A Study on the Relationship between Tourist Satisfaction and Tourism Image Perception Based on Web Text and Gra Model

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Abstract: There are a lot of studies on tourist satisfaction and tourism image perception in the field of tourism research, but tourists' psychological preferences are influenced by a variety of factors, and the impact of tourism image perception on satisfaction still needs to be studied in depth. Therefore, this study analyzes the relationship between tourist satisfaction and tourism image perception by web text of 20 different types of well-known attractions in Shenzhen. The results show that the tourism resources perception has the most significant impact on satisfaction, followed by tourism facilities and services, and social environment. The findings of this study contribute to the construction of tourism and the environment in the economic center city with the high development of science and technology innovation, and promote the construction of ecological civilization and sustainable development.

1. Introduction

China's large population base, vast territory and geographic landscape differences make it the country with the most potential for development in tourism worldwide. According to data from the Ministry of Culture and Tourism, in 2019, when has not yet been affected by the COVID-19 epidemic, China's domestic tourists reached 6.006 billion and domestic tourism revenues reached 66.3 million RMB. Tourism, which can boost economic growth while improving the environment, has gradually become a focus of urban development and an academic research hotspot. With the development of the Internet and the advent of the era of big data, smart tourism, which integrates tourism and big data technology, is developing rapidly. Online travel relying on the Internet has changed the traditional sales model of travel agencies and generated a large amount of data for smart tourism research.

The purpose of this study is to use GRA model to analyze the relationship between tourist satisfaction and tourism image perception based on the online comment of Shenzhen tourism destinations on online tourism platforms. On the one hand, it can analyze the changes in tourist satisfaction in the context of the Internet and provide suggestions for the construction of various types of tourist attractions. On the other hand, it can provide ideas for the construction of tourism and the environment in Shenzhen, and promote the sustainable development of the Guangdong-Hong Kong-Macao Greater Bay Area, by analyzing the psychology of tourists.

2. Literature Review

2.1 Tourism Image Perception and Satisfaction

Tourism image perception plays a very important role both before and after tourism. On the one hand, because tourism cannot be 'tried', the subjective image perception of the destination largely determines tourists' choice. On the other hand, the objective image perception of the destination after tourism significantly influences the tourists' evaluation. There are a lot of domestic and international studies on factors that affect tourism image perception. Mayo (1981) argued that tourism image perception is mainly influenced by landscape, climate and transportation. In the study of Bonn, Joseph and Dai (2005), influencing factors of tourism image perception were classified into natural landscape, historical monument, infrastructure and service quality of tourist destinations. Liu and Bao (1996) argued that tourist's perceived image is related to the perceived distance and human activities of the tourist destination. After analyzing the image perception characteristics of Chinese tourist cities, Xu et al. (2015) concluded that the most prominent characteristics of image perception include landscape, transportation, food and beverage, and resource-based attractors. Gunn (1972) summarized the tourism perception images formed by tourists and potential tourists as primary images and induced images. The primary image refers to the tourism perception image formed by potential tourists before they visit the destination, while the induced image is formed after the tourist has traveled on the ground.

Satisfaction is the evaluation and feeling formed by the tourist based on the gap between expectations and reality, as well as the perceived quality and other psychological aspects. Satisfaction affects travelers' choice of destinations and tourism products, as well as whether to revisit and recommend them. Initially, Pizam et al. argued that tourist satisfaction is the result of comparing expectations of a destination with their actual perceptions after traveling.

Studies on the relationship between satisfaction and tourism image perception mostly analyze the induced image after tourism using questionnaires, for example, Xie et al. (2019) analyzed the relationship between city image perception and satisfaction in Wuhan through questionnaires, and the results showed that both cognitive and affective image perception directly affect satisfaction. Yang, Hu and Yuan (2009) also obtained similar conclusions when they studied Chongqing citizens' tourism perception image of Shanghai. In the study of Zhang, R and Zhang, G (2019), they used web texts to study the tourism image perception in Shanghai Chenshan Botanical Garden and concluded that emotional experience activities, natural ecological environment and scenic service facilities would affect the quality of visitor experience.

2.2 Grey Relation Analysis

Grey Relation Analysis (GRA) is a branch of Grey System Theory, whose basic idea is to determine whether sequences are closely related to each other according to the geometry of the sequence curve. Gray System Theory believes that people's perception of objective things is incomplete and uncertain, that is, gray, so people's evaluation is also "gray". In the past studies, the statistical analysis of multiple factors usually used the method of correlation and regression analysis. Multiple linear regression requires a larger sample size and a more demanding sample distribution, but GRA is based on the data columns of the factors and uses mathematical methods to study the geometric correspondence between the factors, thus describing the strength and order of the factor relationships. GRA is widely used in agriculture, industry, economics, management and other disciplines. Its application in the tourism industry has been increasing in recent years. Mei, Zhu and Wang (2005) studied the satisfaction of tourists in five 4A tourist attractions in Guilin based on GRA. Yang and Ma (2011) studied the differences in the image perception of Xi'an between

domestic tourists and incoming tourists based on GRA.

3. Data Crawling and Processing

3.1 Data Crawling

This study obtains the target data from mafengwo.com. The target destinations are the well-known natural resource destinations, man-made landscape destinations, landmark destinations, and leisure destinations in Shenzhen recommended by mafengwo.com, totaling 20 attractions. They are Window of the World, Happy Valley, Splendid China Folk Culture Village, OCT East, Da Meisha Park, Xiao Meisha Resort, Shenzhen safari park, Shenzhen Xianhu Botanical Garden, Dapeng Ancient City, Nantou Ancient City, Gankeng Hakka Town, Lotus Hill Park, Shenzhen Bay Park, Wutong Mountain, Xichong Beach, Jiao Changwei Beach, Yang Meikeng Beach, Shekou sea world, Chung Ying Street and Diwang Building. Houyi collector was used to crawl the rating and comment content of each attraction, and there were 1509 pieces of data in total.

3.2 High-Frequency Vocabulary Analyses

The crawled comment texts were analyzed by aparticiple, keyword extraction and word count through Smart Analyze and NLPIR sharing platform, and the 40 words with the highest word frequency and the largest TD-IDF related to Shenzhen destinations were obtained by sifting out high-frequency but irrelevant words such as place names, inflections and connectives. (see Table 1 and Table 2). Most of the high-frequency words are nouns indicating attractions, adjectives indicating feelings, adverbs indicating degrees and verbs indicating behaviors, which reflect the destinations resources and the mental activities of tourists. The most frequent word 'can' can be interpreted as a verb, or as an adjective indicating positive emotions. Words such as 'good', 'worthy', 'suitable', 'like' indicate high satisfaction with the destination, which is not much different from their expectations. Words such as 'ancient city', 'beach', 'flora' and 'animals' reflect the destination resources of the destination.

No.	Word	Word frequency	No.	Word	Word frequency
1	Can	459	21	Performances	79
2	A Lot	216	22	Architecture	79
3	No	213	23	Beach	77
4	Not bad	202	24	A bit	74
5	Comparable	172	25	Seaside	73
6	Old Town	135	26	Recommended	70
7	Tickets	119	27	Line up	68
8	Beach	118	28	small town	66
9	Attractions	112	29	photo shoot	63
10	Very	107	30	Scenic spots	62
11	really	104	31	Play	59
12	Worth	104	32	Don't	58
13	Suitable	101	33	Free	55
14	Special	91	34	General	55
15	Scenery	89	35	B&B	54
16	Projects	89	36	Required	52
17	Flora and fauna	87	37	Seawater	51
18	Like	84	38	Scenery	50
19	Not	83	39	History	48
20	Features	82	40	Experience	47

Table 1 the 40 Words with the Highest Word Frequency

3.3 Tourism Image Perception Factors Analyses

The high-frequency words of the text were classified according to the factors influencing the tourism image perception (see Table 2). They are divided into three main categories: tourism resources, tourism facilities and services, and social environment. Tourism resources are the tourism physical or virtual attractions that can attract tourists, including natural landscapes, cultural characteristics, and recreational activities. Tourism facilities and services include internal and external leisure places, shopping places, facilities and services of attraction, and sanitary conditions. The social environment includes the general environment of Shenzhen and the community environment around the destination, divided into accommodation and food environment, security situation and transportation situations.

Primary Indicators	Secondary Indicators	Examples of attribute words
А	A1	beach, seaside, landscape, climate, typhoon
Tourism resources	Natural landscapes	
	A2	ancient architecture, landmark, culture, cultural atmosphere,
	Cultural characteristics	commercialization, historical relics, architectural style, temples
	A3	performances, culture, food festival, cultural festival, Chinese
	Recreational activities	New Year, Halloween, National Day, Dragon Boat Festival
	A4	feel, experience, attract
	Tourism feeling	
В	B1	park, square, bar
Tourism facilities	Leisure places	
and services	B2	shopping, stores, buying, shopping centers, duty-free stores
	Shopping places	
	B3	tickets, queues, infrastructure, public services, planning and
	Facilities and services of	design
	attraction	
	B4	cleanliness, sanitation, ecological environment
	Sanitary condition	
С	C1	hotel, Bed and Breakfast, food, diet, taste, special snacks
Social environment	Accommodation	
	environment and food	
	C2	security, security check
	Security situation	
	C3	subway, walking, cycling, biking, running, train, bus
	Transportation situations	

Table 2 Analysis of Tourism Image Perception Factors

3.4 Sentiment Analysis of Web Texts

Using NLPIR sharing platform to conduct preliminary sentiment analysis and emotion analysis on comments. The results are shown in Fig. 1 and Fig. 2. 68.66% of the positive sentiments and 31.34% of the negative sentiments indicate that Shenzhen tourists have a positive image perception of Shenzhen tourist destinations, but there are also many negative emotions. In terms of emotions, most of the tourists have positive emotions such as "good" and "happy", accounting for 75.48%, but 17.71% of the tourists show disgust and anger.



Fig.1 Sentiment Analysis



Fig.2 Emotional Analysis

The sentiment words were assigned before the specific sentiment analysis of the crawled comments. This paper is based on the word sets for sentiment word analysis from China National Knowledge Infrastructure, sentiment lexicons summarized by other scholars' studies, and a rough skimming of 1509 comments, the following sentiment word list was compiled (see Table 3). Words with emotion were categorized into positive and derogatory adjectives, strong and general degree adverbs, and positive and derogatory verbs, with corresponding scores attached according to their positive or negative lexical nature and emotional intensity.

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Etymology	Examples	Score
Positive adjective	exciting, relaxing, convenient, beautiful, nice, good, worthwhile, shocking, surprising, good	1
Derogatory adjective	poor, worthless, fake, rotten, bad, broken	-1
Strong adverb	really, very, super, definitely, especially, very, totally, much	2
General adverb	average, a little, slightly, a little	0
Positive verb	like, fit, praise, satisfied, happy, recommend	1
Derogatory verb	scam, run, disappoint, can't, don't	-1

3.5 Comment Quantification

The ratings of tourist comments on the tourism image perception are mainly based on

quantitative scores of emotional words. A preliminary analysis of travelers' comments shows that the structure of online comments is generally 'adv. + adj./v.', such as 'n. + adj.', 'n + adv. + adj.', 'n. +adv + v.', 'v. + n.', 'adv. + v. + n.' and other simple and fixed forms. For example, 'The scenery is not bad, and there are many amusement projects, but there are too many people, the experience is not good', 'The cruise ship is very big. It is more beautiful in the night. I took my baby to play, and she is very happy', 'A very beautiful place, you can drink coffee while watching the scenery, and there are many places to eat'. Based on the comment form, this study assigns scores to verbs, adjectives, and adverbs that have affective polarity. Nouns are generally neutral and do not play an influence in the sentiment analysis assignment. Therefore, the calculation of the verb, adjective and adverb scores finally results in a score that represents the tourism image perception, that is, the following equation.

Tourism image perception score = initial score + adverb score × adjective score/verb score

The initial score is 3, so the neutral comment score is 3. The adverb scores, adjective scores, and verb scores are referred to Table 3. If there is no adverb in the text, the default adverb score is 1, that is, the adverb score item does not affect the final score.

A comment text generally contains multiple tourism image perceptions, and the score of each image perception is correspondingly grouped into the tourism image perception categories in Table 2 to form the final score of tourism image perception.

Using the above sample of comments as an example:

1) The scenery is not bad, and there are many amusement projects, but there are too many people, the experience is not good

 $A1=3+1\times 1=4$; $A3=3+1\times 1=4$; $B3=3+2\times (-1)=1$; $A5=3+1\times (-1)=2$

2) The cruise ship is very big. It is more beautiful in the night. I took my baby to play, and she is very happy'

B3=3+2×1=5; A1=3+2×1=5; A5=3+2×1=5

3) A very beautiful place, you can drink coffee while watching the scenery, and there are many places to eat

A1=3+2×1=5; C1=3+2×1=5

The final tourism image perception scores and satisfaction of the 20 Shenzhen destinations are shown in Table 4. Overall satisfaction is expressed in terms of platform user ratings.

Indicator	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	Satisfaction
Window Of the World	3.52	4.52	4.12	3.78	3.77	3.46	2.62	3.67	2.87	4.36	4.89	3.74
Happy Valley	3.47	3.99	4.64	3.18	4.07	3.89	2.64	4.78	3.17	4.29	4.78	3.94
Splendid China Folk	3.15	4.32	4.07	3.58	3.86	3.32	2.82	3.71	3.47	4.22	4.74	3.96
Culture Village												
Oct East	4.33	2.56	2.33	3.00	2.56	2.33	2.11	3.33	2.22	3.99	2.57	3.99
Da Meisha Park	4.14	2.43	3.88	3.43	3.71	2.49	3.36	3.01	2.36	4.18	4.19	3.91
Xiao Meisha Resort	3.87	3.09	3.83	3.16	3.43	3.69	2.33	2.56	2.34	4.11	4.31	3.84
Shenzhen Safari Park	4.24	3.99	4.35	3.32	3.89	3.56	2.33	2.51	3.05	4.34	4.65	3.95
Shenzhen Xianhu	4.62	3.68	3.44	4.16	4.21	3.47	3.65	3.92	3.74	4.57	4.68	4.39
Botanical Garden												
Dapeng Ancient City	2.71	3.71	3.43	3.29	3.00	3.42	3.14	2.43	4.29	3.98	2.01	4.25
Nantou Ancient City	2.89	2.94	3.91	3.47	3.82	4.41	3.22	3.56	3.78	3.94	3.05	3.18
Gankeng Hakka Town	4.09	3.84	3.67	3.63	4.01	4.04	3.59	4.10	4.07	3.76	4.09	4.20
Lotus Hill Park	4.69	4.56	4.38	4.63	3.67	3.39	4.11	4.07	3.51	4.26	4.52	4.40
Shenzhen Bay Park	4.58	4.34	3.44	4.11	4.47	2.94	3.74	3.86	3.82	4.07	4.79	4.33
Wutong Mountain	4.71	3.78	3.92	4.25	3.42	3.03	4.52	4.44	3.98	3.68	4.52	4.45
Xichong Beach	4.77	3.71	3.82	3.68	3.92	3.41	2.97	3.11	3.27	3.58	3.27	4.11
Jiao Changwei Beach	3.65	4.20	4.13	3.74	4.01	4.08	2.52	3.11	3.67	3.49	2.63	4.08
Yang Meikeng Beach	4.43	3.63	3.79	4.15	4.16	3.61	3.86	3.53	4.01	3.64	2.16	4.36
Shekou Sea World	4.43	3.25	4.04	3.00	4.55	4.38	2.71	3.84	3.41	4.33	4.43	4.32
Chung Ying Street	3.43	4.72	3.01	3.95	3.62	4.94	2.58	3.41	3.26	4.05	4.21	3.93
Diwang Building	3.69	3.73	3.88	3.41	4.02	4.06	3.58	4.08	3.43	4.18	4.83	3.85

Table 4 Tourism Image Perception Score and Satisfaction Score

4. Gra of Tourist Satisfaction

Using SPSSPRP platform for GRA. The results of primary Indicators and secondary Indicators of tourism image perception with tourist satisfaction are shown in Figure 3, Figure 4, Table 5 and Table 6.



Fig.3 Gra Correlation Coefficient of Satisfaction (Secondary Indicators)

According to the results of the analysis of secondary indicators, it is clear that there are differences in the relationship between image perception and satisfaction for each tourist destination. For example, cultural characteristics and satisfaction of Nantou Ancient City has the strongest relationship, with a correlation coefficient of 1. Natural landscapes and satisfaction of Xiao Meisha Resort has the strongest relationship, with a correlation coefficient of 0,9063. Sanitary condition and satisfaction of Shenzhen Bay Park has the strongest relationship, with a correlation coefficient of 0,9330. Further analysis revealed that the correlation coefficients of the natural landscape of tourist destinations with purely natural landscape resources were all greater than 0.6, while there was variability in the correlation coefficients of other indicators. Visitors to Da Meisha Park, Xiao Meisha Resort and Yang Meikeng Beach pay attention to the construction of leisure places, visitors to Xichong Beach and Jiao Changwei Beach pay more attention to the feeling of tourism, while visitors to Wutong Mountain pay more attention to the situation of cultural and recreational activities, which reflects the differentiated needs of tourists for specific attractions in the same type of tourism resources. Folklore and ancient city destinations, such as Splendid China Folk Culture Village, Dapeng Ancient City, Nantou Ancient City, and Gankeng Hakka Town, generally have a greater impact on their cultural characteristics, but according to the differences in modernization and commercialization, leisure places and facilities and services also have a greater impact on satisfaction. The correlation of man-made landscape varies widely. Accommodation environment and food and security situation of motorized game amusement parks such as Happy Valley and Oct East have a greater impact on satisfaction. Tourists in destinations such as Window of the World, Lotus Hill Park and Shenzhen Bay Park, which are mainly visited by visual experience, are more sensitive to facilities and services of attraction, sanitary conditions. Tourists in parent-child and leisure destinations such as Shenzhen Safari Park and Shenzhen Xianhu Botanical Garden pay more

attention to leisure places. The tourists of Shenzhen Safari Park, Shenzhen Xianhu Botanical Garden and other destinations for family and leisure activities pay more attention to leisure places, travel experience, facility and services. For landmark buildings, such as Chung Ying Street and Diwang Building, the influencing factors of satisfaction are more diverse, and the greatest correlation with Chung Ying Street tourists' satisfaction is the sanitary conditions, while that of Di Wang Building is the tourist feeling.

Combining the results of 20 tourist destinations, the comprehensive ranking of the influences on the satisfaction of Shenzhen tourists was obtained as shown in Table 5. Tourism feeling has the strongest relationship with satisfaction, followed by leisure places, security condition, natural landscape, and accommodation environment and food. The correlation coefficients of all factors is greater than 0.6, all have a strong influence on satisfaction.

 Table 5 Gra of Relationship between Satisfaction and Tourism Image Perception (Secondary Indicators)

Result of GRA		
Secondary Indicators	Relevance	Rank
A4 Tourism feeling	0.783	1
B1 Leisure places	0.777	2
C2 Security situation	0.770	3
A1 Natural landscapes	0.767	4
C1 Accommodation environment and food	0.737	5
A3 Recreational activities	0.715	6
A2 Cultural characteristics	0.709	7
B4 Sanitary condition	0.707	8
B2 Shopping places	0.664	9
B3 Facilities and services of attraction	0.644	10
C3 Transportation situations	0.640	11



Fig.4 Gra Correlation Coefficient of Satisfaction (Primary Indicator)

Analyzing the primary indicators, the results are obtained in Figure 4. Most of the destinations with the strongest relationship between satisfaction and tourism resources have natural resources or characteristic landscapes as their attraction, such as Window of the World, Happy Valley, Oct East, Nantou Ancient City, Da Meisha Park, Xiao Meisha Resort, Xichong Beach, Yang Meikeng Beach, Chung Ying Street, and Diwang Building. The attractions with the strongest relationship between satisfaction and facilities and services have certain attractive, but they may not have distinctive

features, so tourists pay more attention on additional facilities and services, such as Lotus Hill Park, Shenzhen Bay Park, Splendid China Folk Culture Village, Wutong Mountain. The destinations, such as Shenzhen Safari Park, Shenzhen Xianhu Botanical Garden, Dapeng Acient City, Nantou Ancient City, Gankeng Hakka Town, Shekou Sea World, with the strongest relationship between satisfaction and social environment have more attractive tourist attractions, but tourists are mostly going with their families, so they have higher requirements for the surrounding environment.

Analyzed from a comprehensive perspective (see Table 6), the greatest correlation to tourist satisfaction is tourism resources, followed by tourism facilities services and social environment, and the correlation coefficient of all three indicators is greater than 0.6. As a tourist destination, regardless of the type of destination, the attractiveness of its tourism resources is often the greatest, and the induced image of tourism resources also has the most significant influence on satisfaction. Tourism facilities and services are additional, and they have a slightly lesser but still significant impact on satisfaction. Social environment as a macro factor also has a significant association with satisfaction.

Table 6 Gra of Relationship between Satisfaction and Tourism Image Perception (PrimaryIndicator)

Result of GRA		
Primary Indicators	Relevance	Rank
Tourism resources	0.740	1
Tourism facilities and services	0.718	2
Social environment	0.668	3

5. Conclusions, Implications, Contributions, and Limitations

5.1 Conclusions

Based on GRA, this study analyzes the comment of tourist destinations in the Internet and study the relationship between satisfaction and tourism image perception using 20 well-known attractions in Shenzhen as examples. After crawling, processing, assigning values, and GRA analysis of the web text, this study draws the following conclusions.

First, from the overall perspective, the tourism image perception factors that have the greatest degree of association with tourist satisfaction are tourism resources, followed by tourism facilities and services and social environment.

Second, for specific destinations, satisfaction is most associated with tourism resources for destinations that are diverse, distinctive, highly visible, and attractive. The satisfaction is most associated with tourism facilities and services for tourism destinations that are not distinctive and universal in type. In contrast, satisfaction is most associated with the social environment for destinations with distinctive but small-scale tourism attractions, or where the time required for touring is short

Third, subdividing the three primary indicators found that tourist satisfaction is most associated with tourism feelings. The physical and mental experience and the gap between expectation and reality of tourists play a key role in satisfaction. This is followed by leisure places, security situation, natural landscape, accommodation environment and food, recreational activities, cultural characteristics, and sanitary conditions, all of whom have correlation coefficients greater than 0.7. The smallest correlation with satisfaction is the traffic situation, indicating that tourists are relatively more accepting of traffic inconvenience, so their preference for traffic convenience is relatively small.

Fourth, the image perception factors that most associated with satisfaction are generally different

in different types of attractions, and the influence of tourism image perception factors varies among the same types of attractions. tourist satisfaction of natural landscape attractions is generally most associated with the tourism image perception of natural resources, while that of folklore attractions is usually a factor of human characteristics. Satisfaction of theme parks is mostly related to the internal facilities of the attractions, or the feeling of queuing, as well as the situation of rest-related leisure places. Satisfaction of architectural attractions is closely related to the tourist experience brought by the buildings.

5.2 Implications and Contributions

The purpose of this study is to analyze the relationship between tourist satisfaction and tourism perceived image formed after the tour, and then analyze the psychological preferences of tourists in tourism behavior, to provide reference ideas for the development and construction of tourism destinations, as well as to briefly analyze the psychology of tourism and tourism consumption views of Shenzhen tourists, which is conducive to promoting the development of tourism in Shenzhen, as well as the sustainable development of the Guangdong-Hong Kong-Macao Greater Bay Area. After the research analysis and discussion, the following insights are drawn.

(1) For different types of tourist destinations, travelers focus on different things. Attractions with diverse and distinctive tourism resources, beautiful scenery, large scope, and many amusement items can attract a large number of tourists and satisfy tourism demand just by the attractions themselves, so these attractions need to maintain the characteristics of tourism resources. Common and ordinary attractions, such as parks, zoos, botanical gardens need to be supported by supporting and humane facilities and services to bring out the attractiveness of the attractions. Smaller in scope and more homogeneous in content, even if the tourist attraction is made into a world class attraction, the length of stay of tourists is limited. Such attraction need to pay attention to the construction of the surrounding social environment, because tourists will habitually categorize the surrounding situation as a tourist image perception.

(2) With the development of the times, the travel psychology of tourists gradually formed the characteristics of the times, and individualized needs are becoming more and more diverse. The scenery alone is pleasant can no longer be highly valued by tourists, and tourists can no longer sacrifice the right to enjoy facilities, services and activities for a certain kind of enjoyment. The all-round construction that from tourism resources to supporting facilities and services to the surrounding social environment gradually become the road of construction of tourist attractions. Therefore, in the all-round development to meet the individual needs of different tourists, it is also necessary to highlight attractions characteristics and focus on building advantageous projects.

5.3 Limitations

At present, the research on the relationship between tourist satisfaction and tourism image perception at home and abroad is not very extensive. This study analyzes tourist satisfaction and tourism image perception based on web text, which provides some reference for the research of intelligent tourism, and at the same time, it broadens the application of GRA in tourism industry to a certain extent.

However, it is undeniable that this study has certain limitations. First, in the assignment, some words are positive in nature, but when put into specific contexts, they will show diametrically opposite lexical properties, so simply retrieving verbs, adverbs, adjectives and emotive words for assignment may result in the opposite of reality. Secondly, the division of tourism image perception factors is not strict enough, and some texts may have ambiguity when classifying tourism image perception. For example, 'places to eat' can be classified as 'B3 tourism facilities and services' or 'C1

accommodation environment and food'. Thirdly, the perceived image of tourism studied in this study is the commonly studied cognitive image, and the emotional image of tourists can also have an impact on satisfaction. For example, tourists' special emotions towards a place also affect satisfaction. Therefore, the inclusion of affective images and a more rigorous and detailed classification of tourism image perception factors could be considered in subsequent studies.

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