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Relevance between Tourist Behavior and the Spatial Environment in Huizhou Traditional Villages—A Case Study of Pingshan Village, Yi County, China

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Abstract: In recent years, the tourism industry in traditional villages has been developing rapidly due to the national call to vigorously advocate for and promote traditional culture, but there are plenty of problems and challenges facing the protection and development of traditional villages. The GPS action tracking method was adopted in this study to investigate the trajectory of tourists in typical traditional villages of Huizhou and to screen out different spatial sites with different characteristics based on the kernel density analysis. Thereby, people’s behavior in different spatial sites were analyzed in depth using the method of behavior observation, and ultimately, the relevance between the spatial environment of traditional villages, the characteristics of tourists’ actions, and their staying preferences were discussed, and hence an improvement strategy of spatial optimization was put forward accordingly. The research shows that, in Huizhou traditional villages, different scales and forms of space will affect tourists’ tour paths; the unreasonable distribution of commercial formats leads to the uneven distribution of village vitality; and traditional elements and landscape facilities are more likely to cause tourists to demonstrate a variety of behaviors. These findings provide (1) a basis for further understanding the spatial characteristics of traditional villages in Huizhou; (2) a basis for the spatial optimization of traditional villages; and (3) a new research perspective and feasible technical route for the protection, renewal, and sustainable development of traditional villages in other regions.

Keywords: GPS; kernel density; route characteristics; action characteristics; spatial elements

1. Introduction

1.1. Formation and Value of Chinese Traditional Villages

China is a country with a long history. In ancient China, agriculture was an important part of the national economy [1]. Because people need to establish stable settlements in production and life, many agricultural settlements have appeared in China since ancient times. These settlements formed a unique settlement culture and style [2]. In the process of historical evolution, due to the needs of production methods, cultural inheritance, and political, military, and economic reasons, villages of various ethnic groups have gradually become the most stable social units based on “clustering together” [3]. Over time, a large number of traditional villages have sprung up in China. These villages carry the cultural information of different histories, regions, and nationalities, representing precious material and intangible cultural heritage, and have a very important position in the cultural heritage of humanity [4]. These traditional villages are not only historical relics but also important carriers of the cultural heritage of the local people. They display traditional Chinese culture and folk customs and are also a window for people to learn about and understand traditional Chinese culture. A large amount of cultural heritage, such as historical buildings, cultural relics, and traditional crafts, is preserved in traditional villages. This precious
heritage provides precious materials for the study of human history and culture. Therefore, protecting these traditional villages is not only a work of cultural heritage protection but also an important task in promoting human cultural diversity and the sustainable development of traditional villages [5].

1.2. Historical Development and Preservation Policy

In the context of global urbanization, the increasing gap between urban and rural areas, environmental pollution, the economic recession, and population aging have become global problems that need to be solved urgently [6,7]. The proportion of the global rural population to the total population is estimated to have dropped from 57% in 1990 to 44% in 2020, which indicates the acceleration of global urbanization and the strengthening trend of rural–urban migration. However, in some countries, the population in rural areas is still growing [8]. From the middle of the last century to the present, a series of rural problems have emerged in the United States, France, Japan, and other developed countries [9–12], including a decrease in the rural population, the decline of agricultural production, slow economic development, the imperfection of the social infrastructure, and the destruction of the ecological environment. These problems seriously restrict the sustainable development of rural areas. Since the 1970s, many developed countries have taken the lead in launching the rural revival movement, including Japan’s “Rural Renewal” movement [13], France’s “Renaissance des Villages” movement [14], and Germany’s “Dorfentwicklung” movement [15]. These countries promoted rural economic development and production and living conditions by developing rural industries, improving infrastructure, and increasing employment opportunities.

China carried out large-scale socialist reform and modernization from the 1950s to the 1970s. During this period, the number of Chinese villages decreased dramatically, especially around cities. From the 1980s to the 1990s, China’s economy began to gradually open up, and the country began to implement the policy of reform and opening up. Special rural reform policies were implemented in rural areas, which provided protection to traditional villages with tourism potential [16]. As a special form of villages, traditional villages have attracted widespread attention from society due to their long history, profound cultural heritage, unique architectural style, and beautiful ecological environment. At the beginning of the 21st century, the Chinese government began to implement the policy of “protecting traditional villages” and established a four-level protection system consisting of the state, province, city, district, and county to protect and rebuild traditional villages [17]. Since 2012, the Ministry of Housing and Urban–Rural Development of China has carried out surveys of traditional villages in conjunction with multiple departments [18]. By the end of 2022, a total of 8171 villages with important value have been included in the “Chinese Traditional Village List” in 6 batches [19], and each traditional village included in the list can receive a financial subsidy of CNY 3 million, which is used to restore some dilapidated traditional houses and historical sites. This work has strongly promoted the protection and development of traditional villages, making Chinese traditional villages the largest cultural heritage protection group in the world so far [20].

1.3. Sustainable Development of Traditional Villages

The sustainable development of traditional villages in modern society is facing many problems, including population aging, loss of the young and middle-aged labor force, ecological environment damage, and architectural decay. In order to realize the sustainable development of traditional villages, all walks of life mainly adopt the following methods.

1. Protection of cultural heritage: The cultural heritage of a traditional village is the source of its uniqueness and attractiveness, and its protection is a prerequisite for sustainable development, including the heritage of architecture, style, customs, etc. [21].
2. Inheriting traditional culture: The traditional culture of traditional villages is the foundation of their vitality and development. Traditional culture can be inherited and developed by holding traditional cultural festivals and carrying out traditional handicraft activities [22,23].
3.
Promoting agricultural development: Agriculture in traditional villages has certain advantages and characteristics, can develop characteristic agriculture suitable for the local environment and conditions, and can improve the efficiency and quality of agricultural production [24].

(4) Tourism development: Traditional villages have unique customs and cultural traditions, which have greatly attracted tourists. While developing the tourism industry, it is necessary to protect the environment and avoid damage to the original traditional features caused by over-development [4,25,26].

(5) Construction of infrastructure: traditional villages need appropriate infrastructure support, such as water, electricity, roads, and other infrastructure. This helps to improve the quality of life of residents and attract foreign investment [27].

The combination of traditional villages and tourism is considered to be a relatively effective global development model. This model directly brings economic income, promotes local economic development, creates more employment opportunities, and can provide more social resources for residents [28]. At the same time, tourism can also promote the inheritance and protection of local culture, meaning that traditional culture can be better inherited and developed. In addition, tourism can also improve the cultural self-confidence and sense of belonging of residents, and indirectly reduce the loss of the young and middle-aged population.

1.4. Research on Traditional Village Tourism

With the rapid development of the social economy and tourism industry, more and more traditional villages have carried out large-scale tourism development, relying on their favorable conditions, fully displaying their natural and cultural characteristics, and tapping into their potential cultural and economic value [29,30]. Scholars around the world have carried out various studies on traditional village tourism.

In terms of the impact of tourism activities on traditional villages, Titin examined seven village cases in the Borobudur area, through interviews and field investigations, and found that the impact of uncontrolled tourism development on village landscape elements can be divided into five types: addition, continuation, customization, transformation, and repair [31]. Hassan evaluated the impact of rural tourism development in the Al-Ahsa area on the overall satisfaction of residents and found that the social, economic, and environmental impacts of tourism development were significantly positively correlated with the overall satisfaction of residents [32]. Based on field research, interviews, and questionnaire surveys in traditional villages in Huizhou, Chen Xiaohua et al. found that tourism development had positive and negative impacts on the income of residents, architectural style, public space, industrial land, and human settlements in traditional villages, and put forward guiding suggestions such as subsidizing agricultural production, increasing capital investment in environmental protection and sanitation, and strengthening the excavation and protection of traditional culture [33]. Song Heyou argued that in the process of implementing tourism protection, traditional villages face multiple risks such as the threatening of villagers’ sovereign status, the hollowing out of villages, the homogenization of the environment, and the alienation of village culture [34]. From a social and cultural perspective, Pizam concluded that tourism contributes to changes in value systems, individual behavior, family relationships, collective lifestyles, moral behavior, creative expression, traditional rituals, and community organization [35].

In terms of tourism geography and spatial structure, Randelli took the rural areas of Tuscany as an example. The transition from rural areas to tourism development is caused by the weakness of the existing rural structures and the large number of vacant buildings left behind. Construction has had a major impact on tourism development [36]. Ramaano explored the potential role of GIS in inclusive and sustainable rural tourism, community-based natural resource management (CBNRM), and community development in southern Africa, throughout Africa, and in many other rural areas of the world [37]. Juan analyzed the spatial distribution characteristics of 323 traditional villages using the quantitative geography method in geographic information systems (GIS) and concluded that
the natural environment, social economy, and historical culture are important conditions for the sustainable development of traditional villages and affect the spatial distribution of villages [38].

In terms of the sustainable development of traditional village tourism, López-Sanz conducted a survey of tourists in sparsely populated villages in Spain, collected a large number of questionnaires, and concluded that the future of many depopulated villages depends on whether they can successfully market their beautiful scenery and cultural heritage [39]. Tarawneh believes that the diversification strategy of scenic spots and sustainable tourism planning methods are of great significance to protecting the archaeological site of Petra and realizing the sustainable development of local tourism [40].

In terms of tourist perception and behavior, Xiaoting took Anji County as an example to understand the role of rural tourism destination performance in influencing destination image and predicting satisfaction and loyalty, and concluded that the high-order structure of rural tourism performance has a significant positive impact on the response structure [41]. López-Sanz collected 1658 questionnaires in rural Spain to explore the impact of rural tourism destination image on rural tourists’ behavior, as well as tourists’ satisfaction and loyalty to rural tourism destinations. By establishing a structural equation model to discover the relationship between all variables, it was concluded that the destination image plays an important role in the formation of a new image, and tourist satisfaction is the largest variable that affects loyalty to a tourist destination [42]. Kun used a computer deep learning model to analyze the visual content of photos and used GIS to visualize tourists’ cognitive maps of different perception themes, exploring and expanding the field of how to apply artificial intelligence technology to tourism destination research [43].

To sum up, in the research related to traditional village tourism, the influence of tourism development on traditional villages, the sustainable development strategy of traditional village tourism, and the tourism development policies of traditional villages are mostly discussed at the macro scale, and there are also studies on tourists at the micro-scale, including behavior and satisfaction research.

1.5. Research on the Correlation between Behavior and Spatial Environment

With the development of GNSS technology and big data analysis methods, research on the relationship between human-scale behavior patterns and spatial forms has also been carried out [44]. Compared with traditional survey methods, GPS technology has the advantages of quantitative and continuous measurement. In this regard, researchers from various countries have achieved a series of results. Henriette Bondo Andersen (Henriette Bondo Andersen) used GIS, GPS, and sensors to study the impact of changes in the campus layout of three schools in Denmark on student activities [45]. The Japanese scholar Somoto Junzo used GPS technology to measure the behavior of primary school students after school and explored the relationship between primary school students’ school routes and their place of residence [46]. Gao Yuan et al. used the GPS spatiotemporal trajectory data generated by the movement of urban residents under a mixed mode of transportation to realize the automatic identification of urban road intersections [47]. Li Zao et al. used the method of GPS action tracking to investigate the action trajectories of primary school students after school, combined with the behavior observation method, obtaining an in-depth understanding of the behavior characteristics of primary school students in a specific space, and discussed the spatial composition characteristics and characteristics of the surrounding space of the school. The relevance of the retention of primary school students emphasized the need for improvement strategies and management measures to optimize the space around the school [48]. Ye Maosheng and Zeng Jun used GPS technology to investigate the behavior characteristics of people in cultural and commercial blocks, and discussed the correlation between people’s retention characteristics and commercial space elements [49].

All the above studies took different spatial places in the city as the research objects and verified the effectiveness of GPS action trajectory measurement in the study of human
action characteristics and the spatial relationship between urban and rural areas. In recent years, many scholars have conducted in-depth research on the spatial form and style elements of traditional villages. However, in the context of the sustainable development of traditional village tourism, there are few studies on tourist behavior and action paths in traditional villages, and there is no discussion on the relationship between tourist behavior, action paths, and traditional village spatial forms and style elements. As we all know, spatial form and style elements are one of the most important parts of traditional villages, and they are the most intuitive parts that tourists come into contact with. The spatial environment of traditional villages provides tourists with basic needs for traffic, rest, and play. At the same time, the behavior characteristics and staying preferences of tourists will also affect the shape and structure of the village. Improper tourism development will not only affect the tourist experience but also destroy the original structure and spatial form of the village, resulting in the continuous loss of traditional village spatial features and style elements. Therefore, establishing how to correctly develop village tourism and explore the harmonious coexistence between tourists and traditional village space environment is an urgent problem that needs to be solved.

It is worth explaining that different traditional villages should be regarded as different complex systems, and the local natural environment and people affect the formation of traditional villages. Therefore, this study takes typical Huizhou traditional villages as an example, uses GPS technology to record the movement trajectories of tourists in traditional villages, and analyzes the behavior of tourists in different spatial places through behavioral observation methods. The specific objectives of this research were (1) to summarize the spatial elements in different spaces of traditional villages; (2) to explore the correlation between tourists’ behavior characteristics and staying preferences and the spatial environment of traditional villages; and (3) based on the sustainable development of traditional village tourism, to put forward the optimization strategy of different spaces in traditional villages. This study provides a new research perspective and a feasible technical route for future research on the protection and renewal of traditional villages in Huizhou and other regions.

Under the typical and clear geographical constraints, this study mainly explores the following three research questions:

(1) What are the characteristic spaces of Huizhou traditional villages, and what are the special elements in these spaces?
(2) Will tourists’ action characteristics (speed, route) be affected by the spatial form of traditional villages?
(3) Is tourist behavior affected by traditional elements, landscape environment, and commercial formats?

The following research attempts to establish how to obtain tourists’ tour routes and behavior data, and how to analyze these data so that the entire scientific process has the characteristics of rapidity, objectivity, and generalization. The system method of traditional village space optimization design, landscape environment improvement, and sustainable development and utilization is expounded.

2. Materials and Methods

Huizhou traditional villages include the traditional villages located in Huangshan City, Anhui Province, China, and Wuyuan County, Jiangxi Province in the Huizhou area, and are a type of traditional Chinese village. From 2012 to the end of 2022, a total of 8171 villages with important value were included in the “Chinese Traditional Village List” in 6 batches. Among them, about 500 traditional villages were found to be in Huizhou, accounting for 6% of the total number of national traditional villages. In 2000, the United Nations Educational, Scientific and Cultural Organization included the traditional villages of Xidi and Hongcun in Huizhou in the World Heritage List, because these two traditional villages still maintain their original rural features to a large extent, and their street style, ancient buildings, and decorations, as well as residential houses with
complete water supply systems, which are very unique cultural relics. Traditional villages in Huizhou embody a special regional culture with regard to their architecture, sculptures, painting, craft, and other artistic forms. This regional culture is called Huizhou Studies, and it is one of the three prominent schools of regional culture in China (Dunhuang Studies, Tibetan Studies, and Huizhou Studies) [62].

The cultural value of Huizhou traditional villages can be embodied in the following aspects. (1) Clan culture: Clan culture is an important part of Huizhou culture. It represents the unique form of social organization and cultural inheritance in Huizhou. Every village has its ancestral hall and family tree [63]. (2) Spatial form: The traditional villages in Huizhou formed a variety of spatial forms due to factors such as topography, water source conditions, and ecological environment during site selection [64]. Based on the method of cluster analysis, Ye Maosheng divided the plane spatial form of Huizhou traditional villages into four spatial types: “cluster-concentrated type”, “strip-intensive type”, “radiation-concentrated type”, and “radiation-dispersion type” [65]. (3) Architectural style: Huizhou architecture is widely known around the world for its black tiles, white walls, horse-head walls and other modeling features, brick carvings, wood carvings, stone carvings and other decorative features, and high-rise buildings, deep wells, halls, and other living features [66]. (4) Decoration: Huizhou architectural decoration occupies a pivotal position in the decorative art of the Chinese nation, mainly expressed in the form of wood carving, brick carving, stone carving, and color painting [67]. The patterns are rich in themes and varied in nature, which can be divided into plant patterns, animal patterns, landscape patterns, character story patterns, etc. [68]. With their longstanding clan culture, natural village form, unique architectural style, and distinctive decorative art, Huizhou traditional villages have become a bright pearl among traditional villages in China and the world.

2.1. Case Selection

The site selection of traditional villages in Huizhou is characterized by being situated near mountains and by rivers. Paying attention to the patriarchal clan system and inhabitation by ethnic groups are the necessary conditions for the development and continuation of traditional villages in Huizhou. Pingshan Village was taken as the research object in this paper. Pingshan Village is located in the foothills of Ping Feng Mountain and Ji Yang Mountain in the northeast of Yixian County, Huangshan City. It has a history spanning more than 1100 years, and it was named after a mountain with a shape like a screen to the north of the village. “Shu” is the main family name in the village. Ji Yang Creek trickles through the village, past its white walls, black tiles, and ancestral halls. Many ancient bridges lie quietly over the stream, and the ancient mottled stone road that runs along the bank has seen many ages come and go.

Pingshan Village, together with the world cultural heritage sites Xidi Village and Hongcun Village, which are also located in Yi County, was selected in the first batch of Chinese traditional villages at the end of 2012 [18], which shows its heritage value. As a typical representative of Huizhou traditional villages, Pingshan Village is more typical in the study of sustainable tourism development than Xidi Village and Hongcun Village, which have been fully developed for tourism. Figure 1 presents an aerial photo of Pingshan Village and real photos of the main space nodes.
Figure 1. Aerial photography and main node space.

2.2. Data Acquisition

The spatial form and composition order of traditional villages in Huizhou is relatively complex, and different traditional village spatial forms each have their own uniqueness. This study used GPS technology to explore the correlation between the spatial environment of traditional villages and the behavior characteristics of tourists and attempts to perform targeted research on individual cases and propose related issues and optimization strategies. Compared with the world cultural heritage sites “Hongcun” and “Xidi”, which have an average of 1 million visitors annually, Pingshan Village receives less than one-tenth of the visitors. Ye Maosheng collected the GPS data of 35 groups of tourists and 29 groups of residents, discussed the relationship between the street space of traditional villages in Huizhou and the passage of residents and tourists, and put forward relevant suggestions for the control and adjustment of the action paths of residents and tourists in mixed-living and tourism villages [56]. Weimin Zheng collected GPS data of 56 tourists to verify that his method for research on tourist mobility has better measurement accuracy [69]. Zhu Yurui used a questionnaire survey and GPS positioning methods to collect the activities of 40 primary school students in traditional villages, explored the correlation between primary school students’ behavior and space, and proposed corresponding improvement measures for the current situation [70].

The data collection lasted from 26 March 2018 to 29 March 2018. The local temperature in Pingshan Village was mild and the illumination was soft. Weather factors had little influence on people’s behavior. The GPS walking experiment was performed between approximately 8:00 a.m. and 11:00 a.m. and 4:00 p.m. and 6:00 p.m. Samples of different genders and ages in Pingshan Village were randomly selected as study objects, using the G360 hand-held GPS instrument from the GIS to record satellite positioning points every 3 s to obtain the trajectory information of each sample.

In order to reduce the impact on tourists’ tour behavior, this experiment was carried out in a tracking manner, and the data collection was carried out as close as possible to the subject. The experiment had a certain degree of difficulty. We started recording when tourists entered any village entrance space, and stopped recording when tourists left the village, and the obtained data could be used as a complete set of data. Tourist visit time was basically between 1 and 3 h, and each set of data generated thousands of samples.
A total of 38 groups of valid data were obtained from this trajectory tracking (Table 1). Adolescents and young tourists of all age groups accounted for a relatively large proportion, accounting for 68% of the total. Most tourists chose to travel together, accounting for 76% of the total.

Table 1. Overview on the survey sample.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Population (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of investigation</td>
<td>26–29 March 2018</td>
</tr>
<tr>
<td>Weather</td>
<td>Cloudy 9 °C Southwest Wind Level III</td>
</tr>
<tr>
<td>Investigation Period</td>
<td>8:00–11:00, 15:00–18:00</td>
</tr>
<tr>
<td>Number of effective surveys</td>
<td>38 (90.4)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21 (55.3)</td>
</tr>
<tr>
<td>Female</td>
<td>17 (44.7)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Adolescent (Under 44 years old)</td>
<td>26 (68.4)</td>
</tr>
<tr>
<td>Middle age (45 years old to 59 years old)</td>
<td>7 (18.4)</td>
</tr>
<tr>
<td>The Old (over 60 years old)</td>
<td>5 (13.2)</td>
</tr>
<tr>
<td>Tourism style</td>
<td></td>
</tr>
<tr>
<td>Go with Companions</td>
<td>29 (76.3)</td>
</tr>
<tr>
<td>Go alone</td>
<td>9 (23.7)</td>
</tr>
</tbody>
</table>

3. Results and Analysis

3.1. Spatial Screening

Kernel density estimation is a non-parametric test method, which is used to estimate the unknown density function in probability theory [71]. Thirty-eight sets of GPS trajectory data are presented in the form of kernel density images in this paper. Kernel density analysis is suitable for the observation of detention behavior and the movement trend of people in villages. It can directly reflect the location of crowd gathering, the shape and size of the gathering area, and thereby reflect the influence of space on the characteristics of crowd detention. The correlation between the characteristics of crowd activities and the spatial environment of villages could be established through the adoption of kernel density analysis.

In order to conveniently and intuitively analyze the characteristics of human detention and the correlation between the human behavior and the spatial elements of villages, the division grid of axle-net positioning for kernel density images is carried out in this paper. Axis network positioning locates the spatial region with eigenvalues in the coordinate points, and a total of 22 feature spaces are obtained (Figure 2).

As can be seen from the graph, there are density peaks in the areas labeled 1A, 2B, 4C, 5D, 6G, 7H, 7L, 8H, 9E, 10G, 10H, and 10J. Tourists have strong action trends in these spaces, among which 6G, 7H, 7L, and 10J present higher density values, while 6J, 6H, 6K, 7D, 7J, 8E, 9G, 9M, 10L, and 11K show lower density, and the trend of tourists’ action in these spaces is weak. Additionally, these spaces are often the negative spaces that tourists rarely choose. According to the eigenvalue principle, the typicality principle, and the avoidance of repetition principle, 18 feature spaces were selected from the 22 feature spaces obtained as samples for the study of the correlation between the characteristics of the actors’ behavior and the spatial elements. According to the different morphological characteristics of these spaces, they can be divided into square spaces: village entrance square (1A), village entrance square (2B), front square of Imperial Guard ancestral hall (6G), front square of Shu Guangyu Hall (7H), air-drying square (7J), front square of San Gu Temple (7L), and village tail square (9M); waterfront spaces: Chang Ning Bridge waterfront space (4C), intersection waterfront spaces (5D), commercial waterfront space (8E), commercial waterfront space (9E), commercial waterfront space (10G), commercial waterfront space (10H), commercial
waterfront space (10J), village tail waterfront space (10L); and street spaces: street space (6K), street space (8H), and street space (9G).

Figure 2. Spatial screening.

3.2. Path Model Analysis

In order to better explore the changing rule of the action path of the actors in the village characteristic space, the trajectory lines in the space nodes are classified and three basic lines are extracted: straight lines, turning points, and reciprocating trajectories. A linear trajectory reflects the walking characteristics of tourists walking straight in a space; a turning trajectory reflects the tourists’ path choice in space and the transformation of the spatial sequence; a straight trajectory and a turning trajectory are relatively smooth trajectory in space. A reciprocating trajectory reflects the tourists’ behavior of detention or circuitous return in the space node, and it can also reflect that tourists demonstrate many behaviors in this space [72] (Figure 3).
1. Path Characteristics of Tourists in Square Spaces

The characteristics of tourists’ paths in square spaces are clear. Compared with waterfront and street spaces, the overall proportion of reciprocating paths reaches 25%. Among them, the spatial organization of the front square of Shu Guangyu Hall (7H) provides favorable conditions for tourists’ sightseeing and activities. The proportion of reciprocating trajectories reaches 35%, which proves that tourists have intricate behavior characteristics in the space environment around the ancestral temple. Although the space arrival rate of the front square of San Gu Temple (7L) is not high, its open space and the setting of recreational seats have a greater impact on the action to its entry. Tourists have different degrees of reciprocating behavior in each square space, but the straight-line path also accounts for a large proportion. It can be seen that visitors have better spatial awareness and understanding in the square space. However, due to the choice of tour paths or the influence of landscape guidance [73], certain turning phenomena could inevitably occur.

2. Path Characteristics of Tourists in Waterfront Spaces

The most obvious feature of tourists’ paths in waterfront spaces is that the proportion of turning paths reaches 44%. The Chang Ning Bridge Waterfront space, which demonstrates peak value, serves as the important road intersection entering the village, which embodies its good spatial guidance and provides a strong guiding role for tourists. Ji Yang Creek crossing the village is the most important transportation path and the most important waterfront space in the village. The kernel density images of commercial waterfront spaces such as 10G, 10H, and 10J form continuous banding peaks, in which pedestrians are prone to demonstrate continuous touring and sightseeing behavior. At the same time, many streets and alleys are distributed like fish bones along Ji Yang Creek. The turning behavior path occupies a higher proportion when tourists stay in the commercial space (9E), commercial space (10G), commercial space (10H), and commercial space (10J), which also shows that the fish bone-shaped distribution of the waterfront spaces and alleys in Pingshan Village provides tourists with more route choices and forms a better diversion effect.

<table>
<thead>
<tr>
<th>Path Characteristics</th>
<th>Square Spaces</th>
<th>Waterfront Spaces</th>
<th>Street Spaces</th>
<th>Overall Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Path Type</td>
<td>25%</td>
<td>44%</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>Straight type</td>
<td>25%</td>
<td>44%</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>Turning type</td>
<td>25%</td>
<td>44%</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>Reciprocating type</td>
<td>25%</td>
<td>44%</td>
<td>35%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Figure 3. Comparison of route models.
3. Path Characteristics of Tourists in alley spaces

In the linear roadway space, tourists generally maintain a straight or turning walking mode, and the narrow spatial sequence of roadways has a strong role in guiding the path. In Huizhou villages with limited land use and complex streets and lanes, street space is an important space for tourists’ action orientation, which plays a certain role in spatial cognition and the organization of travel paths. Among them, the commerce is distributed on both sides of the Street 8H, and the increase in reciprocating paths reflects more behavioral activities in this space.

It can be seen that tourists in the square spaces of Pingshan Village are more likely to have the action characteristics of detention or circuitous return; in the waterfront space of Pingshan Village, which is interlaced with streets and lanes, resembling fish bones, tourists will move along the river or turn into streets and lanes; in the narrow space of streets and lanes, tourists tend to move forward step by step until the next space node, and commercial space can occasionally lead to tourists’ detention behavior.

3.3. Behavioral Features and Spatial Elements

3.3.1. Behavior Observation

In the previous section, the authors screened and classified different feature spaces according to kernel density characteristics. These characteristic spaces are further analyzed in this section by deeply studying the spatial composition of each spatial node, observing and recording the behavior of tourists during the period (the investigation was carried out by recording the behavior characteristics of stopover every 30 s), comparing the GPS date images, establishing the relevance between the characteristics of the tourists’ behavior and the spaces and analyzing the influencing factors of tourists’ behavior (Figure 4). It can be seen from the figure that the number and types of tourist behaviors are higher in the waterfront space, followed by the square space, and the lowest in the street space.

![Figure 4. Frequency of action statistics.](image)

The tourist action rate can effectively reflect the law of tourists’ walking in spaces, which is of great significance to study the characteristics of tourists’ action path and action trends. In the study of human movement and detention behavior in residential waterfront spaces, Zao Li put forward that a slow walking speed was below 0.8 m/s, medium-speed walking was between 0.8 m/s and 1.2 m/s, and a fast walking speed was above 1.2 m/s [72]. In this paper, the line segments with different speeds in different spatial nodes were screened out by taking the speed segment as a reference and the ratio of slow, medium, and fast line segments in each spatial node was calculated by taking the medium
speed as a unified reference value, so as to consider the travel trend of tourists who do not pass through the space node.

3.3.2. Spatial Elements of Different Feature Spaces

According to the real scene of the village, a schematic diagram of the spatial interface of part of the feature space can be drawn. From the element sketch (Figure 5), we can see that the spatial interfaces in the square spaces are composed of three forms: pastoral–square–tree, ancestral–square–dwelling, and folk–dwelling–square–dwelling; the space elements in the waterfront spaces can be divided into three forms: dwelling–flagging–tree–water bone platform–water–dwelling, dwelling–flagging–bridge–water–dwelling, and tree–flagging–water–pastoral; and that the space elements in street spaces are basically one single combination of dwelling–flagging–dwelling.

The spatial elements in the characteristic space of traditional villages can be accurately identified through real scenes, and the research divides the spatial elements into five categories: scale, traditional elements, commerce, landscape elements, and infrastructure. Each category is divided into different sub-categories: scale includes the aspect ratio; traditional elements include historical buildings, horse head walls, gatehouses, and facade decorations; commerce includes characteristic commerce, cultural display, and shop signs; landscape elements include water, bridges, green plants, and water ports; and the infrastructure includes rest seats, sunshade facilities, and landscape structures (Figure 5). (1) Aspect ratio: Yoshinobu Ashihara mentioned in “The Aesthetics of the Street” that when the aspect ratio of the street is \( W/H = 1 \), there is a sense of harmony between the width and height, along with when \( W/H > 1 \), a sense of intimacy will be produced as the ratio decreases [74]. Combining behavioral observation and experimental field interviews, it can be found that in traditional villages, this feeling is the opposite. The width and height of the street space are relatively low, which can create a sense of oppression, and tourists often choose to pass through quickly. The ratio of width to height of the square space and the waterfront space is high, and this scale is more pleasant and stimulates various behaviors of tourists. (2) Traditional elements: Traditional elements are the concrete embodiment of traditional culture, mainly including historical buildings, horsehead walls, gatehouses, and facade decorations. Within a comfortable scale, the traditional elements in square space and waterfront space are more likely to attract visual attention and induce tourists to take pictures, chat, and rest. (3) Commerce: In the context of rapid tourism development, commercial activities in traditional villages also have problems such as a high duplication rate of business forms and the homogenization of commodities [75]. Homogeneous business formats tend to cause visual fatigue to tourists and reduce their interest in shopping [76]. This study divides the commercial elements that are likely to cause tourists to demonstrate stop and watch behavior into characteristic businesses, cultural displays, and shop signs. Characteristic businesses mainly refer to businesses with Huizhou regional cultural characteristics, such as time-honored shops, antique calligraphy, paintings, etc. Cultural exhibitions include memorial halls, museums, cultural display boards, etc. Significant shop signs mainly include those with Huizhou regional cultural characteristics. (4) Landscape elements: The landscape elements of traditional villages mainly include streams, green plants, ancient bridges, and water ports. Water ports refer to a kind of miniature wharf built with stones by the stream for villagers to wash. (5) Infrastructure: The infrastructure mainly includes rest seats, sunshade facilities, and landscape structures, among which rest seats are mostly stone benches with a long history. Overall, waterfront spaces have the most abundant spatial elements, covering almost all categories. The street space is relatively simple, mainly including traditional elements and characteristic businesses.
3.4. Correlation Analysis of Action Characteristics and Space Environment

This study obtains the action trajectory of tourists when visiting traditional villages through GPS tracking experiments, and conducts a comprehensive analysis of the path pattern, kernel density, trajectory point speed, and behavior distribution obtained from the analysis. The correlation between speed, behavior preference, and traditional village space environment is established through the comprehensive analysis and comparison of tourists’ action differences in the three types of spaces: square spaces, waterfront spaces, and street spaces (Figures 6–8).

Figure 5. Features of spatial elements.
<table>
<thead>
<tr>
<th>Typical spaces</th>
<th>Route models</th>
<th>Distribute points of trajectory</th>
<th>Kernel density</th>
<th>Speed</th>
<th>Behavior Observation</th>
<th>Real images</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chatting and viewing</td>
<td></td>
</tr>
<tr>
<td>2B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Relatively dense region</td>
<td></td>
</tr>
<tr>
<td>6G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Relatively dense region</td>
<td></td>
</tr>
<tr>
<td>7H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chatting</td>
<td></td>
</tr>
<tr>
<td>7J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>View and photographing</td>
<td></td>
</tr>
<tr>
<td>7L</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Resting and Chatting</td>
<td></td>
</tr>
<tr>
<td>9M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chatting</td>
<td></td>
</tr>
</tbody>
</table>

**Graphic Symbol**
- Straight type
- Turning type
- Reciprocating type

**Low density**
- Slow speed ($V < 0.8 m/s$)
- Medium speed ($0.8 < V < 1.2 m/s$)
- Fast speed ($V > 1.2 m/s$)

**High density**
- Walking
- Chatting
- Resting
- Photographing

**Plotting scale**
- 20m
- 50m

Figure 6. The contrast of the influencing element action characteristics in square spaces.
Figure 7. The contrast of the influencing element action characteristics in waterfront spaces.
### 3.4.1. Analysis of the Influencing Elements of Behavior Characteristics in Square Spaces

From the kernel density images (Figure 6), we can see that the peak of the kernel density estimates appear in the spaces of the front square of Imperial Guard ancestral hall (6G), the front square of Shu Guangyu Hall (7H), and the front square of San Gu Temple (7L), with the trajectory points distributed densely and the path characteristics mainly having a reciprocating trajectory. At the same time, the tourists tend to choose slow walking, which indicates that tourists display more detention behavior in these spaces. These three spatial nodes are the most important tourist attractions in Pingshan Village: the front square of the Imperial Guard ancestral hall (6G), the front square of the Shu Guangyu Hall (7H), and front square of San Gu Temple (7L). The colorful gate building of Shu Guangyu Hall, the nine-fold eaves of the Imperial Guard ancestral hall and the red wall and sandalwood of San Gu Temple (Figure 1) are characteristic and traditional elements, attracting a great many tourists to stop to take photos and chat. At the same time, landscape facilities are set up in the front squares of the three scenic spots, and the gray space and public seats provide favorable conditions for tourists to take rest and eat food.

There are smaller peaks in village entrance square (1A) and village entrance square (2B). Village entrance square 1A is one of the main entrances of Pingshan Village, where tourists usually enter the village after a simple exchange and rest, which is also in line with the straight line as the path characteristic in this space node. The space of 2B is the main road to enter the interior of the village, and the path is wide and forms a banding square space with the landscape paved on the road. A straight line is taken as the main path characteristic. The space of 2B is backed by hills and fields, with beautiful pastoral scenery in all seasons. The layered landscape of mountain–road–fields endows this space with good viewing horizons. Most of the tourists will stop by and chat during their journey. However, through the ratio of walking speed, it can be seen that the ratio of fast walking reaches the highest value of all square space nodes here, which indicates that tourists will stop and chat in the space of 2B but will not be attracted to stay for a long time.

Although air drying square (7J) and village tail square (9M) are the two largest square spaces in Pingshan village, their values of kernel density estimates are low. Space 7J is located between the front square of Shu Guangyu Hall (7H) and the front square of San Gu Temple (7L), with the trajectory points distributed densely and the path characteristics mainly having a reciprocating trajectory. At the same time, the tourists tend to choose slow walking, which indicates that tourists display more detention behavior in these spaces. These three spatial nodes are the most important tourist attractions in Pingshan Village: the front square of the Imperial Guard ancestral hall (6G), the front square of the Shu Guangyu Hall (7H), and front square of San Gu Temple (7L). The colorful gate building of Shu Guangyu Hall, the nine-fold eaves of the Imperial Guard ancestral hall and the red wall and sandalwood of San Gu Temple (Figure 1) are characteristic and traditional elements, attracting a great many tourists to stop to take photos and chat. At the same time, landscape facilities are set up in the front squares of the three scenic spots, and the gray space and public seats provide favorable conditions for tourists to take rest and eat food.

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<th>Speed</th>
<th>Behavior Observation</th>
<th>Real images</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K</td>
<td>Main straight line</td>
<td>Very sparse</td>
<td>Sparse region</td>
<td>0.99</td>
<td>0.97</td>
<td>Chatting</td>
</tr>
<tr>
<td>8H</td>
<td>Straight and reciprocating</td>
<td>Relatively dense</td>
<td>Relatively dense region</td>
<td>1.67</td>
<td>0.98</td>
<td>Shopping and Chatting</td>
</tr>
<tr>
<td>9G</td>
<td>Turning</td>
<td>Very sparse</td>
<td>Sparse region</td>
<td>0.90</td>
<td>1.32</td>
<td>Shopping and Chatting</td>
</tr>
</tbody>
</table>

**Figure 8.** The contrast of the influencing element action characteristics in street spaces.
Temple (7L), which is the only way to be pass from the Shu Guangyu Hall to San Gu Temple. The space of 7L display a spatial shape resembling the Chinese character “Kou” due to the horse-head walls at different heights surrounding. There are all kinds of street junctions around it, which also correspond to the same path characteristics of a straight trajectory, a turning trajectory, and a reciprocating type. In this space, there are not many detention and social behaviors generated, but through the ratio of speed, we can see that tourists tend to walk slowly, which proves that the spatial form of 7L is not easy to understand and recognize, and there are behaviors of road discrimination or road-finding occurring. The space of 9M is located at the northernmost end of the village and its spatial form is a U-shaped square along the waterfront. Because of the low accessibility at the edge of the village, the trajectory points of actors in this space are sparse, and there are large amounts of debris accumulated in this space, and the spatial elements are relatively limited, meaning that most of the tourists often choose to pass through quickly.

### 3.4.2. Analysis of the Influencing Elements of Behavior Characteristics in Waterfront Spaces

From the kernel density images (Figure 7), we can see that the Chang Ning Bridge waterfront space (4C) and intersection water space (5D) are the most important spatial nodes entering the interior of the village. The spatial path of the 4C model is dominated by turning points, and the density of trajectory points is relatively dense, and peak value appears in the kernel density estimation. Additionally, the tourists choose to walk quickly. Because there are pavilions under the bridge, one of the scenic spots of the “Eight Ancient Bridges in Chang Ning”, tourists tend to stop by, demonstrating more behaviors relating to chatting and recreation. The space of 5D is the intersection of the guided route and the waterfront route. In this space node, tourists choose to visit according to the guided route or the waterfront route freely. The path characteristics are mainly a straight line and a turning trajectory, and the trajectory points are relatively dense, with a certain peak value appearing. The space of 5D is rich in space elements. The small bridge over the flowing stream, the white wall with black tiles, and the decorations of the shops attract tourists to stop by for sightseeing and taking pictures.

Commercial waterfront space (8E) and commercial waterfront space (9E) are the most concentrated commercial areas in Pingshan Village. The spatial path model of 8E is mainly a straight line with dense trajectory points, but the kernel density is polarized. On the one hand, the commercial space is transformed from traditional buildings, where tourists generate more behaviors of shopping, chatting, etc., while on the other hand, the modern buildings imitate the antique buildings, where tourists rarely stay. The authors learned from the interviews that the commercial space transformed from traditional buildings is more attractive to tourists. The space of 9E is an important road intersection, and the spatial path model is dominated by turning trajectories with relatively dense trajectory points, and there are certain peak values appearing in the kernel density estimation. While tourists shop and chat in this space, they also display the behavior of finding and choosing their route.

As can be seen from Figure 2, continuous peaks appear from commercial waterfront space (10G) to commercial waterfront space (10H) and commercial waterfront space (10J), forming a coherent banded peak image. The murmuring water, green pastoral scenery, waterfront along the street facade and rich elements of the gate attract tourists to stop by, shop, and take photos. The spaces of 10G and 10H are comparatively similar, and the path model is mainly a straight line and a turning trajectory. When tourists turn along waterfront paths or streets to intersections, they all demonstrate the behavior of stopping by. Compared with the 10G and 10H spaces, 10J is a more open space, with more traditional stone bench seats and gray space formed by large crown trees, which results in more behaviors of chatting, sitting, and resting, and forms the climax of the whole banded waterfront spatial sequence.
The village tail waterfront space (10L) is located at the end of the Village waterfront space, and the path model is mainly a straight line with no peak values appearing. The low accessibility leads to the sparse trajectory points of the actors. Although the space quality is high, tourists often choose to pass through the space quickly because of the lack of landscape facilities encouraging them to stay, according to the researchers’ on-site behavior observation.

3.4.3. Analysis on the Influencing Elements of Behavior Characteristics in Street Spaces

From the kernel density images (Figure 8), it can be seen that the path model of street space (6K) is mainly a straight line with no peak values appearing in the kernel density. Street Space (9G) is a road intersection, and its path model is mainly a turning trajectory. The space of 6K and 9G is narrow and cramped and the DH is relatively small. Because there are many traditional buildings surrounding the streets and alleys, some tourists do not choose to stop by. However, due to the narrow space and lack of commercial facilities along the street, tourists often pass quickly here, forming a weak action trend of staying.

The path model of Street Space (8H) is mainly a straight line and a turning trajectory with dense trajectory points, and certain peak values appear in the kernel density image. The space of 8H is located in the planned tour route. Although the space is narrow, it is connected to Shu Guangyu Hall (7H) and Xian Yi Temple, and there are many commercial shops on both sides of the street, meaning that more behaviors of shopping and chatting are generated in this space.

The spaces of 6K, 9G, and 8H are narrow and secluded street and alley spaces. The small DH ratio often makes tourists feel oppressed, but certain peak values appear in the space kernel density, and tourists demonstrate a slower walking speed in 8H than in 6K and 9G, which shows that the characteristic business and tourism services are able to reduce tourists’ walking speed and generate staying behavior and more behavior activities.

4. Discussion

This study summarizes the typical spaces and elements of traditional villages in Huizhou and analyzes the differences in tourist behavior in traditional villages. Specifically, a follow-up survey was conducted on tourists in Pingshan Village, a traditional village in Huizhou. Based on the collected tourist path data, the analysis of the path pattern, movement speed, and kernel density was carried out. On this basis, we recorded the behavior of tourists, analyzed the behavior differences of tourists in different spaces, and then discussed the correlation between the behavior characteristics of tourists and the space environment. These findings are described in more detail below.

(1) The characteristic space of Huizhou traditional villages can be divided into square spaces, waterfront spaces, and street spaces. The spatial elements contained in these spaces can be divided into five categories: scale, traditional elements, commercial formats, landscape elements, and infrastructure. Among them, traditional elements include historical buildings, horse head walls, gatehouses, and facade decoration; commercial formats include characteristic commerce, cultural exhibitions, and store signs; landscape elements include water, bridges, green plants, and water ports; and infrastructure includes rest seats, sunshade facilities, and landscape structures.

In this study, tourists’ tour paths were recorded and kernel density analysis was carried out, and 18 feature spaces were screened out according to the peak value of kernel density. On this basis, according to the different morphological characteristics of these spaces, the characteristic spaces of Huizhou traditional villages can be divided into square spaces, waterfront spaces, and street spaces. In previous studies, village spaces were usually classified based on functional attributes, such as living spaces, entertainment spaces, productions space, etc. [77]. Yuting used space syntax to divide the space of traditional villages in Huizhou into points, line, and planes, and discussed the evolution characteristics of traditional village spaces [78]. This classification method is based on spatial shape classification. In this study, the feature space is selected based on the difference
in the peak value of the kernel density of the tourist path, and the space is endowed with multiple attributes, such as scale, shape, and elements. Specifically, the scale reflects the size of the space, the form reflects the shape of the space, and the elements reflect the semantic features contained in the space. Of course, these characteristics can be specifically quantified in future research, so that the classification of traditional village spaces in Huizhou can be more detailed. This technique can accurately identify the spatial elements in the characteristic space of traditional villages through the real scene, and the spatial elements can be divided into five categories: scale, traditional elements, business, landscape elements, and infrastructure. In previous studies, traditional village spatial elements were classified as cognitive elements, including landmarks, paths, flora and fauna, regions, edges, and nodes [79]. In previous studies, the author investigated and sorted out the style and features of traditional villages in Huizhou based on four aspects: residential space, facade form, detailed decoration, and village space [80]. The village space here refers to architectural types in a broad sense, such as archways, dwellings, and ancestral halls. In this study, spatial elements are specific to all the elements that tourists can see with the naked eyes in a certain space, and these elements directly or indirectly affect the behavior characteristics of tourists. Traditional villages in different regions have different spatial elements due to differences in geographical environment and climate. Therefore, the feature space classification and spatial element classification in this study cannot be directly applied to traditional villages outside Huizhou.

(2) There is a certain correlation between tourists’ action characteristics (route, speed, behavior) and the spatial form and spatial elements of traditional villages. In the correlation analysis with the spatial form, in a square space with the widest scale, tourists are more likely to demonstrate action characteristics such as retention or circuitous return; in a narrow street space, tourists choose to go straight to the next spatial node, such as a scattered commercial space. This will lead to tourists’ retention behavior. The waterfront space is often distributed in a fishbone shape with street spaces [81], and the scale is relatively appropriate. Tourists will go straight along the water system or turn into the street space. A good walking system and spatial sequence play a positive role in tourists’ visits [49]. The complex spatial form of traditional villages in Huizhou often leads to confusion in tourist paths. How to establish a good walking system deserves attention in future research. In the correlation analysis with spatial elements, spatial elements such as historical buildings, gatehouses, and facade decorations will stimulate tourists to stop and take pictures. These spatial elements visually form a strong contrast with the surrounding environment [82]. These spatial elements are very regional and represent the unique cultural connotation of Huizhou traditional villages. Even in street spaces with a small number of activities, characteristic commercial and cultural display items attract tourists to participate in shopping and other activities. In the waterfront space, abundant green plants and seats increase tourists’ behaviors such as resting and viewing. This study analyzes the correlation between spatial form, spatial elements, and tourists’ behavior characteristics, and the research results can be directly used in traditional village tourism development measures.

(3) Spatial optimization of traditional villages should follow the principles of respecting history and culture, maintaining the ecological environment, highlighting humanistic characteristics, and adhering to sustainable development [83,84]. However, with the rapid development of tourism in traditional villages, we have to consider the symbiosis between tourism and traditional villages [85]. The space of traditional villages has changed from a space that meets the simple living needs of villagers to a space that meets the needs of various populations. The optimization strategy proposed in this study is as follows.

Strengthen the guide system and establish a landmark space: In the too-empty square spaces and narrow street spaces, tourists often easily lose their way. A perfect guide system can guide the direction of tourists [86] and provide them with better path choices. At the same time, decision makers should make full use of the characteristic elements in different spaces to establish a landmark space. Balanced commercial distribution: commercial
space is one of the important spaces to attract tourists. The streets and alleys of Huizhou traditional villages are narrow and tortuous, and the spatial scale is characteristic, but it also makes tourists feel oppressed, so they choose to pass through quickly. A reasonable commercial layout can not only enhance the vitality of narrow streets and alleys but also encourage tourists to stop and stay more, and experience the street scale and cultural charm of traditional villages [87]. Optimizing landscape design: A space with relatively rich landscape elements is likely to stimulate tourists to stay during the tour, thereby generating more behavioral activities and promoting communication and business development. In the landscape space, spatial elements such as water systems, pastoral green plants, and architectural features are likely to cause tourists to stop and take pictures, while traditional stone benches, column foundations, and other components can attract tourists’ attention and trigger tourists to rest and engage in other behaviors. Therefore, landscape facilities with traditional cultural elements should be appropriately increased in traditional villages, especially in relatively empty square spaces.

There are traditional villages of various styles in China, including Huizhou traditional villages. These traditional villages have maintained their own unique natural and cultural characteristics and cultural and economic value over the course of history. In a modern society where tourism is developing rapidly, how tourism can promote the inheritance and protection of traditional village culture and how we can improve villagers’ cultural self-confidence and sense of belonging have become important issues for the sustainable development of traditional villages. The contributions of this paper include exploring a tourist-led approach to the study of village spaces. A technical route consisting of GPS path tracking, kernel density analysis, path pattern analysis, and the behavior observation method has been established. This combination of studies has gradually been practiced more widely in the Huizhou area. The research results provide a positive reference for the protection, renewal, and sustainable development of traditional villages in Huizhou and other regions. For example, we can use GPS technology to study the spatial distribution characteristics of primary and middle school students in traditional villages during outdoor activities; in the research on tourists’ wayfinding, based on GPS experiments, we can screen out spaces that make tourists lose their way, and then use VR simulation and other means to explore spatial optimization strategies; and in the residential space, kernel density analysis and behavior observation can be used to analyze the living habits and behavior characteristics of the original villagers, and the original living conditions of the villagers can be preserved to the greatest extent. These practices can effectively promote the sustainable development of traditional villages.

5. Conclusions

In short, with the rapid development of modernization and the tourism industry, the harmonious coexistence of village renewal and tourism development is the key to the sustainable development of traditional villages. This research work uses the method of GPS action tracking, takes typical Huizhou traditional villages as examples to investigate the action trajectories of tourists in the villages, combines kernel density analysis to screen out the spaces with different characteristics, and divides the spaces with different characteristics into three types. Then, through the behavior observation method, the behavior of people in the three spaces is analyzed in depth, and finally, the correlation between the behavior characteristics of tourists and the space environment of traditional villages is discussed, and spatial optimization strategies are proposed. The research shows that, in traditional villages in Huizhou, spaces of different scales and shapes will affect tourists’ tour paths; the unreasonable distribution of commercial activities leads to the uneven distribution of village vitality; and traditional elements and landscape facilities are more likely to trigger tourists.
to show a variety of behaviors. This study explores the spatial characteristics of traditional villages in Huizhou from the perspective of tourists. In future research, we can study the spatial optimization of traditional villages against the background of sustainable tourism development from the perspective of the interaction between tourists and villagers. This study provides a basis for further understanding the spatial characteristics of traditional villages in Huizhou, a basis for the spatial optimization of traditional villages in Huizhou, and a new research perspective and feasible technology for the protection, renewal, and sustainable development of traditional villages in other regions.

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