

Spatial Distribution Characteristics and Influencing Factors of Folk House-Type Tourist Attractions: A Case Study of Shanxi Grand Courtyard Dwellings (Postprint)

Authors: Lu Xueliang, Wang Guoliang, Hu Weixia, Jin Yu, Yan Yu

Date: 2019-01-11T00:00:00+00:00

Abstract

Traditional residential courtyard scenic areas constitute the primary component of cultural landscapes. This study examines 136 “Shanxi Famous Courtyard Residential Scenic Areas” in Shanxi Province, utilizing Google Earth and Baidu Maps to determine coordinate-based basic geographic information. ArcGIS 10.3 spatial analysis methods are employed for visualization to analyze the spatial distribution patterns and influencing factors of Shanxi courtyard scenic areas. The results indicate: The 136 courtyard scenic areas across 11 prefecture-level cities in Shanxi Province demonstrate a relatively uniform overall spatial distribution.

Significant spatial variations exist among Shanxi courtyard scenic areas, forming seven distinct density agglomeration centers and two density agglomeration regions, with the overall distribution oriented along a northeast-southwest axis.

Municipal-level distribution is unbalanced, exhibiting concentration in peripheral areas anchored by Jinzhong and Jincheng. The elevation spatial pattern reveals that 74.26% of courtyard scenic areas are situated at altitudes between 1500m and 2500m, with altitude macroscopically influencing the overall spatial configuration of courtyard scenic areas. The average distance of courtyard scenic areas from rivers is 2.3km, displaying distribution characteristics that follow river courses. The distribution of courtyard scenic areas demonstrates an urban-oriented pattern, manifesting as a gradual decrease from center to periphery.

Full Text

Preamble

DOI: 10.12118/j.issn.1000-6060.2019.01.24

Journal: Arid Land Geography

Authors: Lu Xueliang, Wang Guoliang, Hu Weixia, Jin Yu, Yan Yu
Affiliation: School of Geography Sciences, Shanxi Normal University, Linfen 041000, China

Corresponding Author: Hu Weixia (E-mail: huiweixia2002@163.com)

Abstract

Taking 136 courtyard scenic spots in Shanxi Province, China as the research objects, this study used GIS spatial analysis to comprehensively analyze their distribution patterns and influencing factors. The geometric center coordinates of 136 courtyard scenic spots were collected to quantitatively analyze the spatial distribution patterns of the compound scenic spots via nuclear density estimation method, standard deviational ellipse, and spatial “hotspot analysis” method, and qualitatively analyze the influencing factors of the distribution pattern. The results indicated that the spatial distribution of the 136 scenic spots in 11 cities in Shanxi Province is congregated, but there are obvious spatial differences in the courtyard scenic spots because the distribution of the cities is uneven and the altitude affects the overall spatial pattern of the scenic spots from a macro perspective, which make the distribution of the compound scenic spots tend to be developed along the river and relying on the city. All above will provide new ideas for the future research on the pattern of famous scenic spots in Shanxi Province, which will be better for reasonably developing the residential scenic spots of Shanxi in the space layout, and scientifically promote the upgrading and transformation of the tourism industry of Shanxi in the future.

Keywords: Shanxi Province; courtyard scenic spot; spatial distribution characteristics

1.2 Data Sources and Research Methods

This study utilized Google Earth imagery as the primary data source for identifying courtyard scenic spots. ArcGIS 10.3 software was employed for spatial data processing and analysis. The research methodology comprised three main components:

1. **Data Collection:** The geographic coordinates of 136 courtyard scenic spots were extracted from Google Earth imagery covering Shanxi Province. These scenic spots are distributed across 11 prefecture-level cities within the province.
2. **Spatial Analysis Techniques:** The study applied three quantitative methods for pattern analysis:

- **Kernel Density Estimation:** This method was used to identify spatial clustering patterns of the scenic spots.
- **Standard Deviational Ellipse:** This technique characterized the directional trend and dispersion of the spatial distribution.
- **Getis-Ord G_i^* Hotspot Analysis:** This approach identified statistically significant spatial clusters of high and low values. The G_i^* statistic was calculated for each feature, with positive Z-scores indicating hotspot clusters and negative Z-scores indicating coldspot clusters.

3. **Elevation Differentiation Analysis:** Based on topographic data with 1500m-2500m elevation ranges, the study examined how altitude influences the spatial distribution of courtyard scenic spots. The average nearest neighbor distance was calculated as 2.3 km, with standard deviation analysis revealing distinct elevation-based clustering patterns.

The spatial distribution was analyzed at multiple scales, with particular attention to clustering within 2 km, 12 km, and other distance thresholds. Moran's I statistic was used to measure spatial autocorrelation, revealing significant positive spatial correlation among the distribution patterns.

2.2 Spatial Distribution Characteristics

The analysis revealed that the 136 courtyard scenic spots exhibit a concentrated distribution pattern across Shanxi Province, though significant spatial variations exist among the 11 cities. The uneven distribution of cities themselves, combined with topographic factors, creates a macro-level spatial pattern where scenic spots tend to develop along river systems and in proximity to urban centers.

The kernel density analysis identified multiple high-density clusters, with the most significant concentrations occurring in areas where elevation ranges between 1500m and 2500m. The standard deviational ellipse analysis showed a northwest-southeast orientation of the overall distribution, reflecting the province's topographic and hydrologic characteristics.

2.4 Elevation Differentiation Patterns

Elevation emerged as a critical factor influencing the spatial distribution of courtyard scenic spots. The analysis identified distinct elevation-based patterns:

1. **Low Elevation Zones (500-1000m):** These areas contained the highest concentration of scenic spots, with 74.26% of all spots located below 1500m elevation. Within this zone, 101 scenic spots were identified, representing the primary development belt.

2. **Mid Elevation Zones (1500-2500m):** This range contained a secondary concentration of scenic spots, with distribution patterns showing moderate clustering.
3. **High Elevation Zones (>2500m):** Very few scenic spots were found above 2500m, indicating clear elevation constraints on tourism development.

The average elevation of scenic spots was 1710m, with a standard deviation of 361m. The maximum elevation reached 2857m, while the minimum was 836.34m. These statistics demonstrate that courtyard tourism development in Shanxi is predominantly concentrated in mid-to-low elevation areas.

2.6 Spatial Autocorrelation Analysis

Using Moran's I statistic, the study detected significant positive spatial autocorrelation in the distribution of courtyard scenic spots. The analysis revealed that scenic spots tend to cluster spatially rather than distribute randomly, with high-value clusters (hotspots) identified in specific geographic regions.

The hotspot analysis based on Getis-Ord G_i^* statistics identified several significant spatial clusters at various distance thresholds (6km, 12km, 18km, 24km, 30km, and 36km). The most pronounced clustering occurred at the 12km scale, where 78.67% of scenic spots formed statistically significant hotspots. This multi-scale approach confirmed that spatial clustering patterns are scale-dependent, with optimal detection occurring at intermediate distances.

The results indicate that the distribution of courtyard scenic spots is not random but follows clear spatial logic related to topography, hydrology, and urban development patterns. This clustering tendency suggests that tourism development policies should consider spatial synergies and regional coordination.

References

- [1] Zhao Rong, Wang Enyong, Zhang Xiaolin, et al. Human geography [M]. Beijing: Higher Education Press, 2006: 108-109.
- [2] Gong Shengsheng, Li Zimo, Hu Juan, et al. Study on the spatial distribution and evolution of ancient villages in Shanxi Province [J]. *Scientia Geographica Sinica*, 2017, 37(3): 416-425.
- [3] Ma Xiaodong, Zhu Chuangeng, Ma Ronghua, et al. Spatial pattern and evolution of urban expansion in Suzhou [J]. *Acta Geographica Sinica*, 2008, 38(4): 405-416.

- [4] Stephen L J. Handbook of tourism analysis [M]. London: Longman Group, 1989.
- [5] Wang Jinping, Xu Qiang, Han Weicheng, et al. Shanxi folk houses [M]. Beijing: China Architecture & Building Press, 2009: 200-235.
- [6] Cui Kai. Spatial composition and morphological analysis of Shanxi land architecture: A case study of Yinyuan Villa in Guangou Village, Yanquan, Shanxi Province [D]. Taiyuan: Taiyuan University of Technology, 2007.
- [7] Ma Ronghua. Geography of Shaanxi folk houses in Ming and Qing dynasties [D]. Xi' an: Shaanxi Normal University, 2001.
- [8] Zhang Chao, Yang Binggeng. Metrological geoscience foundation [M]. Beijing: Higher Education Press, 1991: 28-54.
- [9] Tong Yuquan. Research on spatial differentiation of Chinese traditional villages based on GIS [J]. Human Geography, 2014, 29(4): 44-51.
- [10] Fischer M M, Getis A. Handbook of applied spatial analysis [M]. Berlin: Springer Berlin Heidelberg, 2010: 27-149.
- [11] Jiang Wuqi, Shi Peihua, Fang Lei. Harmonious development between tourism and resource-oriented industry: Also on the harmonious development of coal and tourism in Shanxi Province [J]. Economic Geography, 2007, 27(6): 1037-1041.
- [12] Wang Ye. Analysis of the historical characteristics and original reasons for the construction of the ancient castle in Jingsheng Village, Shanxi Province [J]. Journal of Hubei University for Nationalities (Philosophy and Social Sciences Edition), 2014, 32(4): 26-29.
- [13] Sun Juntao, Niu Junjie, Zhang Kangkang, et al. Study on spatial distribution pattern and influencing factors of traditional villages in Shanxi Province [J]. Human Geography, 2017, 32(3): 102-107.
- [14] Sharun. The natural geographical background of the architectural culture of Chinese traditional residential houses [J]. Scientia Geographica Sinica, 1998, 18(1): 58-64.
- [15] Lu Xueliang, Wang Guoliang, Hu Weixia, et al. Spatial distribution characteristics and influencing factors of residential scenic spots: Cases of courtyard scenic spots in Shanxi Province [J]. Arid Land Geography, 2019, 42(1): 206-214.

Note: Figure translations are in progress. See original paper for figures.

Source: ChinaXiv – Machine translation. Verify with original.