Analysis of the Spatial Morphology and Influencing Factors of Ancient Waterside Towns Based on Space Syntax—A Case Study of Xucun Town, a Historical and Cultural Town in China

Liu Miaomiao
Hefei Municipal Design & Research Institute Co., Ltd, Hefei, Anhui, 23000, China
15005514625@163.com

Abstract: Xucun Town in She County has been selected for inclusion in the fourth update of the Ministry of Housing and Urban–Rural Development's list of China's historically and culturally renowned towns, showcasing spatial characteristics typical of villages in the southern Anhui Province. While current research on ancient towns primarily concentrates on planning and preservation, studies addressing the spatial morphology of ancient towns and their underlying causes remain inadequate. This paper utilizes space syntax to analyze the spatial characteristics of the ancient town, exploring factors such as spatial depth, spatial integration, and spatial intelligibility to interpret its spatial morphology. Additionally, it examines the geographical location of the ancient town, regional cultural conditions, and factors contributing to the relation between the ancient town and the river. Through this comprehensive analysis of spatial morphology and its causes, our aim is to accurately grasp the traditional characteristics of the ancient town's streets and alleys. This understanding will provide a theoretical basis for the preservation and revitalization of traditional streets and alleys during the future process of protecting and renovating the ancient town.
Keywords: Ancient Waterside Towns, Xucun Town; Space Syntax, Street and Alley Spaces.

1. INTRODUCTION

Since the establishment of human settlements, people have consistently chosen to dwell near water bodies, a trend particularly pronounced in naturally formed villages and ancient towns. In Anhui Province, there are eleven historical and cultural towns, each possessing unique regional cultural traits influenced by factors such as geographical environments and regional cultures. Consequently, these towns exist in a state of historical evolution (Gu & Liu, 2015). Existing literature on Xucun Town seems limited in scope and depth, largely comprising oral histories passed down through generations. Additionally, research on the spatial morphology of the town is nearly non-existent. Tourism plays a crucial role in the economic development of ancient villages and towns. Preserving the traditional spatial morphology of streets and alleys during development and

construction processes has become a critical issue for the sustained development of these areas. This paper employs axial analysis, a method from the field of space syntax, to study the spatial depth, integration, and intelligibility of Xucun Town. It proposes the protection of existing core areas of integration, minimizing the impact and destruction of the original spatial morphology during the town's development. Studying the spatial morphology and environment of Xucun Town is crucial for filling gaps in research regarding the spatial morphology of ancient towns in southern Anhui (Zhang, 2001).

2. GEOGRAPHIC CONDITIONS AND HISTORICAL BACKGROUND

Situated at the southern foot of the Huangshan Ruoling Pass, Xucun Town is located 21 kilometers away from She County. It shares its northwestern border with Huizhou District and Huangshan District, while adjoining Shangfeng Township to the southeast. Surrounded by mountains on all sides, Xucun Town enjoys a favorable geographical location, considered an auspicious site within the principles of Feng Shui. To its east lies Wenfeng Mountain, to the west Wuxiu Mountain, to the south Tianma Mountain, and to the north Sishan Mountain. Xucun is enveloped by two water systems, the Fang Stream and Sheng Stream, converging under the Gaoyang Covered Bridge to form the Fuzi River, ultimately flowing into the Xin'an River. Xucun Town stands as a representative ancient town in the southern Anhui Province, showcasing the distinctive characteristics of Huizhou architecture. The town boasts a remarkable collection of well-preserved ancient buildings, including iconic landmarks such as the Gaoyang Covered Bridge, Wumafang Archway, Daguan Pavilion, Weishengfang Archway, Residence of the Inspector (Guanchadi), and Dabangbo Shrine (Dabangboci). With a history spanning over 1500 years since its inception, Xucun Town served as a vital passage connecting Huizhou to Anqing and Chizhou in ancient times. Over 200 well-preserved ancient buildings, primarily constructed during the Yuan, Ming, and Qing dynasties, still grace the town. These structures showcase numerous distinctive elements of the southern Anhui architecture, including stone archways, brick archways, pavilions, a covered bridge, stone arch bridges, and ancestral shrines. Particularly noteworthy is the Gaoyang Covered Bridge, an architectural gem from the Yuan dynasty featuring a unique design adorned with intricately carved beams and painted rafters. The

Wumafang and Shuangshou Cheng'enfang archways, built during the Ming dynasty, showcase exquisite carvings. The Daguan Pavilion's ceiling and main beams are painted with the pattern of "two dragons playing with a pearl," while the lower walls are adorned with the beautiful and detailed "eight trigrams" pattern. The exquisite craftsmanship of Xucun Town is evident in the intricately carved brick and wood artistry found in its well-preserved ancient homes. During the Southern dynasties period, the literary figure Ren Fang secluded himself in Xucun Town, frequently indulging in fishing along the Fang Stream. Today, a colossal rock and pavilion stand by the Fangxi Bridge, commemorating Ren Fang and his significant contribution to the formation and development of Xucun Town. This pavilion is affectionately referred to as the "Fishing Terrace of Duke Ren (Rengong Diaotai)" and serves as a memorial to Ren Fang by the local residents (Wu, 1990). During the Southern Liang dynasty, Xucun was known as Fuzili. During the Tianjian era of the Liang dynasty (502–557), it was named Fangyuan due to being the hermitage of the Xin'an Prefect Ren Fang.

"Forty miles from She County, there lies Xucun, which is the origin of the ancient Fuzi River. It was the leisure destination of Duke Ren Fang, the Prefect of Xin'an during the Liang dynasty" .

The name Fuzili was derived from the Fuzi River at the foot of the Dongshan Ruoling Pass. During the Tianjian era of the Liang dynasty (502–519), Ren Fang "went on a spring excursion while serving as the Prefect of Xin'an and fell in love with the beauty of the Fuzi landscape, thus choosing to settle there. Later, he named his residence Fangyuan." Thus, the transition from the name Fuzili to Fangyuan was due to Xin'an Prefect Ren Fang settling in the area. According to the inscription on the Stele for the Fusheng Grand Shrine, written by Xu Wenwei, Libationer of the National University in the Jingding Jiazi year of the Song dynasty (1264):

"The establishment of Fusheng Grand Shrine dates back to the 2nd year of Dali in the Datong era of the Southern Liang dynasty (536 AD). At that time, Prefect Ren chose to escape the mundane world and take refuge here".

During the middle of the Tang Dynasty (847–859), the Provincial Governor Lu Pan, renowned for his discerning governance, decided to change the name of Fangyuan to Renxi and Rengong Village. However, it is worth noting that in the Tang dynasty, the names "Fangyuan" and "Rengong Village" were already firmly established (Gu et al., 2000). In the late Tang dynasty, Xu Ru and his father fled from Yongzhou to Jiangnan

and settled in the area. Their family's profound literary heritage enabled Xu Ru to participate in the imperial examinations, eventually leading to a successful career in government service. This event holds great significance for the subsequent flourishing of the literary culture in Xucun. Due to their admiration for the teachings of sages, 19 members of the Xu family, migrating to the south during the Southern Song dynasty, achieved success in the imperial examinations. In the Ming and Qing dynasties, 38 officials were born in the town. Owing to its mountainous terrain, Huizhou had limited arable land, resulting in a population dominated by merchants. With the robust economic power of the Huizhou merchants and their fascination with Feng Shui, the residents of Xucun constructed a unique ancient town described as "surrounded by four mountains, resembling a city, with residences arranged in tight rows like the scales of a fish." After the Qin and Han dynasties, a significant number of people from the Central Plains and other regions moved to Huizhou to escape war. Due to the growing prosperity of the Xu family during the Southern Song dynasty, the town was named "Xucun," and thus, the name Xucun has a history of nearly a thousand years. Over three hundred years, from the Southern Song to the early Ming dynasty, Huizhou's society, culture, and economy experienced steady development. The relocation of the northern gentry to Huizhou caused the city to undergo a developmental process often described by scholars as "immigration, imperial examinations, and Huizhou merchants." The flourishing villages in Huizhou owed their success to the enterprising Huizhou merchants. By the Chenghua and Hongzhi eras of the Ming dynasty, these merchants had already established themselves, amassing substantial economic profits. Simultaneously, the circulation of social commodities increased at an unusually slow pace. The Huizhou merchants, having acquired significant wealth, reinvested in their homeland, purchasing land, erecting ancestral halls, and constructing gardens. This influx of wealth significantly contributed to the prosperity of Huizhou villages during the Ming and Qing dynasties (Wang, 1994).

3. ANALYSIS OF SPATIAL STRUCTURE

A significant connection exists between the selection of the site for Xucun Town and cultural ideology, rooted in the development brought by Huizhou merchants. The formation of this ancient town is intricately linked to Feng Shui principles, with site selection and spatial layout playing pivotal roles. In the pursuit of establishing a "lasting foundation" for future

generations, Xu Ru extensively sought guidance through divination to select a residence. The divination results indicated the following: "The four gentlemen seek to reside in Raozhou and Shezhou. Yang, Luo, Fang, and Dong represent the foundation of prosperity and wealth." The "Xu Clan East Dunbentang Genealogy: Terrain and Situation of Xucun Town," compiled in the Qing dynasty, provides a detailed description of Xucun's terrain:

"To the left is Wenfeng Mountain, to the right is Wuxiu Mountain, the town is embraced by Tianma Mountain, and leans against Jinping Mountain. Two crystalline streams meander around the magnificent mountain range, tributaries of the Lian River that eventually converge into the Yellow Sea".

A comparison between the topography of Xucun Town and an idealized model of a village layout reveals striking similarities. The prosperity of villages in Huizhou owes much to the success of Huizhou merchants. The concept of "all things returning to their roots" is deeply ingrained in the thinking of the Huizhou people. After accumulating substantial profits, Huizhou merchants returned to their hometowns, purchasing land, constructing ancestral shrines, and repairing gardens. Additionally, the morphology of the town is closely linked to the shape of the land formed by the Fang and Sheng streams (Zhang, 1995). The spatial pattern formation of Xucun Town distinctly reflects local cultural ideologies. The water systems of Xucun Town play a crucial role in defining its location and character. The town spans a considerable area, encompassing a natural village strip stretching approximately ten miles from Ruxin Pavilion in Jincun to Shanhua Pavilion in Dongsha. Situated along the water's edge, the town is renowned as "Xucun's Ten Miles of Water," a designation that highlights the town's distinctive natural conditions.

3.1 Spatial Depth

Applying the space syntax axial analysis method to organize the spatial system of roads in Xucun Town revealed 284 axes. The maximum depth value reached 23 steps, while the average depth value stands at 9 steps. Notably, the road leading to the town government building has a depth value of 0. An average depth value of 9 steps suggests that the ancient town is relatively challenging to navigate, featuring winding and meandering roads with fewer straight paths. This characteristic aligns with the natural village state formed by Xucun Town. The spatial features of larger depth values, along with two peaks of depth values, are closely linked to the town's natural environment. Positioned at the convergence of the Fang and

Sheng streams, Xucun Town occupies the hinterland of a Y-shaped space formed by the confluence of these two rivers (Cui & Wu, 1990). The rivers naturally divide the convergence point into three areas, and the village, naturally forming along the two rivers, is characterized by the rivers running through its center. Residential areas, separated by the rivers, have gradually formed distinct clusters, interconnected by bridges.

Figure 1: Spatial Depth of Xucun Town

Table 1: Depth Values of Xucun Town

Steps	**<2.3**	**2.3-4.6**	**4.6-6.9**	**6.9-9.2**	**9.2-11.5**	**11.5-13.8**	**13.8-16.1**	**16.1-18.4**	**18.4-20.7**	**>20.7**
Axes	17	46	55	71	37	13	21	15	6	3

The depth value analysis table indicates the presence of two prominent peaks in the number of axes. The first peak falls within the range of 6.9 to 9.2 steps, encompassing 71 axes, while the second peak ranges from 13.8 to 16.1 steps, comprising 21 axes. Numerical variations suggest that the spatial layout of the ancient town is predominantly clustered, with noticeable differences in size between the two clusters. Given that the highest peak falls between 6.9 and 9.2 steps, the depth values of the larger cluster are relatively lower than those of the smaller cluster. This suggests higher accessibility for the smaller cluster, indicating that the larger cluster potentially accommodates more functional public spaces and areas. The peak in the smaller cluster at 13.8 to 16.1 steps displays greater depth values, indicating a more considerable distance in the spatial layout and a greater independence in functionality (Hu, 1995). The trough between the two peaks, occurring between 11.5 and 13.8 steps, signifies a rapid decrease in the number of roads, followed by an increase in the number of axes. This suggests a decrease in the road count, revealing that Xucun Town displays a clustered layout connected by roads, as depicted in Figure 1.

Moreover, the significant difference in the number of axes between the two peak values indicates a sharp reduction in road quantity. The depth value table illustrates that the town's layout can be understood as taking the form of a large cluster interconnected to a smaller cluster.

3.2 Spatial Integration

The global integration degree denotes the relative reachability of one axis to all other axes in the system, with a radius of "n" representing the degree of aggregation or dispersion between a singular spatial unit and all other spaces within the system. The local integration degree refers to the relative reachability of an axis to other axes within a topological radius of 3 or more steps. This delineates the degree of aggregation or dispersion between a singular spatial unit and other spaces within a three-step proximity. The local integration degree essentially captures the ease or difficulty of reaching a specific node within the pedestrian space (Zhang & Hao, 2002).

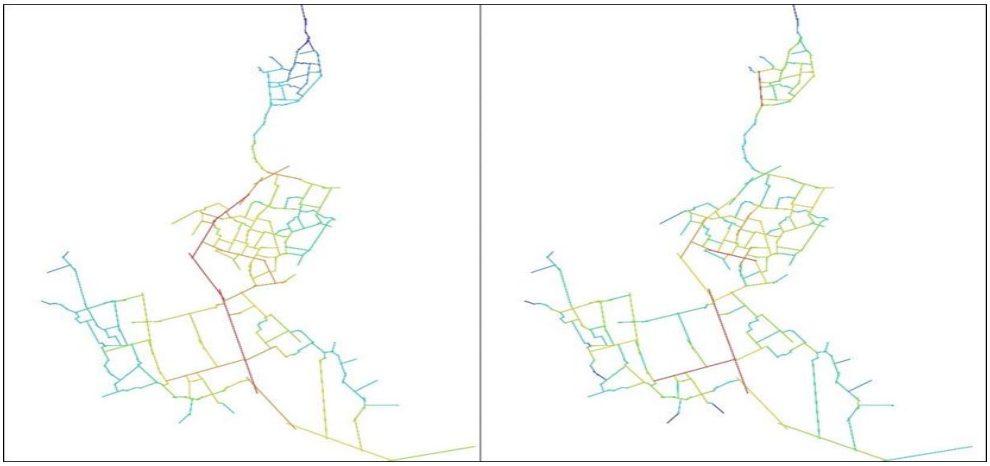

Figure 2: Global and Local Integration Map of Xucun Town

When a space exhibits high integration at both local and global scales, represented by shades of orange–red, it implies that the space serves as the integrated core area of the city, essentially the city's center. For example, a space showing high integration at the global scale might represent a city's expressway, while high local integration could indicate the most crowded spot within a residential area. Only spaces demonstrating both high global and local integration can serve as the true center of the city.In the case of Xucun Town, the global integration measures 0.4857, while the local integration is 1.2046. The orange–red axes within the global integration map in Figure 2 represent the primary roadways and high-speed roads within the town. The overlap between global and local integration is evident in the roads leading to the town hall square and the entrance to Gaoyang Bridge. These roads currently experience the most frequent

commercial activities within the ancient town and are where the town hall, market, and shops are concentrated. Additionally, these pathways serve as the essential passages to access the ancient village complex, making Gaoyang Bridge a critical node in Xucun Town. An analysis of global integration reveals four orange–red axes distributed across three areas, suggesting the mutual independence of these regions (Guo). This indicates locally high integration, with increased foot traffic and usability in the local road networks within these areas. The formation of such a spatial state may be attributed to the dispersed points during the developmental stages of the village, each having its own core area. As the population grew, residential areas expanded outward, eventually converging at their boundaries. As the economy developed, roads were constructed to connect these distinct cores, resulting in the clustered village form seen today (Hu & Wang, 2008).

3.3 Control Value

Figure 3: Control Value Analysis Diagram of Xucun Town

Figure 4: Distribution of Major Scenic Spots and Ancient Dwellings

The control value represents the degree of control a particular space exerts over the spaces it intersects, reflecting spatial permeability. In an

actual spatial system, a higher control value for a space indicates better spatial permeability. For Xucun, the average control value is 1, with the maximum value being 2.7. This suggests a strong dependency of surrounding nodes on the town, indicating good spatial permeability. As observed from the earlier analysis of global and local integration, the axis with the highest degree of integration has the highest control value, which is 2.7. In the control value analysis, the axis control values of 2.6666 and 2.5 correspond to the global integration values of 0.6049 and 0.3627, respectively. Chengxu Highway serves as the most convenient vehicular-accessible road for entering and exiting Xucun Town. Axis 1, which has the highest integration value, serves as the main traffic road of Xucun, thus possessing a higher control value over the ancient town area (Liao et al., 2021). Axis 2, located in the clustered area at the convergence of the Fang and Sheng streams, exhibits high control intensity due to its intersections with various side alleys. Within this clustered area, it exerts significant control over the surrounding nodes and spaces, despite not displaying a notably high degree of integration. Regarding the correlation between scenic spots and control values, archways, ancestral shrines, and sites of ancient residences in Xucun are relatively dispersed throughout the old town. Divided by the Chengxu Highway main road and Gaoyang Bridge, the ancient town is segregated into three zones: A - the space between the Fang and Sheng streams; B - from the archway entrance at the southern end of the ancient town to Gaoyang Bridge; and C - the ancient town space west of the Chengxu Highway. The control value analysis diagram indicates that Axis 1 is connected to the main roads of zones A, B, and C, with the control range covering the entire area. Axis 2, with a control value of 2.666, has a control value slightly lower than Axis 1, particularly in Zone A, which has a higher concentration of major attractions and ancient residences and the highest density of axes among the three zones. Zone C, separated from zones A and B by the Chengxu Highway, possesses relative independence. Its lower axis density and lower density of scenic spots and ancient dwellings contribute to its control value being slightly lower, at 2.5, compared with axes 1 and 2. Overall, Xucun exhibits a relatively good overall control value (Luo & Lin, 2023).

3.4 Summary

Xucun Town exhibits a spatial morphology comprising multiple clusters, characterized by a compact layout and relatively distinct, independent boundaries between its internal and external spaces. This layout is closely tied to the local adherence to traditional Confucian thought, emphasizing private spaces with limited open areas. Main connecting roads may be

wider, but overall, streets and lanes in Xucun Town are relatively narrow. The scale of convex polygonal node spaces is small, lacking larger-scale spatial nodes. This configuration facilitates the relative independence and privacy of public spaces. However, due to this enhanced privacy, the depth value is relatively high, resulting in a lower degree of intelligibility. The integration of space syntax analysis with an examination of the town's cultural thought reveals the distinct spatial characteristics of Xucun Town (Gao et al., 2021). Notably, the old streets in Xucun lack a prominent main commercial street, a characteristic closely associated with the local economic approach. Historically, the majority of Xucun residents were engaged in external trade or government positions, leading to infrequent commercial activities. The economic system was self-sufficient, and commercial activities predominantly served the local residents, resulting in a scattered layout of commerce. Analysis of the pedestrian flow interface in Xucun Town indicates relatively low values. This is attributed to the overall complexity of roads in the town, where the direction of streets and lanes lacks a consistent pattern. The low recognizability of the roads makes it challenging to establish specific points for commercial activities. Consequently, the roaming paths of external visitors lack strong predictability, limiting possibilities for commercial activities. As a typical Huizhou village culturally, Xucun Town embodies free spatial relationships, spatial morphology, and a lifestyle with little interaction with the outside world. Cultural thought is directly manifested in the spatial environment.

4. CAUSES OF THE SPATIAL RELATION BETWEEN THE ANCIENT TOWN AND WATER SYSTEMS

Figure 5 indicates that the Y-shaped intersection of the two rivers divides the space of Xucun Town into three parts. The Sheng Stream separates Xucun into clustered spaces, connected by the Gaoyang Covered Bridge. Buildings on both sides of the Sheng Stream are predominantly constructed along the riverfront due to its narrow width. The relation between buildings and the water system along the Fang Stream, which has a wider riverbed, appears more separated. The site selection of Xucun has a significant relation with the study of Feng Shui, and the formation of its spatial morphology is closely linked to its geographical environment. Xucun is situated between the Sheng and Fang streams, which converge within the town to form the Fuzi River (Zhang et al., 2023). The "Huizhou Prefecture Local Chronicle" documented that prior to the founding of the Republic of China, there were three major waterway routes in She County:

the Xin'an River, Jian River, and Lian River routes. Due to the mountainous terrain in She County, only certain segments of these rivers were navigable. The upper reaches of the Lian River allowed navigation from the county town to the south of the Xi Stream. The Fuzi River enabled navigation from the county town to Fengkou. However, the upper reaches of the Fuzi River where Xucun is located were not navigable for the transportation of goods. Due to the mountainous terrain and underdeveloped waterways in the region, there are numerous ancient roads in She County. Cheng-Ruo Ancient Road is one such example that runs through Huizhou, Xucun, and Ruoling Pass. It is apparent that land transportation in Xucun is more convenient than water transportation. Therefore, the primary function of water systems in Xucun is not for transportation but rather is closely connected to Feng Shui and the residents' means of production and lifestyle in the town (Liao et al., 2022).

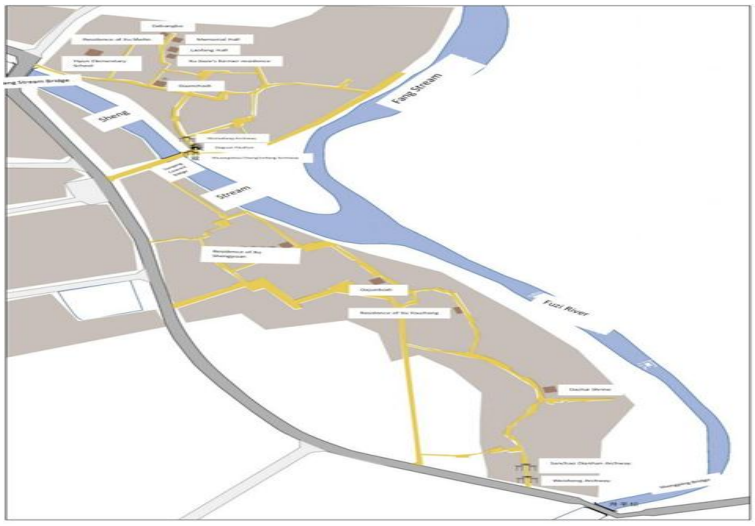

Figure 5: Relation between Xucun Town and the Water Systems

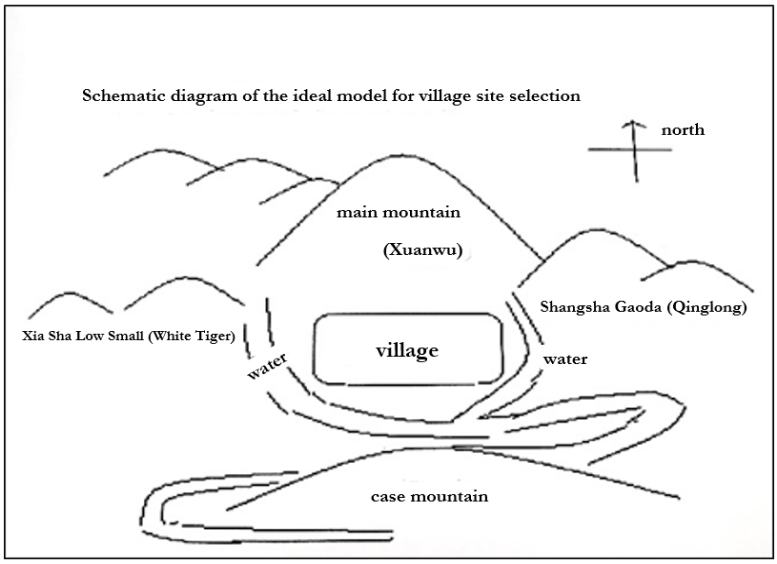

Figure 6: Ideal Site Selection for Xucun Town

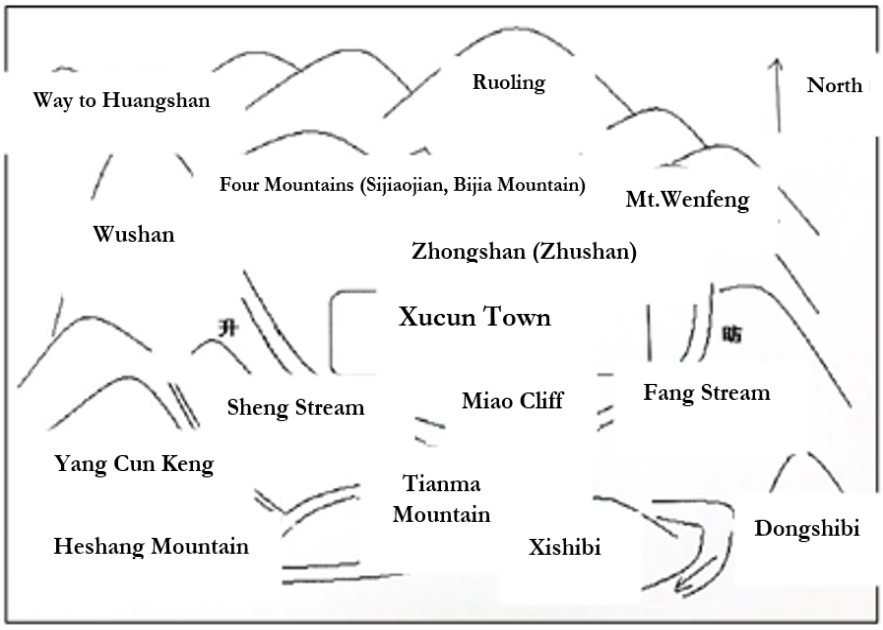

Figure 7: Xucun's Mountains and Terrains

The spatial structure of Xucun Town is intricately linked to its water systems. However, during the initial establishment of Xucun Town, these water systems primarily served as the foundation of Feng Shui principles, limiting their influence on the formation of the spatial morphology of the town. Figures 6 and 7 highlight the significant position water systems hold in the ideal village pattern. Xucun's site selection was primarily based on the ideal village pattern in Feng Shui. For Xucun, the main function of water systems is neither transportation nor irrigation but rather an indispensable condition to achieve an ideal living environment under Feng Shui principles. The function of these water systems primarily caters to spiritual needs rather than practical necessities (Teng et al., 2021).

5. SPATIAL ELEMENTS OF THE ANCIENT TOWN

5.1 Bridges and Pavilions

Situated in the southern Anhui Province, Xucun Town is surrounded by water, resulting in the presence of numerous bridges and pavilions within its precincts. Gaoyang Bridge, a covered bridge, spans the West Stream. Initially constructed by Xucun resident and Yuan dynasty scholar, Xu Youshan, it was originally a wooden bridge supported by a pair of stone piers. During the Hongzhi era of the Ming dynasty, it underwent a transformation into a stone arch bridge. In the Jiajing era, around the year of Kuiyou (1557), Xu Hanqing and others donated funds for its reconstruction, leading to its renaming as Gaoyang Bridge. Subsequently,

during the Kangxi era of the Qing dynasty, it underwent further renovations, culminating in its present form. The bridge is adorned with a gallery comprising seven sections, each featuring benches on both sides. Buddha statues adorn the middle and south sides. The gallery also incorporates windows, offering scenic views. The square and hexagonal windows of each section vary in size, serving as a method to regulate air pressure within the gallery. At the top of the bridge structure, an architectural motif resembling a "Song-style official hat" symbolizes the aspiration for future generations to attain high-ranking government positions. On the east and west sides of the "official hat" structure, there are semi-circular gallery doors. Additionally, on the north and south sides of the bridge, there are eight pillars and six benches, respectively (Xiaxuan et al., 2022).

Table 2: The Bridges of Xucun Town

Name	Year of Construction	Location	Structure	Photo
Bashi Bridge	The 52nd year of Qianlong's reign (1787)	Entrance to Yangjiatian Village	Single-arch stone bridge	
Gaoyang Bridge	Yuan dynasty	Over Sheng Stream, Xucun Town	Initially constructed as a twin-arch stone pier wooden bridge.	
	Ming dynasty, Hongzhi era (1488-1496)		Converted into a stone arch bridge.	
	Ming dynasty, the Guiyou year of Jiajing's reign (1557)		Gallery was established.	
	Qing dynasty, the Yihai year of Kangxi's reign (1718)		Comprises seven sections, with benches on both sides, Buddha statues in the middle and on the south side, and painted ceilings.	

Table 3(a): The Pavilions of Xucun Town

Name	Year of Construction	Location	Current State	Photo
Daguan Pavilion	Ming dynasty, the Wuxu year of Jiajing's reign (1537)	East of Gaoyang Bridge in the village	Still existing	
Shanhua Pavilion	Ming dynasty, the Xinhai year of Jiajing's reign (1551)	Entrance of Dongshaxia Village	Relocated to Qiankou	N/A
Yongji Pavilion	Ming dynasty, the Guiyou year of Zhengde's reign (1513)	Intersection of Qingshantou Road	Destroyed in 1996, rebuilt in 2006 using old materials.	N/A
Zhenshu Pavilion	Southern Song dynasty	On the Diaoyutai (钓鱼台, Fishing Terrace)	Reconstructed	

5.2 Spiritual and Cultural Sites

Ancestral halls are a ubiquitous presence in most ancient towns, embodying the cultural manifestation of ancestral worship beliefs among the Han Chinese people. As ancient towns evolved throughout history, places like ancestral halls and memorial archways emerged as spiritual and cultural sanctuaries. In the era when China functioned as a feudal society, a village often belonged to one or several prominent clans. Driven by a profound sense of family, esteemed families would construct ancestral halls primarily to strengthen the unity of the clan, wielding influence over their members through the prestige of their ancestors. Moreover, within these distinguished families, specific family rules were established and conveyed through these halls to educate and manage the clan more effectively.

Figure 8: Memorial Archway

Ancestral hall, also products of feudal society, served as auxiliary structures to ancestral halls, showcasing the noble virtues and achievements of a clan while fulfilling the purpose of ancestor worship. In the early days of Xucun's establishment, it was deemed an auspicious site chosen by the Xu family through Feng Shui principles. With the flourishing of the Xu clan, the village evolved into a town, and consequently, a majority of Xucun's residents belonged to the same clan. This close-knit community fostered stronger cohesion among clan members, facilitating the establishment of unified management practices within the clan. This, in turn, led to more frequent ritual activities related to worship and the commemoration of noble ancestral morals and clan honor. Consequently, Xucun Town now boasts numerous memorial archways. Such archways are commonly found in villages and towns in southern Anhui, signifying a significant connection to the living patterns of family clans.

6. RESEARCH SIGNIFICANCE

There are 11 ancient towns in the central Anhui region. This study, however, is situated in southern Anhui, which imposes certain limitations on the scope of the research, rendering it less comprehensive in terms of coverage. The core theory and research method of this paper center around space syntax—an increasingly mature academic discipline that plays a significant role in urban planning research. Axial analysis has been employed to examine the spatial morphology of the ancient town of Xucun. By conducting research and analysis on the geographical environment, historical culture, and spatial characteristics of traditional streets and lanes in Xucun Town, this study concludes that the features of traditional street and lane spaces have evolved based on the geographical

location and regional cultural conditions of the ancient town. Additionally, the study investigates the reasons behind the formation of the relation between the town and its rivers. Through this comprehensive understanding, the study aims to accurately capture the traditional characteristics of the street and lane spaces in the town. Accordingly, it provides a theoretical foundation for the conservation and renovation of the traditional streetscape during future preservation and revitalization endeavors. In terms of theoretical significance, this paper also serves as a valuable theoretical supplement to the study of the spatial morphology of ancient waterfront towns in Anhui Province.

References

Cui, G. H., & Wu, J. (1990). he Spatial Structure and Development of Chinese Urban Fringe. *Acta Geographica Sinica*, *45*(4), 399-411.

Gao, S., Han, L., Li, C., & Zhao, L. (2021). Detecting the evolution of collective memory space using a space syntax-based analysis method in Beiyuanmen historical and cultural block. *Current Urban Studies*, *9*(4), 744-758.

Gu, D. Z., & Liu, M. M. (2015). An Analysis on Spatial Pattern and Affecting Elements of Waterfront Ancient Town from the Perspective of Space Syntax -- A Case Study of Maotangchang Town. *Architecture & Culture*.

Gu, Z. L., Zhen, F., & Zhang, J. X. (2000). *Agglomeration and Diffusion: A New Theory of Urban Spatial Structure*. Nanjing: Southeast University Press.

Guo, W. Q. *Research on the Historical Changes of Urban and Rural Areas in Anhui* (Vol. 2). Anhui Renmin Press.

Hu, H. S., & Wang, L. (2008). Research on Spatial Configuration of Historical and Cultural Towns (Villages) in China. *Geography and Geo-information Science*.

Hu, J. (1995). *Chinese Cities: Their Evolution and Patterns*. Beijing: China Architecture Publishing & Media Co., Ltd.

Liao, P., Gu, N., Yu, R., & Brisbin, C. (2021). Exploring the spatial pattern of historic Chinese towns and cities: A syntactical approach. *Frontiers of Architectural Research*, *10*(3), 598-613.

Liao, P., Yu, R., Gu, N., & Soltani, S. (2022). A syntactical spatio-functional analysis of four typical historic Chinese towns from a heritage tourism perspective. *Land*, *11*(12), 2181.

Luo, Y., & Lin, Z. (2023). Spatial Accessibility Analysis and Optimization Simulation of Urban Riverfront Space Based on Space Syntax and POIs: A Case Study of Songxi County, China. *Sustainability*, *15*(20), 14929.

Teng, Y., Yang, S., & Huang, Y. (2021). Structural features of the streetscape of Macau across four different spatial scales based on historical maps. *PloS one*, *16*(10), e0258086.

Wang, J. G. (1994). On the Historical Characteristics and Evolution of the Changshu's Urban Form. *Journal of Southeast University*, *24*(6), 1-5.

Wu, J. (1990). *The morphology of Chinese Cities: Structure, Characteristics, and Evolution*. Nanjing: Phoenix Science Press Ltd.

Xiaxuan, H., Luxi, W., & Minjia, Y. (2022). Spatial Distribution Characteristics and Influencing Factors of Traditional Villages in Northern Guangxi Based on Spatiotemporal Big Data and Spatial Syntax. *Journal of Landscape Research*, *14*(2).

Zhang, L., Tian, F., Zheng, X., & Sun, Z. (2023). Spatial configuration of fire protection for historical streets in China using space syntax. *Journal of Cultural Heritage*, *59*, 140-150.

Zhang, X. C., & Hao, J. X. (2002). Research on Alleyway Landscape of Traditional Settlements in Southern Anhui. *Journal of Jiangnan University*, 179-183.

Zhang, Y. Q. (2001). An Topological Study on Urban Morphological Networks: A Case Study of Wuhan City. *Huazhong Architecture*, *19*(6), 58-59.

Zhang, Y. X. (1995). Elements and Processes of Urban Morphological Growth. *New Architecture*(1), 27-30.