

Study on Tourist Emotional Space of Island-type Tourist Destinations

-- A Case Study of Changhai County

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ABSTRACT

Taking Changhai County as a case study, this research explores the characteristics of tourists' emotional space and their influencing factors in island-type tourist destinations. It is based on online travel note text data and combines GIS spatial visualization, content analysis method and spatial autocorrelation method. Breaking through the limitations of traditional tourism image analysis, this study reveals the laws of tourists' emotional distribution and its correlation with temporal-spatial behaviors and attraction types through text emotion extraction and spatial modeling. The results show that: (1) The tourism image of Changhai County centers on the marine theme, presenting positive characteristics of the integration of leisure-experience natural scenery and fishing village culture. However, some negative emotions are caused by inconvenient transportation, environmental damage and management problems. (2) Tourists' temporal-spatial behaviors show the characteristics of complex cross-island flow, and the emotional space agglomeration is significant. Places such as Haxian Island form "high-high" emotional agglomeration areas, while some parts like Guanglu Island have a "low-high" heterogeneous pattern. (3) The type of attractions significantly affects emotional differences. The emotions towards coastal landscapes are polarized, those towards mountain scenery are positive, while the scores of historical buildings are low due to scale limitations. Based on these findings, suggestions are put forward, such as optimizing the transportation network, strengthening ecological protection, standardizing market management and exploring cultural resources, so as to enhance the emotional experience of island tourism and the ability of sustainable development. This study provides a methodological reference for the research on the emotional geography of island tourism and also offers empirical basis for the refined governance of tourist destinations.

KEYWORDS

Island tourism; Emotional space; GIS visualization; Spatial autocorrelation; Changhai County

1. INTRODUCTION

Tourism image is a comprehensive image formed by tourists' experiences and evaluations of various factors of a tourist destination [1]. During tourism activities, tourists develop different perceptions and emotions toward the destination. Tourist emotions serve as a crucial entry point for studying tourism image, tourist satisfaction [2], and revisit rate [3]. Foreign scholars have conducted extensive explorations in the research on tourists' emotional experiences: Bigne and Andre [4] were the first to propose that "emotion" can be used as a segmentation variable for classifying tourists in theme parks and interactive museums; Veenhoven [5] put forward a framework of the "affect balance model" to calculate scores for average positive and negative emotions; Mitas [6] et al. assumed that each

emotion is assigned equal weight and used the average intensity of emotions to calculate the overall emotional score. With the rapid development of internet technology, online data generated by tourists' behaviors such as online transactions and evaluation interactions—including travel photos with spatial information [7], online texts [8], and POIs [9, 10]—have provided new data sources and perspectives for tourism research. To a certain extent, they have significantly promoted efforts to proactively expand the market, enhance the visibility of tourist destinations, and build brands [11]. Meanwhile, online texts, as an information medium, have played an increasingly important role in research on destination environments, tourism resources, and tourists' emotional experiences [12].

A review of existing studies shows that an increasing number of research outcomes in tourism studies have utilized emotions, focusing mainly on perceptions of tourist destination images [13, 14] and tourists' emotional experiences [15]. Davidson creatively proposed that tourists' emotional experiences during travel are not static; emotions are characterized by dynamic changes, which determine that emotional changes caused by temporal and spatial variations in the flow process will inevitably affect human-environment interactions [16]. Some scholars have focused on the spatial changes of emotions and the emotional dynamics of mobile tourists, with research spaces mainly being large-scale, block-like regions. However, studies on the generation of emotions, changes in emotions along temporal-spatial paths, influencing factors, and micro-scale regions are relatively insufficient.

Against the backdrop of high-quality and sustainable development of the tourism industry, island-type tourist destinations, due to their inherent constraints such as closedness, vulnerability, resource scarcity, and special national defense status [17], must adhere to balancing protection and development and take the path of sustainable development [18]. Therefore, this study uses tourists' online travel notes as the data source, employs a Python deep learning model to identify the comprehensive emotions of tourists' island travel experiences, extracts tourists' travel routes (attractions/paths), and uses GIS for spatial visualization to present the temporal-spatial behaviors and emotional characteristics of tourists. It is expected to enrich the in-depth development of geographical research on emotions and further promote attention and research on island-type tourist destinations.

2. RESEARCH METHODS AND DATA PROCESSING SECTION HEADINGS

2.1. Content Analysis Method

Content analysis method converts unsystematic and irregular symbolic content (such as text and images) into systematic and regular data. It is a research method that combines quantitative and qualitative approaches to objectively and quantitatively describe explicit content. Its greatest advantage is that it can capture tourists' complete travel experiences and psychological perceptions [11]. Grounded theory, first proposed by Glaser and Strauss [12] in 1967, is a qualitative research method. Its main purpose is to establish theories based on empirical data. Its core is to study issues without prior theoretical assumptions, induce and abstract concepts, ideas, and propositions from raw data, and then elevate them to theories. Rost Content Mining 6, a computer analysis software, is currently the most recognized large-scale free computing platform in China, mainly assisting research in the humanities and social sciences. Through Rost Content Mining software, a series of text analyses can be performed on the collected online travel note texts, such as word segmentation and word frequency analysis, traffic analysis, Weibo analysis, and cluster analysis [13].

2.2. High-Frequency Feature Word Analysis

The BERT (Bidirectional Encoder Representations from Transformers) deep learning model, with its bidirectional encoding and pre-training mechanism, can deeply understand the semantics and grammar of text. Unlike traditional unidirectional language models, BERT can simultaneously use contextual information in the text to understand the meaning of each word, thereby more accurately capturing the semantic and grammatical features of the text, achieving excellent results in various natural language processing tasks.

2.3. GIS Spatial Visualization

Next, the content of the obtained online travel notes will be conceptually deconstructed following Escalas' approach to time, based on chronological order and causal relationships. Tourist attractions and hotels where tourists stay will be extracted to obtain and encode tourists' spatial paths. Using ArcMap 10.2 software, temporal-spatial path samples will be superimposed one by one to present tourists' movement trajectories and emotional changes in the spatial scope. Then, global/local spatial autocorrelation analysis and visualization will be conducted on the troubles reflected in tourists' comprehensive emotions.

2.4. Spatial Autocorrelation

The calculation formula of Global Spatial Autocorrelation Moran's I is derived from the covariance of correlation coefficients in statistics. The formula for the Global Moran's I is:

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

Where W_{ij} is the spatial weight matrix, reflecting changes in the scale of spatially adjacent or contiguous regions. The value of i ranges from -1 to 1. A positive value indicates a positive correlation, and a larger value indicates a stronger spatial correlation of attribute values; conversely, it is weaker.

2.5. Data Processing

Well-known websites and forums have high attention and usage frequency among tourists, which can influence potential tourists' travel motivations to a certain extent. Therefore, this study selects data from four well-known domestic and foreign tourism websites (Ctrip, Dianping, Mafengwo, and Qunar) and Xiaohongshu, an emerging social media platform in recent years, to collect, screen, and sort out online travel notes and attraction reviews about Changhai County. Through the data collection software Bazhuayu, 2758 independent travel notes and attraction reviews targeting Changhai County and its subordinate islands were collected, which were used for the analysis of destination cognitive image perception. This study uses Python to construct a semantic dictionary by combining a deep learning model with emotional theme words, analyzes the text in the obtained online travel notes, and obtains their pysenti-comprehensive emotions to quantitatively measure the emotional levels of different locations.

Table 1. Summary and Classification of Emotional Themes in Online Travel Notes

Emotion Classification	Emotional Theme Words
Positive Emotions	Excitement (excitement, frolic, take off); Interest (interesting, intriguing, novel); Happiness (joyful, pleasant, laughing out loud, having fun, happy, delighted,); Entertainment; Romance; Fascination (like, be intoxicated, reluctant to leave); Satisfaction (satisfied, worthwhile, excellent, extremely valuable); Contentment (healing, fully content); Longing; Admiration; Worship; Appreciation (refreshing, extremely beautiful, stunning, gorgeous, breathtaking); Comfort (comfortable, cozy, relaxed); Surprise (amazing, surprise)
Neutral Emotions	Warmth; Tenderness; Calmness (relaxed, leisurely, comfortable, peaceful)
Negative Emotions	Hatred; Disgust (frustrated, indescribable, vomiting, unbearable, disgusting, disappointing, being cheated); Weariness (boring, uninteresting, strenuous, chatterbox); Pain (uncomfortable); Anxiety; Embarrassment; Confusion (distress); Jealousy; Fear (ferocious, scared); Sadness (depressed, upset, speechless); Anger (angry, shocked, frightening, absurd); Regret (regret, pity)

Meanwhile, the data were checked one by one to screen out 651 travel notes that meet the requirements for route research. The screening criteria are: 1. Having clear departure ports and travel modes; 2. Having clear accommodation locations, tourists' travel time, places, and travel routes; 3. Having clear expressions of tourists' emotions. Based on the geographical location, popularity, and other characteristics of tourist attractions, incorrect attractions were excluded; small-scale attractions with repeated geographical coordinates, indistinct boundaries, or subordinate to higher-level attractions were merged; and attractions with ambiguous names were corrected. Finally, 27 non-repetitive tourist destinations and 129 tourist hotels were obtained. The longitude and latitude coordinates of all tourist destinations and hotels were obtained through geographic coordinate extraction.

3. RESULT ANALYSIS

3.1. Analysis of Perceived Image of Tourism Destinations in Changhai County

The image of a tourist destination is one of the most crucial factors in attracting tourists, and it runs through the entire process of tourists making travel decisions and planning their trips, being perceptible. Using ROST-ContentMining6, we conducted a word frequency analysis on 2,768 online travel journal texts from Changhai County. We filtered out the frequent words that were either place-related or meaningless, and extracted the high-frequency words in the online evaluations and travel journals about Changhai County and its various islands. By integrating the collected travel journals and scenic spot evaluations of Changhai County, we obtained the 40 most frequently used characteristic words. The behavioral characteristics of tourists in Changhai County can be summarized into the following themes: motivation (seashore fishing, seafood, homestays), route and location (Pi Kou Port, Guanglu Island, Daxiangshan Island, the seaside, Xiaoshigu Forest Park), perception (original ecology, freshness, comfort). Secondly, from the perspective of part of speech analysis, nouns mainly manifest in the names of the various islands attached to Changhai County, port names, and scenic spots; verbs mainly reflect the modes of transportation, such as driving or taking a boat; adjectives mainly express the tourists' mood and perception, and there are more words describing the sense of tourism.

Table 2. High-frequency characteristic words and their frequencies in Changhai County

Key words (frequency)	Key words (frequency)	Key words (frequency)	Key words (frequency)
Seafood (1617)	Hour (1014)	Nature (225)	Jinshitan (137)
Homestay(1406)	Haxian Island (1001)	Golden Coast (224)	Wave (131)
Guanglu island(1322)	Seawater (831)	Shenyang (218)	Cross-sea Bridge (130)
Pikou Port(1273)	Xiaochangshan Island (775)	Xingshu Port (214)	Sanitation (128)
Changhai(1238)	Xiaoshuikou Forest Park (322)	Coast (208)	Guapi Island (127)
Hotel(1222)	Zhangzi Island (313)	Comfortable (184)	Rich (124)
Changhai (1216)	On the sea (302)	Sea area (170)	Cost (122)
Dachangshan Island(1193)	Approximately (293)	Ocean (165)	Comfortable (106)
Seaside (1071)	Jinsha Beach (267)	Island tour (153)	Freedom (87)
Island (1067)	Self-driving (255)	Haiyang Island (152)	Abundant (59)

The higher the word frequency, the deeper and more attentive the tourists' understanding of the image elements. Firstly, "Changhai", "Guanglu Island", "Dachangshan Island", "Hahexian Island", etc., as the names of tourist destinations, are the words frequently mentioned by tourists, indicating that these places have a relatively high reputation in the tourism of Changhai County; "Island", "Island Tour" reflect the geographical characteristics of Changhai County - an archipelago. "By the Sea", "At Sea", "Coast", "Sea Area" indicate that Changhai County, with its unique archipelago geographical environment and various leisure experience activities around the ocean, emphasizes that its tourism has a distinct "sea-oriented nature", and at the same time [1] this "sea-oriented nature" is also the key factor that attracts tourists. Secondly, "Seafood", "Homestay", "Hotel" rank high, showing that the attractiveness of Changhai County to tourists mainly revolves around tourists' yearning for delicious food and the original way of life. Most of the tourists use these words when experiencing and deeply experiencing the unique island scenery of Changhai County and experiencing working at sea. Choosing deep experience participatory tourism and leisure activities is the behavior characteristic of tourists. Xiaoshuikou Forest Park, Jinhai Coast, etc. tourist attractions rank high, indicating that these scenic spots are highly noticed by tourists, receive a large number of tourists, and fully demonstrate that there are significant differences in the popularity and attractiveness of tourist destinations on the islands of Changhai County. Thirdly, in terms of the source market and transportation methods, "Pi Kou Port", "Xingshu Port", "Self-Drive", "Shenyang" etc. words rank high, clearly showing that the travel methods of island-type tourist destinations are relatively simple and highly dependent on sea transportation, and the entry mode has certain constraints on island tourism purposes; "Self-Drive" ranks high, indicating that tourists reach Changhai County mainly by self-driving, as the self-driving travel method has certain restrictions on the travel distance and is mostly for short-distance travel, and thus it can be seen that the attractiveness of Changhai County is mostly limited to the surrounding cities within a short distance. Therefore, ports, railway stations, geographical location affect the way tourists reach Changhai County and their first impression of the tourism image. In terms of tourists' feelings, "Comfortable" and "Relaxed" reflect the comfort and relaxation that tourists feel during their tourism in Changhai County, indicating that the local tourism environment and supporting facilities can bring a good experience, making people feel at ease; "Rich" refers to the local tourism resources, such as diverse scenic spots, distinctive tourism activities, various distinctive foods, and unique "Sea Food Culture" and "Sea Fishing Culture", etc., which are rich and diverse and can meet tourists' diverse needs; "Free" indicates that tourists have a relatively free and casual feeling during the游玩 process, with no too many restrictions. And there are no derogatory adjectives in the high-frequency words, which also indirectly confirms that most tourists in Changhai County rarely encounter or do

not encounter negative situations such as poor environment and poor service, and overall they are recognized and satisfied with the tourism service situation of Changhai County.

3.2. Tourists' Temporal and Spatial Behaviors and Emotional Characteristics

The processed data obtained through the screening were used to obtain the spatial distribution of hotels and scenic spots in Changhai County, as well as the tourist routes between scenic spots. The obtained data were segmented and analyzed to produce visual graphics. The scenic spots on Zanzhai Dao and Haiyang Dao were Eagle's Beak Forest Park and Qinglongshan Park respectively. Since these two scenic spots did not appear in the path during the data screening, only the scenic spots and islands that appeared in the spatial path were retained. The tourist routes obtained from the data screening did not include the scenic spots in Haiyang Dao and Zanzhai Dao, so the island was not presented in the drawn graph.

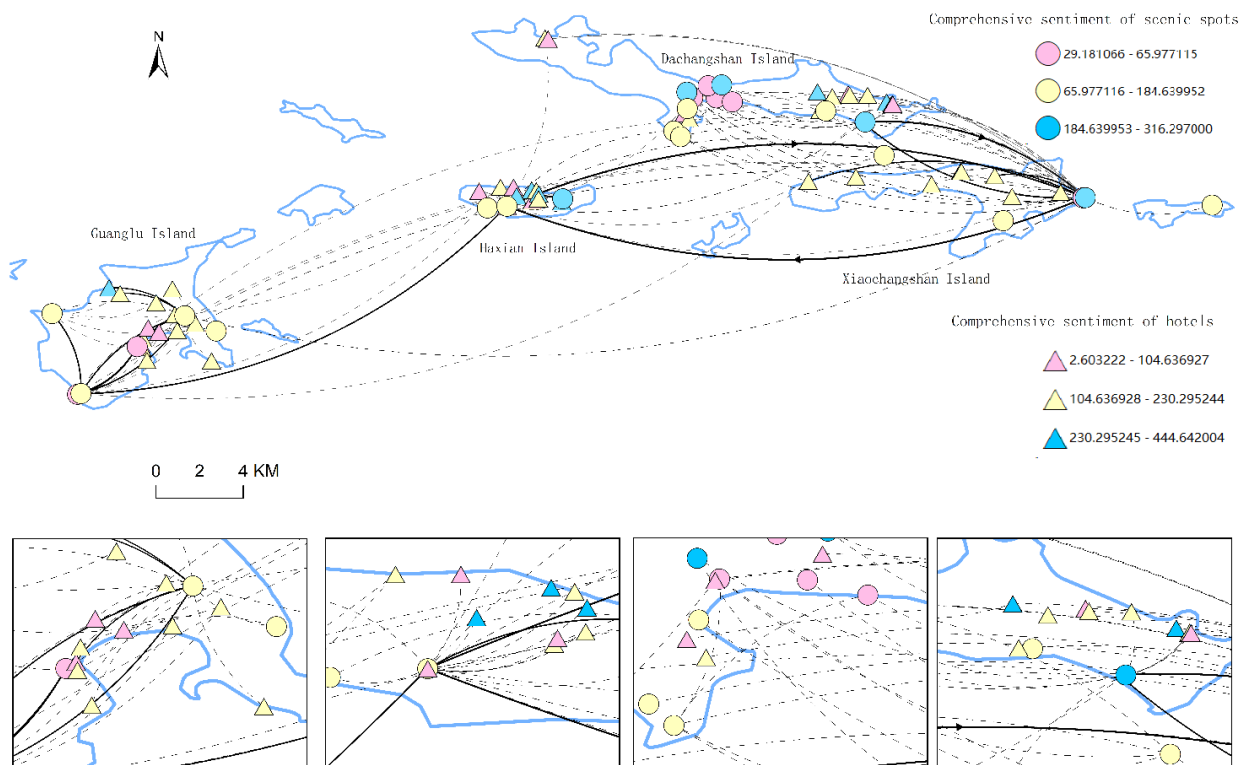


Figure 1. High-frequency characteristic words and their frequencies in Changhai County

From the perspective of the spatial distribution of the relationship between hotels and scenic spots, several characteristics are clearly manifested: Firstly, the distribution of hotels in Changhai County has a strong dependence on scenic spots. Secondly, the scenic spots in Changhai County are mostly concentrated in areas such as the harbors of the islands, coastal regions, etc., where water-related activities can be carried out, showing a distinct "coastal" feature. This is particularly evident on Daxiangshan Island and Guanglu Island. From the perspective of the tourist route, it can be divided into four inflow-outflow areas: 1. Guanglu Island - Maozhou Temple, Fairy Lake Inflow-Outflow Area 2. Haixian Island - Jinsandan Inflow-Outflow Area 3. Daxiangshan Island - Lao Tieshan Inflow-Outflow Area 4. Xiaozhangshan Island - Xiaoshigu Forest Park Inflow-Outflow Area. The repetitive route between Xiaoshigu Forest Park - Jinsandan and Xiaoshigu Forest Park - Yin Nu Bay Resort Area, and the Jinsandan - Xiaozhangshan Island route is a round-trip path. All these routes are cross-island routes. Xiaoshigu Forest Park, Jinsandan, and Yin Nu Bay Resort Area have the highest frequency of occurrence in all the route paths, indicating that some well-known scenic spots in Changhai County have a greater attraction for tourists and have become the must-visit places for tourists in Changhai County. The tourism overlapping paths of many scenic spots are relatively low,

indicating that the attractiveness and popularity of other scenic spots are lower and their distribution is more scattered. The tourist routes between hotels and scenic spots, as well as between scenic spots, are not limited to the same island. The inter-island travel is very common. This is inseparable from the sea-going projects in Changhai County and the convenient sea routes between the islands, making it possible to connect tourism among different islands. Therefore, tourists' itinerary arrangements have become diversified, and the tourist itinerary is no longer limited to a single island. Routes starting from hotels, in addition to the well-known tourist attractions on the current island, are also within the path range of other well-known tourist attractions on other islands.

In the figure, the tourists' overall emotions towards various attractions and hotels are superimposed. From the overall emotional score of the tour route, it can be seen that most attractions have a moderate emotional state, while only Xiaoshui Kou Forest Park, Golden Coast, San Yuan Gong, and Qifu Yuan are located on the large and small Changshan Islands, and their overall emotional scores are relatively high, showing positive emotions. Thus, it can be concluded that the convenient transportation provided by the port has strengthened the connection between local residents and the outside world, making the large and small Changshan Islands more accessible, having a longer development history, and having more complete infrastructure compared to other islands. This has enhanced the tourists' experience and satisfaction, leading to positive feedback for these attractions. The hotels with higher overall emotional scores are mostly concentrated on Haixian Island.

3.3. The Relationship between Tourists' Spatial Behavior and Emotions

This study aims to explore the types and degrees of the correlation between spatio-temporal behavior and emotions. It focuses on the clustering, correlation, and relationship between the emotional changes of tourists during their spatial movement, as well as the connection between the emotional attributes of tourists and their individual path transitions. Moreover, the scenic spots are classified into three different types: waterfront scenic spots, mountain scenery spots, and historical architecture scenic spots, to investigate whether different types of scenic spots cause differences in tourists' emotions.

3.3.1. Spatial autocorrelation analysis of emotions

Specifically, spatial autocorrelation is a spatial data analysis method used to study whether there is a correlation and the degree of correlation between adjacent observations in the same space. That is, spatial autocorrelation is an important indicator for testing whether the attribute values of a certain element are significantly correlated with the attribute values of adjacent spatial points. Global spatial autocorrelation is measured by comparing the similarity of attribute values between adjacent positions.

Using the Geoda software to calculate the comprehensive emotional scores of scenic spots and hotels in Changhai County, a Moran scatter plot was obtained. In spatial autocorrelation analysis, the Moran scatter plot is often used to reveal the spatial correlation characteristics between adjacent regions. It represents different correlation types in the four quadrants. As can be seen from the figure, there are more clustered spatial points in the first and second quadrants. The high-value areas of the comprehensive emotional scores in Changhai County are surrounded by high-value areas and low-value areas by high-value areas, and the higher the score, the more obvious the clustering degree. The number of spatial points in the first and third quadrants is significantly greater than that in the second and third quadrants. This situation indicates that the comprehensive emotional scores in Changhai County have a relatively obvious spatial positive correlation.

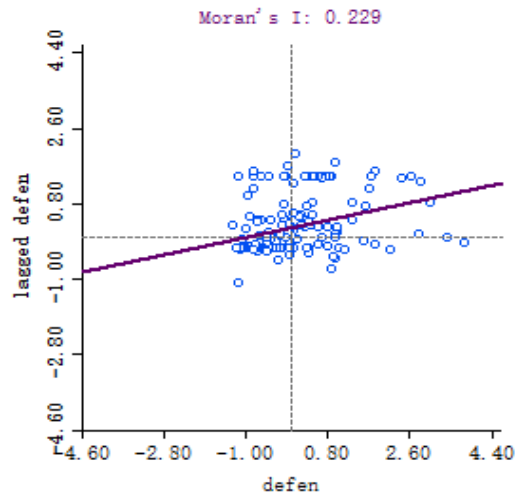


Figure 2. Moran scatter plot

Furthermore, the global Moran's I estimate value for spatial distribution = $0.230 > 0$, which further indicates that the combined emotional nature of scenic spots and hotels in Changhai County has a relatively significant spatial autocorrelation. Scenic spots and hotels with the same emotional attribute are not randomly distributed. The local Moran index shows that the scenic spots and hotels on Haxian Island exhibit a clear "high-high" clustering, indicating that the aggregation trend of local tourist attractions and hotels with high combined emotional scores is significant, mainly concentrated in the Haxian Island area, which is consistent with the situation where the combined emotional scores of hotels in this area are generally higher; the "low-high" clustering area, where low values are surrounded by high values, mainly appears in Guanglu Island, Haxian Island, and the northern area of Dachangshan Island, indicating that some scenic spots and hotels with lower service levels and slightly lacking infrastructure have shared part of the tourist flow from surrounding well-known scenic spots and hotels; the "high-low" type clustering is relatively sparse in Changhai County, only distributed near Sanyuan Palace on Dachangshan Island. It can be seen that the combined emotional score of Sanyuan Palace is in a leading position among the surrounding scenic spots; no "low-low" type clustering was observed in this study. Thus, it can be seen that scenic spots with higher combined emotional scores often have a radiating and driving effect, promoting the development of surrounding scenic spots. The combined emotional score of tourists for the tourism services, dining, and accommodation provided by Changhai County is relatively positive, and the tourism service level and quality of Changhai County have been recognized by most tourists, without forming a negative emotion aggregation phenomenon.

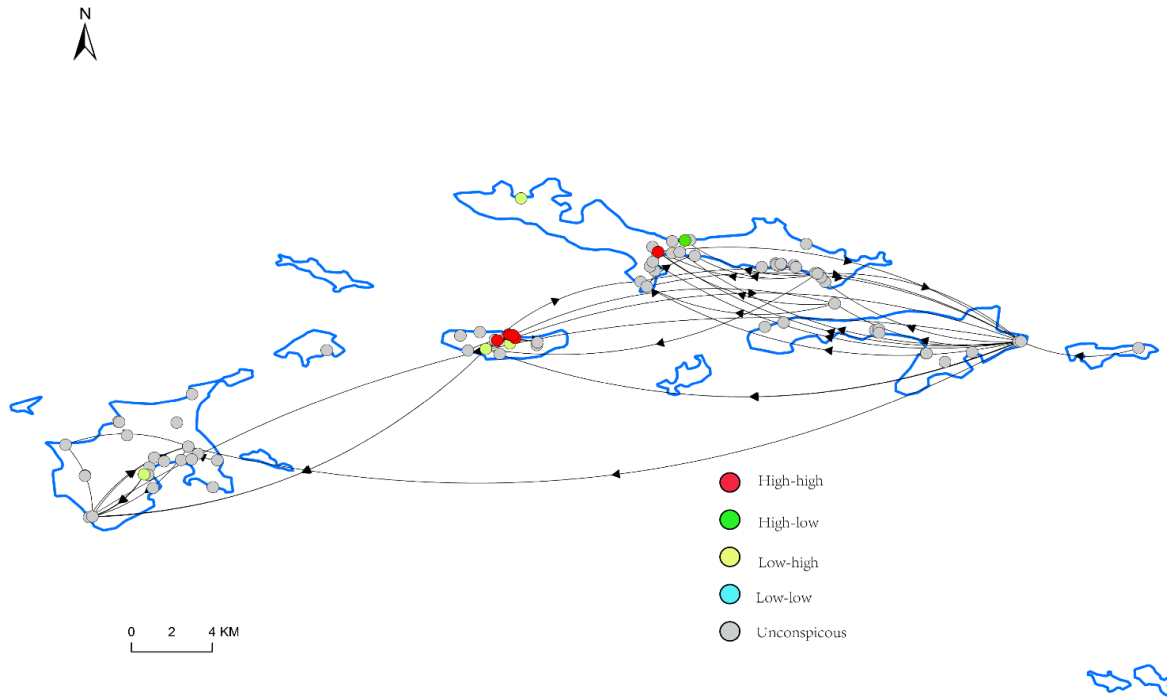


Figure 3. The local Moran's Index of scenic spots in Changhai County

4. CONCLUSIONS AND IMPLICATIONS

Taking Changhai County as an example, based on the online travel diaries and other textual materials posted by tourists on online travel platforms, this study breaks through the previous research that was only focused on the image of tourist destinations, further cleans and extracts the text content, obtains the comprehensive emotional scores for different scenic spots, and uses ArcGIS for spatial visualization analysis of emotions, resulting in the following conclusions:

(1) Tourists' perception of the image of the island county generally presents a positive state. Through content analysis and word frequency statistics, the cognitive structure and characteristics of the image of each island cluster in Changhai County were analyzed: centered around the ocean, with leisure-experiential island natural scenery and the artistic conception of fishing villages as the carriers, integrating marine cuisine, fishing labor, fishing customs, and cultural arts into a cluster of island recreational and vacation tourism.

(2) Tourists' emotions towards Changhai County are mainly positive, with a relatively small proportion of negative emotions. The reasons for tourists' negative emotions mainly include insufficiently convenient transportation on the island, severe environmental damage, poor management of scenic spots, and rampant illegal charging.

(3) The tourist itinerary in Changhai County is not limited to individual islands or hotels and scenic spots. The tour routes between scenic spots and between islands are complex, and the travel between different islands is very common. According to the local Moran index, the scenic spots and hotels on Haixian Island show a significant "high-high" aggregation, indicating a significant trend of the aggregation of local tourist attractions and hotels with high comprehensive emotional scores; the "low-high" aggregation area, where low values are surrounded by high values, mainly appears in Guanglu Island, Haixian Island, and the northern part of Daxiangshan Island; the "high-low" type aggregation is relatively sparse in Changhai County, only distributed near Sanyuan Palace on Daxiangshan Island; this study did not observe the "low-low" type aggregation.

(4) The main attractions of island-type tourist destinations are mainly coastal tourism landscapes. Such tourism activities are greatly limited by natural conditions and have a certain degree of

randomness, thus there is a two-level differentiation phenomenon in the emotional polarity; while the emotional comprehensive scores of mountain scenery are generally high, presenting a relatively positive emotion; historical buildings have a relatively low overall emotional comprehensive score due to the limitations of scale and grade.

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