grades: main road and sub-main road. The limit speed of road grade is 40-60 km/h and 30-40 km/h, respectively. Therefore, 60, 40 and 30 km/h can be set for research. In the same way, according to the driving speed attribute of the motor vehicle and the road distance, the corresponding resistance value of the road time is calculated and given. According to the statistics of Arcgis, the area and proportion of the service area of the current scenic spot accessibility under different travel time in different modes of travel are obtained [10] (Table 3).

Table 3 Accessibility Evaluation of Service Area

Name of scenic spot	Road Distance/km	Time/min	Accessibility evaluation	Is it within the scope of service?
Tianwai Village	7.4	20	Commonly	No
Dai Temple	5.3	18	Good	Yes
Mount Tai Fante's Happy World	5.3	10	Excellent	Yes
In the Flowering Scenic Spot	5.5	14	Excellent	Yes
Underground Great Rift Valley in Mount Taishan	11	22	Commonly	No

It can be seen from the table that Tianwai Village and the underground rift valley of Mount Tai are not within the service scope of the selected area, but because Tianwai Village is the entrance of Mount Tai. Mount Tai is the pillar of Tai'an tourism industry. Tourists are inclusive of going to the scenic spots, so even if it is not covered by the leisure area, it will not have a great impact. The

Taishan underground rift valley is close to the Flowering Scenic Spot and can be played on the same day. There is a certain linkage, so only one scenic spot is in the service area and the other scenic spot is less affected. It can be concluded that the construction of the tourism and leisure area can not only take into account the passage of the regional attractions in Tai'an, but also provide the resources to support the development of the " Not popular " scenic spot. Finally, it is concluded that the area marked as the tourist and leisure area in the intersection of Tianzhufeng Road and Dongyue Street is the most suitable site for selection.

4. Conclusion and suggestion

4.1. Conclusion

In this paper, the buffer area analysis, overlay analysis and road accessibility analysis are used to select the tourist and leisure areas, and the following conclusions are obtained:

(1) The development of Tai'an City is very different for the tourist traffic in various tourist attractions. The development of the eastern scenic spot in Taishan District is seriously affected by the economic backwardness of the eastern region, which limits the tourists' willingness to visit the eastern scenic spot. (2) Location selection of tourism and leisure areas is an important project, which needs to refer to natural, human, economic and social factors to determine the weight of each region. This paper also has many limitations, but only from an objective point of view and GIS technology to provide suggestions. (3) As the mainstream mode of tourists'choice, there are no more environmentally friendly and convenient ways for tourists to choose.

4.2. Suggestion

(1) With the wide application of GIS and related science and technology, the application of big data processing has been widely used and gradually replaced the traditional decision-making mode. In the location of tourism and leisure areas, the application of GIS has an important reference value for the processing and analysis of geographical data. In Taishan District of Tai'an City, we should integrate natural resources and human resources, coordinate the tourism resources of Taishan District, and rationally select the location based on the principle of comprehensive development. The construction of tourism and leisure area at the intersection of and Dongyue Avenue from the perspective of geographical location plays a role in promoting several important scenic spots in the eastern part of Taishan Mountains and is conducive to the comprehensive development of tourism in Taishan Mountains. (2) During the development of tourism and recreation areas, attention should be paid to the protection of natural resources and ecological environment. In the mode of travel, the purpose of green travel should be achieved by increasing the bus line of the railway station, the high-speed railway station to the leisure area, or placing more parking spots for green vehicles such as shared bicycles, and arranging reasonable riding routes.

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