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Study on the Spatial-Temporal Distribution of Tourist Flow in the Scenic Spots: Taking Golden Weeks as Examples

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Abstract

During the golden week of National Day, large numbers of domestic residents will take a trip simultaneously, which not only leads to the overloading of some 5A scenic spots but also goes against sustainable development of scenic spots. Whether it is necessary to reestablish golden week of May Day has always been discussed during National People's Congress and Chinese People's Political Consultative Conference. However, different scholars hold different opinions. This paper will conduct empirical research to study the daily passenger flows during six golden weeks of the 34 scenic spots. By using EXCEL, this study does descriptive statistics of six golden weeks and calculates the weekly skewness index of 33 scenic spots. Meanwhile, SPSS is used to do ANOVA, which will be the basis for the calculation of the skewness index and correlation analysis of the weekly skewness index in different golden weeks. As shown by the results, the peaks of tourist flows in golden week of May Day and National Day are at the early period, which can be easily influenced by the length of the holiday. Also, it can be found that the peak distribution of different scenic spots has positive correlation among different weeks. According to the research results, the government should improve the forecasting system, make sure the timeliness of the tourism information, and improve the traffic system. Additionally, scenic spots should use the ticket strategies to stabilize the tourist flows. Besides, tourists and travel agencies should maintain information contacts with scenic spots and have rational travel.

Keywords: Golden week; Scenic spots; Distribution of tourist flows; The weekly skewness index

Introduction

According to the Annual Report of China Domestic Tourism Development 2017 released by the China National Tourism Administration on August 30, 2017, there is a growing demand for domestic tourism. In 2016, the total number of tourists in the China was up to 1.4 billion in seven holidays. In 2017, the number of domestic tourists will be 4 billion 880 million, with an increase of 10%. As the number of trips continuously increases, the congestion and overloading problems gradually become serious, especially during the National Day each year. At that time, lots of domestic tourists go on traveling simultaneously, so that the tourist flow in some well-known 5A scenic spots increases sharply [1].

The system of golden week has been implemented for nearly 20 years. Although overloading of scenic spots can bring huge economic benefits, it will also bring many negative effects [2]. It goes against the sustainable development of scenic spots, easily leads to accident, and spoils experiences of tourists. During the golden weeks, congestion frequently occurs in scenic spots. Hence, it is urgent to regulate and control the spatial-temporal distribution of tourist flow.

Literature Review

The development of information science and technology is of great importance to tourism industry [3]. Tourists, operators, and managers are all eager for an accurate and efficient way of accessing and releasing tourism information. Moreover, they want to save the costs of time, space, and money [4]. The knowledge of regular pattern of tourist flow can lay the foundation for the development of information science and technology. In 1980s, data collection methods and influencing factors of tourist flows became the research emphasis for foreign scholars, and they started to use time prediction methods to forecast the spatial-temporal distribution of tourist flows [5]. Beyond that, The authors studied tourist flow from tourism-generating regions by using gravity mode [6,7]. Meanwhile, the attenuation law of tourism attraction distance was proposed, and variables such as the perceived distance, the objective distance, and travel expense, were introduced in the model. Since 90s, the imbalance between supply and demand of tourism products has gradually attracted the attention of scholars [8]. Since the 21st Century, it has gradually become the focus of tourism research for foreign scholars to forecast tourist flow [9]. The phenomenon of congestion and overloading during golden weeks only happens in China. Also, some Chinese scholars have studied tourist flow in this phenomenon. For example, by using the tourism ecological footprint model, Lu et al. [10] calculated the tourism ecological footprint of Songshan scenic spot in golden week. Additionally, Xiao-Hui et al. [11] measured the time fluctuation and fractal structure of tourist flow through Zipf dimension. It had been found that the hierarchical structure of scenic spot system has fractal characteristics every year during National Day. Furthermore, Wang et al. [12] built the correlation model through Ordinary Least Squares method. As shown by this research, the variation feature of tourists in each scenic spot is similar, presenting the feature of reverse "U". Based on the study of three theme parks in OCT, Liang and Bao [13] pointed out that the same fluctuation trend of different types of theme parks is consistent with Chinese holiday system and citizens' habits. With the increasingly abundant network information in recent years, the spatial-temporal

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distribution of network attention has also become a research focus for scholars. For instance, Zhang et al. [14] explored the spatial-temporal characteristics of tourists' network attention in Pingyao in golden weeks by using skewness index G and analyzed the influencing factors. According to the spatial-temporal characteristics of network attention of cruise tourism, Li and Qu [15] proposed concrete countermeasures for the development of cruise tourism. Also, He et al. [16] researched the spatial-temporal characteristics of network attention of hot spring tourism based on Baidu Index and analyzed the reasons.

The above results on spatial-temporal distribution characteristics of tourist flow in golden weeks have laid foundation for this research, yet most studies only concentrate on a few scenic spots. The researches on the network attention of scenic spots also foreshadow the research of the spatial-temporal distribution characteristics of tourist flow. Therefore, this paper takes the "33 national 5A scenic spots" as the research object, sees all scenic spots in China as a whole, and summarizes the spatial-temporal distribution characteristics of tourist flow in golden weeks. Overall, it can provide suggestions for the public management of government, early warning of scenic spot, as well as the planning of travel agency and tourist, which has practical significance.

Theoretical basis and Research hypothesis

Theoretical basis

This paper studies lots of data and mainly uses weekly skewness index formula to calculate the spatial-temporal distribution of tourist flow in golden weeks. According to the finding of Liu et al. [17], in the golden weeks, tourist flows in most scenic spots have single peaks, and the weekly skewness index formula is transformed based on the Gini coefficient, which can reflect the concentration of tourist flow in golden weeks. The calculation formula can be expressed as follows:

$$G = 100 \times \frac{2}{7}\left(\sum_{i=1}^{7} i f_i - \frac{7+1}{2}\right)$$

Among skewness index G, f_i denotes the proportion of tourist number in day i to total tourist number in golden weeks. When G<0, the peak of tourist flow is in the early period of golden week. When G>0, the peak of tourist flow is in the late period of golden week. According to his study, the longer the temporal distance between tourist attractions and regional tourism resources is, the later the peak of tourist flow appears, and the higher the G value is.

Research hypothesis

As pointed out by previous studies, there are two main reasons for the different spatial-temporal distribution of tourist flow during the golden weeks. First of all, tourists prefer to firstly visit scenic spots with convenience traffic as well as rich and well-known resource, and then visit the scenic spots with poorer condition, which leads to the earlier peak of tourist flow in the former kind of scenic spots. Secondly, the spatial structures of scenic origins affect the choices of scenic spots and tourist routes, while traffic restricts the distribution of tourist flows. Moreover, the temporal distance from the tourist transport center to each destination becomes an important factor to spatial-temporal distribution of tourist flow [17,18]. In this study, these 33 national 5A scenic spots are well-known and have rich resources, so that the peaks of tourist flows are mainly in the early period of golden weeks. However, a few peaks of the sample spots may occur in the late period for the restriction of spatial structure. Meanwhile, due to the stability of factors such as travel time, resource, popularity, and spatial structure, there is a certain correlation between the scenic spots and the weekly skewness index in every golden week involved in the study.

To sum up, this study proposes two hypotheses

- H1: The peaks of tourist flows in the sample scenic spots mainly distribute in the early of golden weeks, but some of the peaks of the spots may distribute later due to the restriction of the spatial structures.
- H2: There is a correlation among the weekly skewness indexes of the same scenic spot in every golden week.

Research Methodology and Results

This study carries out an empirical survey mainly based on the following four steps (Figure 1).

Data collection and descriptive statistics

This study selects the daily number of tourists in 33 national 5A scenic spots during six golden weeks from Reset. The first five golden weeks are May Days and National Days from 2004 to 2008. The last golden week in this sample is in the first year after May Day golden week has been officially abolished. Every selected golden week is recorded as the seven days. Although the golden week in 2009 has eight days, this study collects it as seven days because there are few people on the 8th day.

Firstly, descriptive statistics is used (Table 1). It can be found that among 33 national 5A scenic spots in every golden week, they have large numbers of tourists, but show great differences.

"Average" means the average number of tourists flow in 33 scenic spots, and the "standard deviation" refers to the stability of the daily tourist flow in 7 days.

Discrepancy of tourist flow on different days

Secondly, one-way ANOVA is used to research whether tourist number has a significant difference on seven-day golden weeks. This study labels the 1st to 7th day in 6 golden weeks as "1-7 factors", and the number of daily tourists in each scenic spots is taken as the dependent variable. Furthermore, one-way ANOVA is used to analyze the data (Table 2).

This study compares the average number of tourists in different date. As shown by one-way ANOVA analysis results, there are significant differences in daily tourist flows of 25 scenic spots. Among

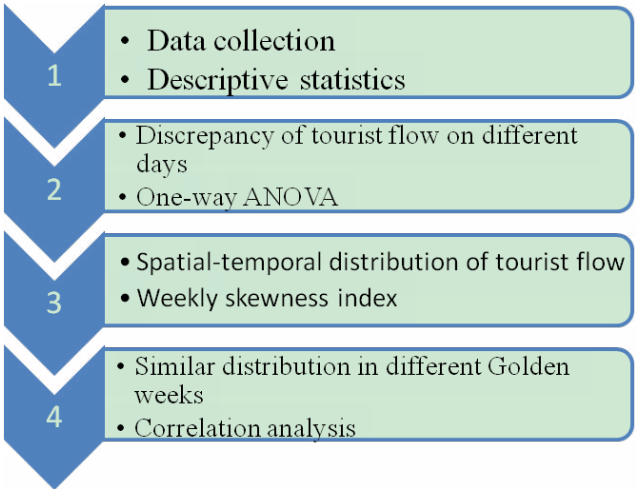

Figure 1: Steps of Empirical survey.

Golden week	Average	Standard deviation	Maximum tourist (scenic spot)	Minimum tourist(scenic spot)
National day in 2004	17148	16289	120000（Mount Wuyi）	300（Yulong Snow Mountain）
May day in 2005	19748	19916	136000（Mount Wuyi）	1000（Huanglong Scenic and Historic Interest Area）
National day in 2006	23516	38360	285000（Heaven Pool）	600（Yulong Snow Mountain）
May day in 2007	27524	33330	235500（Heaven Pool）	1100（Yulong Snow Mountain）
National day in 2007	20261	20145	231400（Small Three Gorges）	1200（Yulong Snow Mountain）
National day in 2009	21029	20066	136600（Huaying Mountain natural bonsai）	2400（Yulong Snow Mountain）

Table 1: The descriptive statistics of daily number of tourists.

Scenic spots	Sig.t	Scenic spots	Sig.t	Scenic spots	Sig.t
Badaling Great Wall	0.000	Huangyaguan	0.000	Potala Palace	0.000
Mount Hua	0.000	Heaven Pool	0.518	Yulong Snow Mountain	0.207
Yulong Snow Mountain	0.000	Mount Taishan	0.451	Qufu	0.341
Yuntai Mountain	0.651	Shaolin Temple in Songshan	0.167	Wudang Mountain	0.000
Three Gorges Dam	0.000	Jiuhua Mountain	0.073	Mount Wuyi	0.000
Reed Flute Cave	0.000	Haiquan Bay	0.000	Lushan Mountain	0.000
Zhouzhuang	0.000	tongli ancient town	0.000	Huaguo Mountain	0.000
Western Xia Imperial Tombs	0.000	West China Film Studio	0.000	The Ancient City of Ping Yao	0.000
Mountain Wutai	0.000	Terracotta Army	0.000	Serdang snow mountain	0.000
Deng Xiaoping's former residence	0.001	Huaying Mountain natural bonsa	0.135	Qianling Park	0.000
The remotest corners of the globe	0.000	Nanshan scenic spot	0.000	Small Three Gorges	0. 010

Table 2: The results of one-way ANOVA analysis of tourists flow in golden weeks.

	Spots with G>0 (G value)	Characteristic	Average G value
National Day in 2004	Huangyaguan (2.37), The remotest corners of the globe (10.02), Nanshan scenic spot (9.27)	Spots in Hainan or those far from regional tourism resources	-7.75
May Day in 2005	The remotest corners of the globe (8.26), Nanshan scenic spot (8.35)	Spots in Hainan	-10.91
National Day in 2006	Yuntai Mountain (50.76), Shaolin Temple in Songshan(5.06), Jiuhua Mountain(1.49), The remotest corners of the globe (2.05) Nanshan scenic spot (5.51)	Spots in Hainan or those far from regional tourism resources	-6.79
May Day in 2007	Shaolin Temple in Songshan (8.29), The remotest corners of the globe (2.03), Nanshan scenic spot (4.70)	Spots in Hainan or those far from regional tourism resources	-11.75
National Day in 2007	The remotest corners of the globe (11.54), Nanshan scenic spot (11.53)	Spots in Hainan	-9.47
	Spots with G<0 (G value)	**Characteristic**	**Average G value**
May Day in 2005	Potala Palace (-1.73), Mount Hua (-9.43), Yulong Snow Mountain (-5.01), Wudang Mountain (-4.00), Mount Wuyi (-0.50), Haiquan Bay (-10.16), Zhouzhuang (-2.13), Small Three Gorges (-2.00), Reed Flute Cave (-0.91)	Not obvious	5.27

Table 3: Calculation results of skewness index G.

these 25 spots, the average number of tourists on the 2nd, 3rd, 4th, and 5th days are significantly large than other days, forming 2 layers and appearing peaks obviously. One-way ANOVA analysis conforms that 76% of the 33 scenic spots have significantly different tourist flows on different days in six golden weeks, which lays a foundation for the calculation of the weekly skewness index.

Calculation results of skewness index G

Thirdly, weekly skewness index was used to calculate the original data of 33 scenic spots in 6 golden weeks. As revealed by the results, in National Day golden week of 2004, three of the sample spots have G values of more than 0. In May Day golden week of 2005, two of the sample spot have G values of more than 0. In National Day golden week of 2006, five of the sample spots have G values of more than 0. In May Day golden week of 2007, three of the sample spots have G values of more than 0. In National Day golden week of 2007, two of the sample spots have G values of more than 0. In National Day golden week of 2009, only 9 of the sample spots have G values of less than 0. In conclusion, most of the scenic spots have negative skewness index G value, meaning that the peaks of tourist flows in the sample scenic spots mainly distribute in the early period of golden week, while some of the peaks of the spots may distribute later (Table 3).

From the calculation results of weekly skewness index, it can be found that the average G value of the first five golden weeks is less than 0 and the peaks of tourist flows mainly distribute in the early of golden week. However, the last golden week has eight days, so that the peak appears in the late of golden week, with the average G value of more than 0. In the first five golden weeks, except spots in Hainan Province, some scenic spots with G value of less than 0 such as Huangyaguan, Yuntai Mountain, Shaolin Temple in Songshan, and Jiuhua Mountain are far away from the transportation centers, which take a long time to reach. The G value of two scenic spots in Hainan province is more than 0, which may be closely related to the location of being far from regional tourism resources.

Similarity of distribution in different golden weeks

Fourthly, the Pearson correlation analysis is used to research the similarity of skewness index G in 6 golden Weeks (Table 4).

As shown by the results, among these six golden weeks, 80% of them are significantly correlated. However, the peak of tourist flow in National Day of 2009 is in the late of golden week, leading to great differences from other golden weeks. Thus, the correlation coefficients of weekly skewness index G value between National Day of 2009 and

	National day in 2004	National day in 2004	National day in 2004	National day in 2004	National day in 2004	National day in 2004
National day in 2004	1					
May day in 2005	0.267	1				
National day in 2006	0.444**	0.346*	1			
May day in 2007	0.757**	0.565**	0.549**	1		
National day in 2007	0.601**	0.696**	0.638**	0.800**	1	
National day in 2009	0.461**	0.320	0.195	0.698**	0.542**	1

**Significant correlation on the 0.01 level (bilateral)

*Significant correlation on the 0.05 level (bilateral)

Table 4: The correlation analysis results of skewness index G in 6 golden weeks.

other golden weeks are small. Among these coefficients, the correlation coefficient of G value between National Day of 2006 and National Day of 2009 is the smallest, only 0.195. The coefficient is the largest between May Day of 2007 and National Day of 2007, which is 0.800.

Results and Suggestion

The daily tourists of 33 scenic spots have large average number in each golden week and there are great differences in tourist flows, especially between spots with the largest flows and the smallest flows. Moreover, there are significant differences from 1st to 7th day in the daily tourist flows of the 25 scenic spots, and these days have been stratified. Among them, the daily tourist flows on 2nd, 3rd, 4th, and 5th days are significantly more than that of other days, so that the peaks of tourist flows appear obviously, laying foundation for the calculation and analysis of weekly skewness index G. According to the results of weekly skewness index, it can be found that the peaks of tourist flows in the sample scenic spots mainly distribute in the early of golden week, yet they can be related to the length of holiday, which proves the restriction of the spatial structure and psychological factor to tourists. In 2009, this golden week has 8 days, so that the peak of tourist flow has a tendency of moving later, and there is no relation with the difference of spots. Additionally, the peaks of tourist flows in each scenic area have large positive correlations among different golden weeks, and the correlation coefficient is related to the temporal distance. In this study, the correlation coefficient of the skewness index G of two golden weeks in 2007 reaches to 0.800, while the correlation coefficients of the skewness index in 2009 and any other years are mostly lower than 0.5, proving that the weekly skewness index is affected by the length of golden weeks.

In summary, the hypotheses H1 and H2 make sense. This study offers three proposals from different perspectives according to the survey of spatial-temporal distribution in tourist flow in the scenic spots:

(1) For government, on the one hand, it should establish and consummate the tourism information prediction system to improve the timeliness of the tourism information and dredge the channel of information sharing, especially when the peaks of tourist flows in most of the well-known scenic spots are distributed in the early of the golden weeks. Without doubt, transportation is of great significance for the development of tourism. When nonlocal tourists and local residents go out simultaneously in golden weeks, government can dredge traffic efficiently according to the spatial distribution of local spots with different resources and popularities. Beyond that, the information of traffic jam, road seal, and line change should be announced timely so as to avoid the situation of road overstock and even paralysis. As a part of public service system, government can combine radio, television, and network together and transmit information by news, message, micro-blog, etc. Providing counseling and guidance services for tourists at the intersection of highway is also a good way to bypass flow.

On the other hand, those scenic spots which are in the same city can also cooperate with each other and form alliances. In this way, government can break the inherent tourism management system and give full play to the basic role of the market allocation of resources. Beyond that, the restructuring and cooperation of tourism attractions nearby should be encouraged. For example, it can combine small scenic spots with large scenic spots, so as to achieve the linkage of tourism benefits. The theme of spots can be unified and the development ideas can be clarified. Additionally, the more famous ones can help less famous ones by bringing new scenic spots to the public. In fact, this can not only balance the development of scenic area but also evacuate a degree of tourist flows [19].

(2) For scenic spots, it is useful to stabilize the number of tourists by adjusting ticket price. According to the result, the peaks of tourist flows can occur in different time due to different resource condition, popularity, and spatial structure of spots. First of all, the spatial-temporal distribution of tourist flows affects the operation of scenic spot directly and stable tourist flows are conducive to the sustainable development of tourist attractions, so that operators should not only guide tourists actively but also promote rational consumption [20]. However, the adjustment of ticket prices should focus on not only different tourist flows on the midseason and off-season but also the peaks of tourist flows in midseason. According to the survey results of golden weeks, scenic spots can regulate the quantity of tourists on different days and in different periods of a day by ticket discount and restriction. Online reservation systems can also reduce the situation that large numbers of tourists queue up to buy tickets during the peak period of golden week. Also, the systems can meet the actual needs of tourists' flexible scheduling. Besides, scenic spots can strengthen cooperation with media and telecommunications operators and establish information transmission channels for tourists, so as to relieve congestion during peak hour and improve tourist's experience. Last but not least, scenic spots can cooperate with other tourism enterprises such as travel agencies to negotiate about the time and quantity of visitors, adjust the peaks of tourist flows in golden weeks, and avoid the hustle and bustle of scenic spots. Cooperation among scenic spots and tourism enterprises can improve the quality of sightseeing tour, promote the effective control of tourist flows, and protect the environment and facilities.

(3) From the perspective of travel agency and tourist, tourists should pay attention to the information of traffic and tourist flow from government and scenic spots, know the peaks of tourist flows in the spots in advance, evade rush hour, and travel rationally. Meanwhile, travel agencies should coordinate with the public management of government and understand the actual situation of scenic spots, in order to improve the customer's experience and obtain more economic benefits.

Conclusion and Discussion

In conclusion, this study selects the daily tourist flow data of six

golden weeks in 34 scenic spots from the Reset database and carries out empirical research using descriptive analysis, one-way ANOVA, weekly skewness index, and correlation analysis. Furthermore, it summarizes the regular distribution pattern of peaks of tourist flows in golden weeks, which has wide applicability. Meanwhile, according to the results of spatial-temporal distribution of tourist flows, this study gives some advices on public management of government, warning of scenic spots, as well as trip planning of travel agencies and tourists.

Due to the great difficulty in data collection and the lack of new samples, this survey still has some shortcomings. If conditions permit, this paper can conduct a more in-depth study of the golden week by large capacity sample.

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