Advances in Social Science, Education and Humanities Research, volume 480
Proceedings of the 2020 5th International Conference on Modern Management and Education Technology (MMET 2020)

Analysis on the Spatial Structure Characteristics of Gansu Tourism Flow Based on the Social Network Analysis Method

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ABSTRACT
This paper uses the method of social network analysis, takes the digital footprint of tourists of big data on the Internet as the original data, constructs the network structure map of Gansu tourism flow by using Ucinet and Netdraw software, and systematically describes the spatial structure characteristics of Gansu tourism flow. On this basis, it makes an in-depth analysis of the problems existing in the development of Gansu tourism. It is found that: (1) the level of scenic spots in Gansu has a low matching degree with consumption hot spots, and (2) the tourist flow routes in Gansu show a multi-core and multi-point distribution pattern. Scenic spots such as Mogao Grottoes, Kongtong Mountain, Labrang Temple and Zhangye Danxia Geopark jointly form the core of tourism flow, while scenic spots such as Dadun Gorge, Hesheng Ancient fossil Museum, Xinglong Mountain and Baita Temple are still "isolated island attractions". (3) there is a lack of systematic overall management for the further excavation and high-quality development of tourism resources in Gansu.
Keywords *: digital feature, tourism flow, social network analysis*

1. CONSTRUCTION OF GANSU TOURISM FLOW NETWORK STRUCTURE

The tourism flow system is a spatial network structure composed of tourism flow nodes, tourism flow channels and tourism flow festivals. Exploring the spatial distribution characteristics of tourism flow is of great significance to the development of global tourism and the planning of tourist destination routes.[1][2]

Data collection and processing

Based on the principles of tourism market share, website popularity and interactivity, this research selects Mafengwo as the data collection website, and uses the crawler software Python to collect the digital footprint data of domestic tourists traveling to Gansu in 2018.

2. CENTRALITY ANALYSIS

Centrality analysis is one of the important analytical methods of social network theory. It is a quantitative expression of the core status of actors (nodes) in the network from the perspective of "relationship". This paper will analyze the structural characteristics of tourist flow in Gansu Province through three indicators: degree centrality, intermediary centrality and proximity centrality.[3]

Table 1 Degree centrality calculation diagram

		1 Degree	2 NrmDegree	3 Share
1	Maiji Mountain Grottoes	20.000	12.346	0.100
5	Kongtong Mountain	18.000	11.111	0.090
15	Zhangye Danxia National Geological Park	18.000	11.111	0.090

18	Labrang Monastery	17.000	10.494	0.085
4	Wuwei Confucian Temple	15.000	9.259	0.075
6	Mogao Grottoes	14.000	8.642	0.070
2	Fuxi Temple	14.000	8.642	0.070
9	Mingsha Mountain Crescent Spring	12.000	7.407	0.060
12	Guan Egou	9.000	5.556	0.045
21	Nishisa Ode	8.000	4.938	0.040
16	Horseshoe Temple	8.000	4.938	0.040
8	Jiayuguan Cultural Relic Scenic Area	7.000	4.321	0.035
13	Langmusi	7.000	4.321	0.035
27	Palace of the Queen Mother	7.000	4.321	0.035
19	Eight Lanes and Thirteen Alleys	6.000	3.704	0.030
14	Wuwei Leitai	5.000	3.086	0.025
20	Vientiane Cave	3.000	1.852	0.015
3	Yuquan Temple	2.000	1.235	0.010
10	Shouyang Mountain	2.000	1.235	0.010
26	Yellow River Stone Forest	2.000	1.235	0.010
11	Weihe Source	2.000	1.235	0.010
25	Three Gorges of the Yellow River	2.000	1.235	0.010
23	East Mansion	1.000	0.617	0.005
7	Qin Culture Museum	1.000	0.617	0.005
22	Hezheng Ancient Animal Fossil Museum	0.000	0.000	0.000
17	White pagoda temple	0.000	0.000	0.000
24	Xinglong Mountain	0.000	0.000	0.000
28	Dadun gorge	0.000	0.000	0.000

Degree centrality is to express the degree of a point or a person's center in the whole network, or to judge the importance of a node in this network by studying the centrality of a node.[4]

Through the analysis of degree centrality, it is found that the degree centrality in the network nodes is divided into 15 types. The highest degree centrality is node 1, Maiji Mountain Grottoes, and the lowest is the node Hezheng Ancient Animal Fossil Museum, Baita Temple, Xinglong Mountain and Dadun Gorge show that node 1 Maiji Mountain Grottoes has the most connections with other nodes in the network, occupying the central position of the entire network, and conducting tourism analysis for this scenic spot and proposing policies will often achieve better results.

Table 2 Intermediary centrality calculation diagram

		1 Betweenness	2 nBetweenness
1	Maiji Mountain Grottoes	47.500	6.766
6	Mogao Grottoes	42.500	6.054
5	Kongtong Mountain	29.500	4.202
9	Mingsha Mountain Crescent Spring	29.000	4.131
21	Nishisa Ode	25.500	3.632
12	Fuxi Temple	22.500	3.205
15	Guan Egou	20.500	2.920
14	Zhangye Danxia National Geological Park	20.000	2.849
4	Wuwei Leitai	13.000	1.852

18	Wuwei Confucian Temple	8.000	1.140
27	Labrang Monastery	7.000	0.997
19	Palace of the Queen Mother	4.000	0.570
3	Eight Lanes and Thirteen Alleys	3.000	0.427
8	Yuquan Temple	0.000	0.000
10	Jiayuguan Cultural Relic Scenic Area	0.000	0.000
17	Shouyang Mountain	0.000	0.000
11	White pagoda temple	0.000	0.000
16	Weihe Source	0.000	0.000
20	Horseshoe Temple	0.000	0.000
7	Vientiane Cave	0.000	0.000
22	Qin Culture Museum	0.000	0.000
23	Hezheng Ancient Animal Fossil Museum	0.000	0.000
24	East Mansion	0.000	0.000
25	Xinglong Mountain	0.000	0.000
26	Three Gorges of the Yellow River	0.000	0.000
13	Langmusi	0.000	0.000
28	Dadun gorge	0.000	0.000

Intermediary centrality refers to the number of times that a node acts as the shortest bridge between the other two nodes, which can be used to measure whether a tourism node occupies the intermediary position of other nodes. The higher the number of times a node acts as an intermediary, the greater its intermediary centrality.[5]

The highest betweenness centrality in the network is the Maijishan Grottoes of node 1, indicating that node 1 is in the middle position of other nodes. If it is lost, it will be more difficult for the other two to communicate. The lowest network intermediary centers are Yuquan Temple, Jiayuguan Cultural Relics Scenic Spot, Shouyang Mountain, Baita Temple, Weihe River Source, Mati Temple, Vientiane Cave, Qin Culture Museum, Hezheng Ancient Animal Fossil Museum, Donggongguan, Xinglong Mountain, and Yellow River Among the 15 nodes, including the Three Gorges, the Stone Forest of the Yellow River, Langmusi, and Dadunxia the betweenness centrality is 0. This shows that these 15 nodes do not play a role in information communication in the network, and are at the edge of the network, acting as a bridge.

Table 3 Calculation diagram of proximity to centrality

		1 inFarness	2 outFarness	3 inCloseness	4 outCloseness
13	Langmusi	268.000	756.000	10.075	3.571
18	Labrang Monastery	295.000	729.000	9.153	3.704
8	Jiayuguan Cultural Relic	344.000	756.000	7.849	3.571
2	Fuxi Temple	369.000	497.000	7.317	5.433
6	Mogao Grottoes	369.000	498.000	7.317	5.422
1	Maiji Mountain Grottoes	371.000	492.000	7.278	5.488
9	Mingsha Mountain Crescent Spring	371.000	499.000	7.278	5.411
5	Kongtong Mountain	374.000	494.000	7.219	5.466
21	Nishisa Ode	379.000	503.000	7.124	5.368
27	Palace of the Queen Mother	381.000	497.000	7.087	5.433
12	Guan Egou	391.000	496.000	6.905	5.444
4	Wuwei Confucian Temple	649.000	456.000	4.160	5.921

15	Zhangye Danxia National Geological Park	651.000	447.000	4.147	6.040
25	Three Gorges of the Yellow River	703.000	756.000	3.841	3.571
19	Eight Lanes and Thirteen Alleys	729.000	676.000	3.704	3.994
11	Weihe Source	729.000	756.000	3.704	3.571
14	Wuwei Leitai	729.000	425.000	3.704	6.353
3	Yuquan Temple	756.000	411.000	3.571	6.569
10	Shouyang Mountain	756.000	729.000	3.571	3.704
17	White pagoda temple	756.000	756.000	3.571	3.571
7	Qin Culture Museum	756.000	477.000	3.571	5.660
16	Horseshoe Temple	756.000	431.000	3.571	6.265
23	East Mansion	756.000	652.000	3.571	4.141
24	Xinglong Mountain	756.000	756.000	3.571	3.571
22	Hezheng Ancient Animal Fossil Museum	756.000	756.000	3.571	3.571
20	Vientiane Cave	756.000	486.000	3.571	5.556
28	Dadun gorge	756.000	756.000	3.571	3.571

The closeness centrality indicates the closeness of a point to all other nodes. If a node has a relatively close flow relationship with other nodes as a whole, and the connection "distance" between them is short, the closeness centrality is relatively high.

The closer to the center of the analysis shows that Lang wooden temple from the value of the minimum, close to the center is relatively high, indicating that the network "relationship" with the other node distance is relatively short, relatively close to other attractions in the overall relationship.

The nodes Dadunxia, Hezheng Ancient Fossil Museum, Xinglong Mountain, Baita Temple, etc. have the largest distance to the center, indicating that the nodes such as Dadunxia and Hezheng Ancient Fossil Museum are in an isolated state on the periphery of the network, and have a relationship with tourists from other attractions.

3. CONCLUSION

In terms of the characteristics and trends presented by the digital footprint of tourists, the tourist flow routes of Gansu tourists show a multi-core and multi-point distribution pattern. Kongtong Mountain, Mogao Grottoes, Labrang Monastery, Zhangye Danxia Geopark, etc. are the core of tourists traveling to Gansu, and together constitute the core component of tourism flow. In the Gansu tourism flow network structure diagram, Kongtong Mountain and Dunhuang Mogao Grottoes have the most connections with other nodes in the network, occupying the central position of the entire network, connecting the entire Gansu tourism flow network, and are the two important ones.

For scenic spots, formulating relevant industrial policies, marketing plans, and transportation layouts for the scenic spots will often achieve better results. However, some scenic spots are in the state of "isolated islands." Dadunxia, Hezheng Ancient Fossil Museum, Xinglong Mountain, Baita Temple and other scenic spots are not closely connected with other scenic spots, do not play a node role, and there is no reasonable tour route design to connect them with other scenic spots. Other scenic spots are connected as a tourist route. In terms of tourism transportation route design and marketing planning, these scenic spots should actively seek cooperation with surrounding scenic spots, break through the scope of administrative divisions, and achieve win-win cooperation.

This paper is a beneficial attempt to explore the spatial and temporal characteristics of Gansu Tourism Flow Based on the network digital footprint. It aims to grasp the structural characteristics of Gansu tourism flow more comprehensively, provide decision-making basis for the development of Gansu's tourism, and provide reference for the development of other urban tourism cities. Of course, the article also has some limitations, tourism data can be further supplemented, the article only collected the data of a single tourism website in Mafengwo, not combined with multiple tourism website data for analysis, and the digital footprint data can only represent a part of tourists' perception of the destination tourism market, cannot reflect the characteristics of all tourists, the development of destination wide tourism and other aspects It is also worth further studying.

ACKNOWLEDGMENT

This work is one of the phased achievements of the Gansu Provincial Sports Bureau project "The Diversified Development Path of Rural Sports under the Vision of Precision Poverty Alleviation-Taking Gansu "Two Prefectures and One County" as an Example" (project number: GST201921)

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