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Ethnic differentiation in the internal spatial configuration of vernacular dwellings in the multi-ethnic region in Xiangxi, China from the perspective of cultural diffusion

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Abstract

Understanding the cultural characteristics and evolution of traditional dwellings in the context of ethnic integration is of great significance for protecting the diversity of residential cultural heritage of ethnic minorities. This article compares the ethnic differences in the internal spatial configuration of vernacular dwellings in Xiangxi region, China, a typical multi-ethnic area where "line-shaped" dwellings are prevalent among the Miao, Dong, Yao, Tujia, and Han groups. This study found that the spatial sequence, ritual axis, importance of fireplace, spatial hierarchy, and privacy of bedrooms of each ethnic group's dwellings present a trend towards Han's dwelling culture in the order of "Western Miao, Southern Dong, Northern Dong, Yao, Eastern Miao, Tujia". Based on the analysis of the lifestyles, ethnic customs, and historical development processes of ethnic minorities, this study identifies that the main reasons for the formation of the aforementioned sequence lie in the differences in the historical diffusion patterns and paths of Han culture in Xiangxi. This article analyses the ethnicity of minority residential culture in Xiangxi and its spatial configuration formation process, revealing the relationship between the spatial effect of Han cultural diffusion pattern and the spatial difference pattern of each ethnic group's vernacular dwelling space configuration, and expanding the connotation of "cultural genotypes" in multi-ethnic areas.

Keywords Multi-ethnic areas, Vernacular dwelling, Indoor spatial configuration, Space syntax, Evolution of dwellings

Introduction

As an important part of the built cultural heritage, vernacular dwellings are the order and organizational expression of the basic spatial units of traditional Chinese society, as well as the accumulation and reflection of certain cultures and traditional beliefs [1]. In unofficially built vernacular dwellings, the relationship between space and culture is more intuitive and flexible. Due to the courtyard combination characteristic of mainstream Chinese vernacular dwellings [2, 3], most of the previous studies on dwellings focused on the courtyard combination of the main house, the compartments, and the attached houses to explore the social order and natural view reflected in the combination mode [4]. However, this mainstream residential research paradigm is not fully applicable to ethnic minority dwellings. The development of ethnic minorities was relatively slow historically, and most of the vernacular dwellings that have survived to this day are mainly of simple "line-shaped" type, which cannot reveal the logical relationship between the spatial organization of dwellings and culture in terms of the

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courtyard combinations. Most previous research has distinguished different Chinese ethnic minority dwellings through external or overall construction features such as building materials, appearances, or regional characteristics [5–7], or directly used ethnic attributes as the criterion for type differentiation. However, the construction materials of the dwellings reflect more of a regional character that echoes the natural geographical conditions of the area than the ethnicity. For example, Gan-lan buildings (built on stilts), were widely used by different ethnic groups in southern China to adapt to wetlands or mountainous terrain and humid and hot climates. In terms of the external forms, most dwellings in the ethnic blending areas shows blending homogeneity, and thus is not sufficient either as a symbol to distinguish ethnic identity. On the other hand, there may also be differences in the form of dwellings of the same ethnic group. Classifying them based on ethnic attributes cannot present the diversity of ethnic architecture, but instead may form a "labeling" understanding that a certain ethnic group has a certain type of architecture. In the multi-ethnic Xiangxi region of China, we found that although the "line-shaped" houses with similar external forms and volumes are commonly used by various ethnic groups, there are obvious ethnic differences in the division and use of internal space, i.e., the internal spatial configuration of houses with the same ethnic culture and lifestyle will show similar characteristics [8, 9]. The organization, occupation, and use of space inside vernacular dwellings are closely related to their cultural patterns, and cultural factors such as identity, gender, age, and taboos influence the organization and composition of architectural space in dwellings [10, 11], called “cultural genotypes” of dwellings by Hillier [12]. Therefore, internal space can be an important point of penetration to observe the relationship between space and culture in ethnic dwellings.

There is an interactive relationship between the form of architectural space and the social culture it carries. On one hand, culture can influence and even determine the function, relationship, and organization of architectural space through religious beliefs, traditional customs, and life practices [10, 13–15]. Conversely, the design and use of architectural space also play a role in the production and formation of social and cultural patterns [12]. When architectural space does not adapt to or contradict cultural models, an evolutionary driving force emerges. Over time, the use of space in the architecture of dwellings not only strengthens traditions but also caters to new cultural concepts and lifestyles [16]. Al-Mohannadi and Furlan (2021) indicated that sociocultural elements such as privacy and gender segregation are important forces that drive and shape the evolutionary development of residential forms [17]. On the other hand, in the transfer of space, the inhabitants (immigrants) often establish a relationship with their own cultural origins while adapting to local social and cultural needs by adopting or adapting, to varying degrees, the vernacular architectural forms of the place they moved to [11, 18, 19]. Based on existing results, it is more mature to analyze the association of dwellings with their cultural patterns and the evolution of dwellings on a case-by-case basis, but there is still room to further explore the influence of cultural diffusion on the dwellings of different ethnic groups and its association at the regional level, especially in the areas of cultural intermingling [20, 21]. Xiangxi is a typical multi-ethnic area in China. At present, scholars have mostly analyzed the value of regional architectural cultural heritage, ethnic architectural characteristics, and overall spatial distribution or analyzed the formation logic of the living space of various ethnic groups from the natural and historical background of their regions [22, 23]. However, the studies focus on the interpretation of the characteristics of the core area of a single ethnic culture may neglect the dynamic evolution and integration of residential culture in cultural integration area. Overall, there is a lack of research methods combining quantitative analysis of the internal spatial organization of dwellings with qualitative analysis of ethnic life forms, and a lack of comparing and analyzing the differences between different ethnic dwellings in a common cultural diffusion background and dynamic historical development process, making it difficult to reveal the differential patterns, spatial relationships, and evolution laws of multi-ethnic residential cultures at the regional level.

Based on this, the purpose of this research follows: (a) To identify the geographic pattern of the spatial configuration of dwellings by quantitatively portraying the differences in the internal spatial configuration of dwellings of different ethnic groups in a typical ethnic intermingling area in Xiangxi; (b) To explore the laws of cultural diffusion on the spatial configuration of dwellings by correlate the spatial pattern of the spatial composition of dwellings with the process and spatial paths of cultural diffusion and intermingling of Han groups in history, providing new evidence for the analysis of the formation mechanism of dwelling culture of various ethnic groups. (c) To further discusses whether there are "cultural genotypes" dominated by ethnic attributes in the cultural integration area, and attempts to understand the dynamic evolution process of ethnic minority residential culture in a broader temporal and spatial field.

Study area

The Xiangxi region located in the transition zone from the second to the third terrace of the Chinese terrain, with high mountains, late development, and a long history of the Tusi system [1] [24]. Since the Ming and Qing dynasties, the central dynasty strengthened its development of the Xiangxi region and vigorously implemented the policy of "Bureaucratization of native officers"[2]. The Yuanjiang River and its tributaries became a military artery and migration route for the Central Dynasty to control the southwestern region [25]. With the influx of Han immigrants, ethnic minorities have continuously integrated from conflicts and exchanges, ultimately forming a settlement pattern with the Tujia ethnic group in the northern Wuling Mountains, the Miao ethnic group in the central La'er Mountains, the Dong ethnic group in the southern mountains in Xiangxi, the Yao ethnic group in the Xuefeng mountainous area, and the Han group interspersed among them.

Taking into account the distribution of ethnic groups and the composition of topography and water systems, and in order to better compare the differences between the dwellings of different ethnic groups in similar areas, the approximate range of the Xiangxi region referred to in this study is the middle reaches of the Yuan River basin (Fig. 1). This area is surrounded by mountains forming a relatively intact geographic unit, making it an ideal case study for understanding the cultural intersection of Chinese ethnic minorities and Han ethnic groups. In addition to reviewing books and historical materials, this study selected 55 well-preserved traditional villages of multi-ethnic groups for field research, including 19 Miao villages, 9 Tujia villages, 12 Dong villages, 6 Yao villages, and 9 Han villages, covering 18 county-level units in the study area.

Methods

Space syntax

Space syntax is an analytical method that can effectively quantify spatial organization, and is widely used in exploring the deep structure and its cultural connotations of various scales of spaces including urban blocks, building combinations, and the interior of buildings [26–30]. At the scale of urban blocks or large building combinations, the line segment model and viewshed model in spatial syntax have good analytical advantages, while the convex model is more suitable for the relatively simple internal space of residential buildings in this article. The specific analysis method is to draw a floor plan of a vernacular dwelling and divide the internal space of the vernacular dwelling into several convex spaces according to the field of view, each convex space represents a functional space of the vernacular dwelling, forming a "J" graph with "points" representing convex spaces and "lines" representing spatial connections. After calculating the main indices including RRA value, depth value, and control value, we can quantitatively analyze the internal spatial configuration of residential houses and the sociocultural logic they carry (Table 1).

Comparative case study

Conducting representative case studies can dig deeper into the general principles or laws behind the samples. However, how can representative dwellings of the Miao, Dong, Yao, Tujia, and Han ethnic groups in Xiangxi be identified? Firstly, based on the "List of Traditional Chinese Villages" published by the Chinese government, 55 villages with well-preserved ethnic cultures in Xiangxi were selected for on-site investigation. After repeatedly comparing the division and use of internal space in the same ethnic residential area, and combining the typical and representative principles of case studies proposed by sociologists such as Robert K. Yin and Wang Ning [31, 32], the most representative residential samples of each ethnic group were selected, drawing residential plans and their functional attributes. Secondly, an in-depth investigation is conducted on the selected samples to understand the internal spatial division of dwellings, their functions, daily activities, and customs. Finally, the representative dwelling samples of each ethnic group are portrayed and compared to analyze the differences in the spatial grouping of dwellings of different ethnic groups in similar geographical environments and the drivers.

Analysis and results

Ethnic differences in the spatial configuration of "line-shaped" dwellings in Xiangxi region

Vernacular dwellings in Xiangxi are mostly single "line-shaped" houses, usually located on mountain slopes or foothills, with a width of three bays. Each bay is divided into two compartments along the depth direction, that being front and rear. The indoor functional space generally includes a hall room, a fireplace room, a bedroom, and a multi-functional room. A fireplace room is an important internal component of ethnic minority

[1] In Chinese history, the central dynasty established an administrative management system for remote ethnic minority areas. The central government appointed local ethnic minority leaders to govern the areas, and the local leaders were called "Tusi". Their positions were hereditary, they had independent local armed forces, and they had significant autonomy.

[2] The central government of the Ming and Qing dynasties gradually abolished the "Tusi system" in minority areas, selected Han officials with limited tenure to govern minority areas, implemented political and social systems similar to those of Han areas, and strengthened economic, cultural, and social interactions between minority groups and Han people.

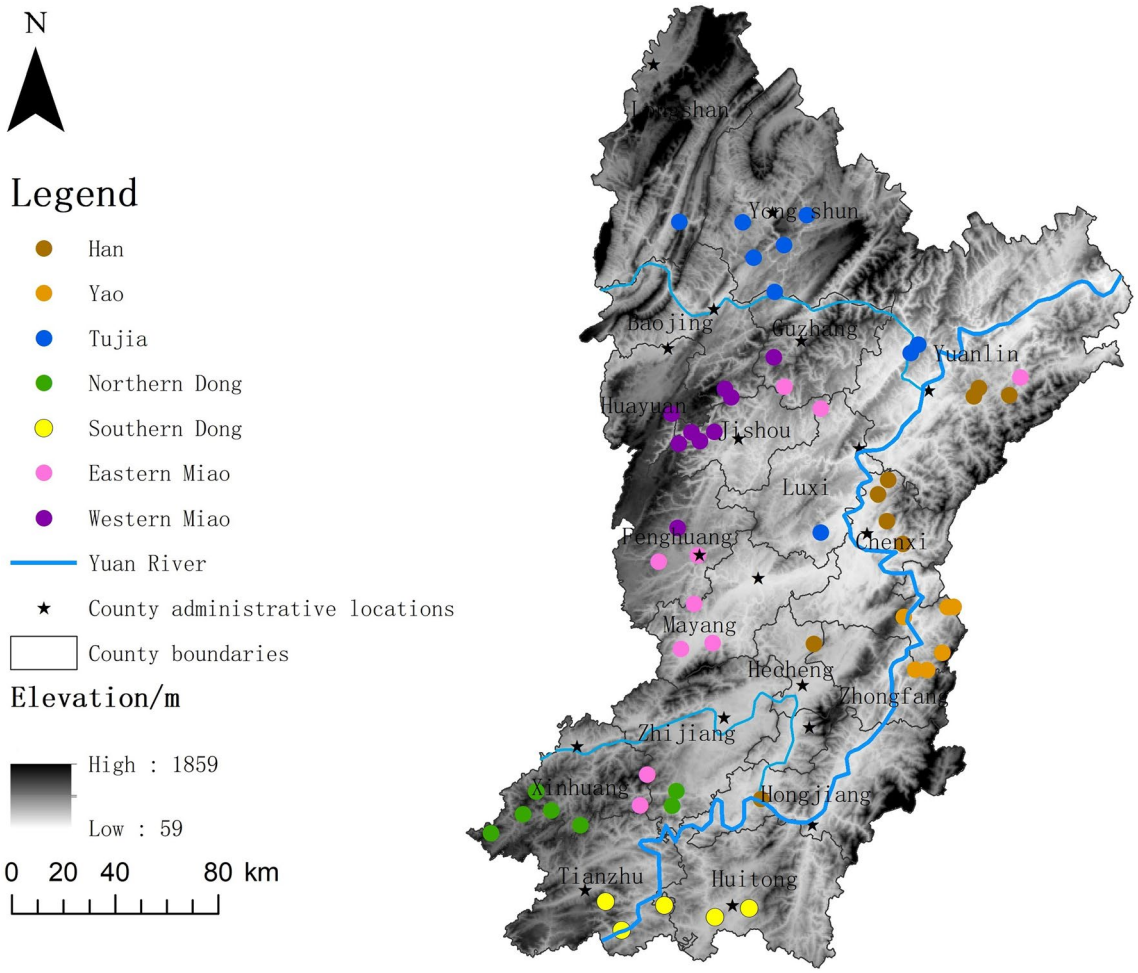
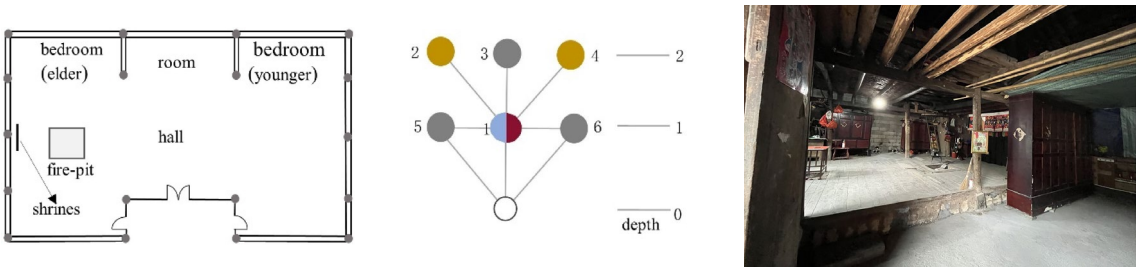


Fig. 1 Study area and distribution of research villages

Table 1 The main indicators in spatial syntax

Index	Formula and parameter description	The spatial meaning
Depth value	$MD_i = \sum_{j=1, j\neq i}^{n} d_{ij}/(n-1)$ Depth value D_i is the shortest topological distance between a certain space and all other spaces. The Mean depth value (MD_i) represents the average of the sum of topological distances between a certain space i and all the other spaces. d_{ij} represents the topological cost (step size) experienced from node space i to node space j	The greater the depth value, the farther the topological distance, and the more isolated the space is
RRA value	$RA_i = 2(MD_i - 1)/(n-2)$ $D_n = 2\{n[\log_2((n+2)/3) - 1]\}/(n-1)(n-2)$ $RRA_i = RA_i/D_n$ $I_i = 1/RRA_i$ RA_i is the result of a one-time normalization of MD_i in order to normalize the parameters distribution. RRA_i is the result of the second normalization of RA_i using D_n as the normalized parameter. I_i denotes the integration degree of a space i	*RRA* and *I* are used to express the accessibility of a space as a destination. The higher the integration degree *I*, the higher the accessibility of the space, reflecting the centrality of the space in the entire residential space. In this paper, the reciprocal of *I*, the *RRA* value, is used to measure the degree of integration, that is, the higher the *RAA* value, the lower the integration degree
Control value	$Ctrl_i = \sum_{j=1}^{k} \frac{1}{C_j}$ j (j=1,2,3…, k) is the space directly connected to space i, k is the total number of these spaces, and C_j is the total number of spaces directly connected to space j	The Control value Indicates the degree to which a space has control over the space directly connected to it, with higher values indicating greater influence on the surrounding space



(a) floorplan (b) "J" graph (c) interior

Fig. 2 Spatial syntactic model and interior of typical vernacular dwellings in the Western Miao area

Table 2 Spatial syntactic attribute values of typical vernacular dwellings in the Western Miao area

Number	Functional spaces	Main functions	Mean depth	Control values	RRA values
1	Hall	Living/activities/cooking/worshipping/working/connection/etc	1.0	4.33	0.00
2	Bedroom	Sleep/rest	1.83	0.17	0.98
3	Room	Storage	1.83	0.17	0.98
4	Bedroom	Sleep/rest	1.83	0.17	0.98
5	Connecting room	Storage/connection	1.67	0.5	0.79
6	Connecting room	Storage/ connection	1.67	0.5	0.79
	Outdoor space	Connection	1.5	1.17	0.59

dwellings in southern China. There are usually two types of fireplaces: fire-pit type (a pit furnace dug on the ground) and fire-bed type (a furnace set on a platform built with soil and wooden boards above the ground). The fireplace room not only has practical functions such as heating and cooking, but also often undertakes functions such as receiving guests and sacrificial ceremonies. It is a comprehensive space that integrates social interaction, daily living, and spiritual culture.

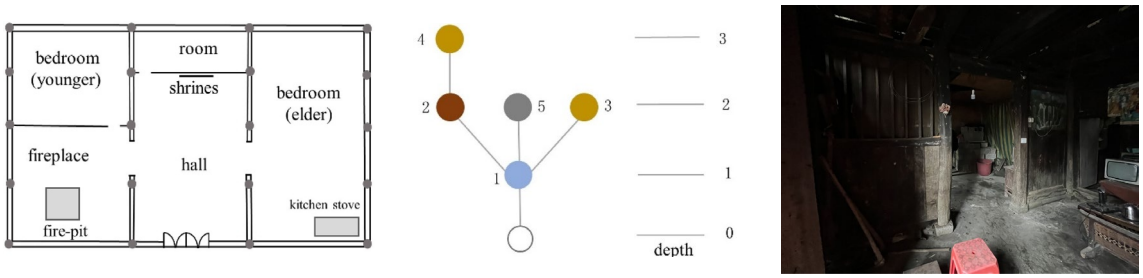
There are mainly Miao, Dong, Tujia, Yao, and Han in Xiangxi. Among them, according to the dialect and geographic location the Miao are divided into "Western Miao" and "Eastern Miao"[3] and Dong are divided into "Southern Dong" and "Northern Dong".[4] These groups are discussed separately in this study due to the significant differences in their dwellings.

The Western Miao: front hall and rear bedroom

This type of dwelling is mainly distributed in the La'er Mountain area in the central and western parts of Xiangxi, such as Fenghuang, Jishou, and Huayuan counties. Dwelling houses are usually three bays arranged laterally, with a "concave space" formed in the middle of the exterior wall (Fig. 2). The biggest feature of this type of residential building is that the functional space is divided in a longitudinal direction, with the interior usually undivided, forming a whole hall space (Fig. 2). The fire-pit is on the left side of the hall for cooking, dining, guest-receiving, daily housework, and family gatherings. A shrine is set up on the wall facing the fire-pit near the central pillar as a space for daily worship. At the rear of the hall, separated from the living room only by curtains that can be pulled up and down, two beds are laid out on two sides, the left one for the younger generation and the right for the elder. From the spatial syntactic characteristic shown in Table 2, it can be seen that the hall is the absolute core of the Western Miao dwelling, with complex functions and high integration, forming a lateral space; the bedroom has low depth value, low privacy, and high openness to the outside; the internal space of the dwelling has few layers.

[3] The eastern and western parts of the Miao group in Xiangxi are roughly divided by the historical Miao Border Wall in terms of geographical location. The western part is concentrated in the La'er Mountain area, belonging to the western dialect area of Miao, while the eastern part belongs to the eastern dialect area.

[4] The Southern and Northern Dong ethnic groups are divided based on the language and residential location within the Dong ethnic group, with Jinping County in Guizhou Province and Huitong County in Hunan Province as the geospatial boundary.



(a) floorplan (b) "J" graph (c) view from the hall to the fireplace

Fig. 3 Spatial syntactic model of typical vernacular dwellings in the Eastern Miao area

Table 3 Spatial syntactic attribute values of typical vernacular dwellings in the Eastern Miao area

Number	Functional spaces	Main functions	Mean depth	Control values	RRA values
1	Hall	Living/activity/ritual/working/connection/etc	1.2	3.5	0.29
2	Fireplace	Living/cooking/heating/eating/entertaining/parties/etc	1.6	1.25	0.86
3	Bedroom	Sleep/rest/elder	2	0.25	1.43
4	Bedroom	Sleep/rest/younger	2.4	0.5	2.00
5	Room	Storage/rest	2	0.25	1.43
	Outdoor space	Connection	2	0.25	1.43

The Eastern Miao: central hall and side room

Eastern Miao dwellings are mostly two-storied, with the first floor used for living and the second floor for storage, and are mainly located in Mayang, Guzhang, Luxi, etc., near the main stream of the Yuan River. The interior space of this type is vastly different from that of the Eastern Miao dwelling. The interior space is clearly divided (Fig. 3) into hall, bedrooms, and fireplace, with the main hall as the center (Table 3). A shrine is set up in the center of the back of the main hall, with the inscription "Tian (gods), Di (land), Jun (monarchs), Qin (ancestors), Shi (sages)",[5] reflecting obvious sacrificial functions. Compared with the aforementioned Western Miao dwellings, the sacrificial position of Eastern Miao dwellings is located in the independent central hall. At the same time, a stove originating from the Han ethnic group appears in the corner of the house and partially replaces the function of the fire-pit.

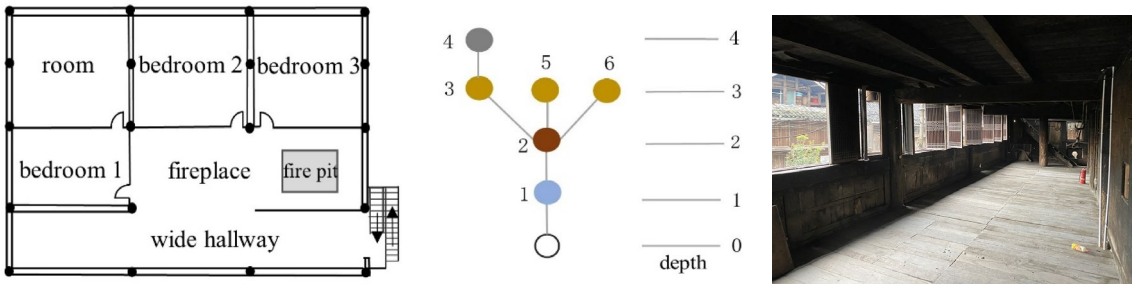
The Southern Dong: front wide hallway and rear bedroom

Southern Dong dwellings are distributed in Huitong county and Tianzhu County in southwestern Xiangxi. These dwellings generally have three floors with a Ganlan style. The first floor is empty with low floor height, making it uninhabitable and only used for raising poultry and livestock. The third floor is usually not fenced and only for storage; the second floor is the daily living space (Fig. 4). Southern Dong dwellings mainly include stairs, fireplace, wide hallway, bedrooms, etc. Among them, the fireplace is the core space of daily life (Table 4), which has the same functions of a hall such as guest-receiving, family gathering, dining, cooking, and worshipping. The semi-open wide hallway is the biggest feature of Southern Dong dwellings (Fig. 4), which is the public space for family interaction, resting, and daily handicrafts, as well as the transition space from inside to outside. This space is usually shared by multiple small families, meeting the social needs of a large clan living together. In terms of layout, the Southern Dong dwellings move from the front corridor, from the fireplace to the bedroom, and from the public to the private space in the sequence of "front-middle-back", and the hierarchical characteristics of the spatial composition are obvious.

The Northern Dong: central hall, side room, and rear fireplace

Northern Dong living in the study area are concentrated in Xinhuang and Zhijiang Counties. Compared with the

[5] A belief system in Han culture, including gods, land, monarchs, ancestors, and sages. It is an expression of the Chinese people's desire for favorable weather, prosperity of their country, and a healthy and prosperous life.



(a) floorplan (b) "J" graph (c) the wide hallway

Fig. 4 Spatial syntactic model and wide hallway of typical vernacular dwellings in the Southern Dong area

Table 4 Spatial syntactic attribute values of typical vernacular dwellings in the Southern Dong area

Number	Functional spaces	Main functions	Mean depth	Control values	RRA values
1	Wide hallway	Living/activity/working/connection/etc	1.83	1.25	0.98
2	Fireplace	Dining/heating/living/hosting/gathering/etc	1.33	3	0.39
3	Bedroom1	Sleep/rest	1.83	1.25	0.98
4	Room	Storage//rest	2.67	0.5	1.96
5	Bedroom2	Sleep/rest	2.16	0.25	1.37
6	Bedroom3	Seep/rest	2.16	0.25	1.37
	Outdoor space	Connection	2.67	0.5	1.96

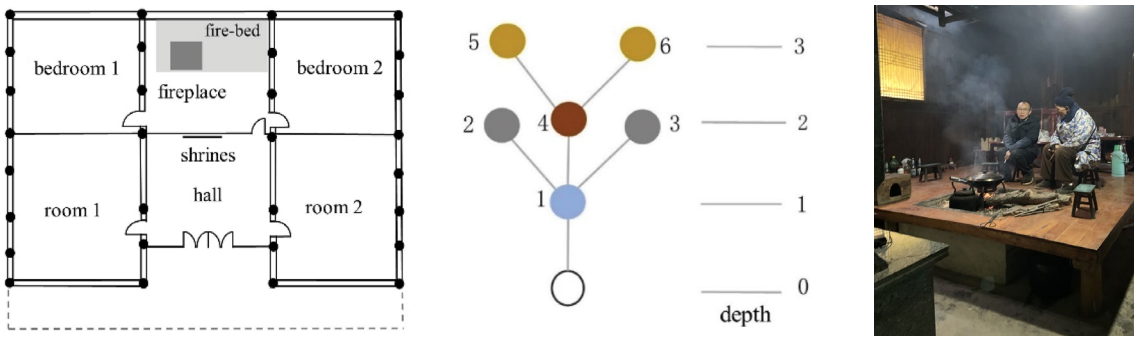
Table 5 Spatial syntactic attribute values of typical vernacular dwellings in the Northern Dong area

Number	Functional spaces	Main functions	Mean depth	Control values	RRA values
1	Hall	Ritual/activity/working/connection/etc	1.33	3.33	0.39
2	Room1	Storage/connection/rest	2.17	0.25	1.37
3	Room2	Storage/connection/rest	2.17	0.25	1.37
4	Fireplace	Dining/heating/living//hosting/gathering/etc	1.5	2.25	0.59
5	Bedroom1	Sleep/rest	2.33	0.33	1.57
6	Bedroom2	Seep/rest	2.33	0.33	1.57
	Outdoor space	Connection	2.17	0.25	1.37

Southern Dong, the hall of the Northern Dong dwelling is separated from the fireplace and becomes the center of the dwelling (Table 5), and a shrine is set at the back of the hall to highlight the ritual function. The fireplace is located behind the hall taking the form of a fire-bed (Fig. 5), which is usually 0.5–0.6 m high, 1.8–2.0 m long, and 1.2–1.5 m wide, with a square fire pit on top. The seating order on the fire-bed is clearly ordered, with elderly male guests sitting opposite the entrance and other guests sitting on their left. On the whole, the importance of the hall in North Dong residential buildings has increased, forming a symmetrical structure that emphasizes both the central hall and the fire pond. This is significantly different from the spatial structure of South Dong with the fire pond as the center.

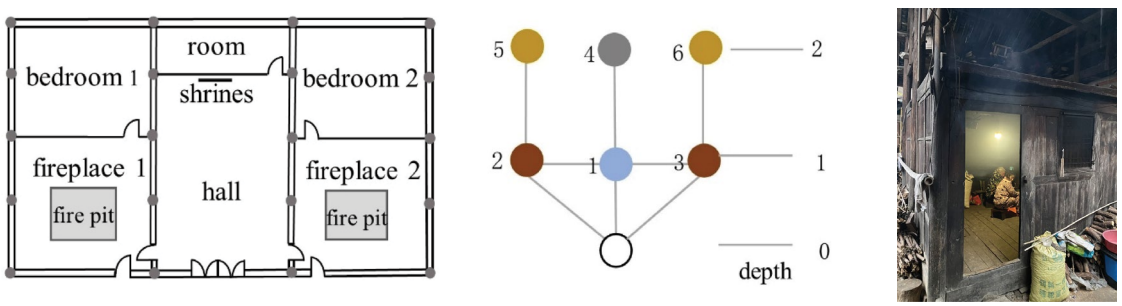
The Yao in East Xiangxi: central hall, rear room, and front fireplace

There are fewer Yao villages in Xiangxi, concentrated in the eastern part of Chenxi County in the Xuefeng Mountain area. These villages, which belong to the Bunu language family of the Yao ethnic group, are located at an average altitude of 800 m above sea level and represent a typical mountain-type village. The biggest difference between these Yao dwelling and other dwellings is the presence of two fire-pits, both of which open directly



(a) floorplan (b) "J" graph (c) the fire-bed

Fig. 5 Spatial syntactic model and fire-bed room of typical vernacular dwellings in the Northern Dong area



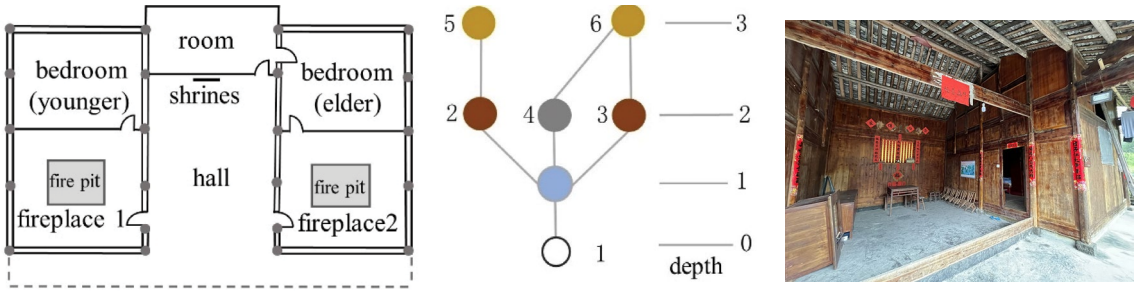
(a) floorplan (b) "J" graph (c) the fireplace open to the outside

Fig. 6 Spatial syntactic model of typical vernacular dwellings in the Yao area

Table 6 Spatial syntactic attribute values of typical vernacular dwellings in the Yao area

Number	Functional spaces	Main functions	Mean depth	Control values	RRA values
1	Hall	Ritual/living/activity/connection/etc	1.33	2.0	0.39
2	Fireplace1	Living/heating/dining/hospitality/connection/gathering	1.67	1.58	0.79
3	Fireplace2	Living/heating/dining/hospitality/connection/gathering	1.67	1.58	0.79
4	Room	Storage/connection	2.17	0.25	1.37
5	Bedroom1	Seep/rest	2.5	0.33	1.77
6	Bedroom2	Seep/rest	2.5	0.33	1.77
	Outdoor space	Connection	1.5	0.92	0.59

to the outside (Fig. 6), allowing direct access to the fireplace without going through the hall. The bedrooms are behind the fire-pits on both sides. The overall spatial configuration of the dwelling has the characteristic of central symmetry. This structure is an adaptation and adjustment of the economically disadvantaged Yao ethnic group towards household division. We learned from the field interviews that Yao in east Xiangxi live in the mountains and forests and that their economic development has been slow. After being separated economically, the families of fathers and sons often continue to live together by sharing a common hall instead of living in separate houses, thus separate fireplaces as a symbol of independent families are set on each side of the hall for small families to use. From Fig. 6 and Table 6, we can see that the integration of the external space of Yao dwellings is relatively increased, the control value of the hall house is relatively weakened, and the isolation of the bedroom is weakened due to the direct opening of the fireplace to the outside.



(a) floorplan (b) "J" graph (c) the hall is open to the public

Fig. 7 Spatial syntactic model of typical vernacular dwellings in the Tujia area

Table 7 Spatial syntactic attribute values of typical vernacular dwellings in the Tujia area

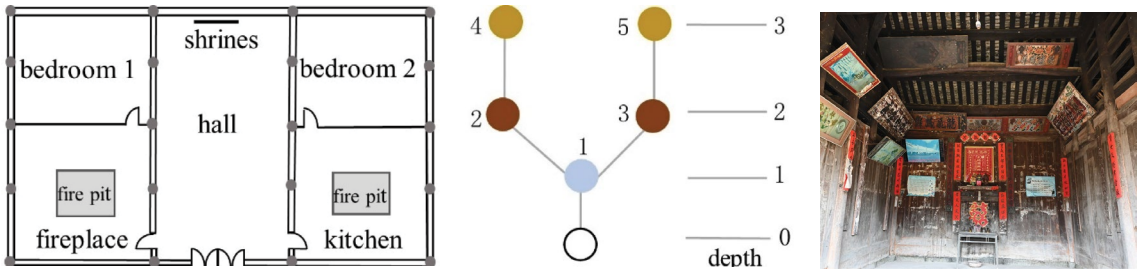
Number	Functional spaces	Main functions	Mean depth	Control values	RRA values
1	Hall	Living/activity/ritual/connection/storage/etc	1.33	2.5	0.39
2	Fireplace 1	Living/heating/dining/hospitality/connection/gathering	1.83	1.25	0.98
3	Fireplace 2	Living/heating/dining/hospitality/connection/gathering	1.83	0.75	0.98
4	Room	Storage/connection/sleep	1.83	0.75	0.98
5	Bedroom	Sleep/rest/ younger	2.67	0.5	1.96
6	Bedroom	Sleep/rest/ elder	2.33	1	1.57
	Outdoor space	Connection	2.17	0.25	1.37

The Tujia in North Xiangxi: central hall, side fireplace, and side rooms

The Tujia family is an indigenous people in Xiangxi, mainly distributed along the Youshui River in the Wuling Mountains. Most of the dwellings of the Tujia are located in the flat lowlands, with a three-bay-wide facade and an open hall in the middle, usually unfurnished with only a shrine in the back for worship. For the Tujia, the hall is not a space for daily activities, but mainly a space for rituals or important ceremonies such as marriages and funerals, generally open directly to the outside (Fig. 7). The rituals of the Tujia are not as grand as those of the Han and Miao and are more often performed in the Baishou Hall (a kind of temple) of the village. The small room behind the hall is used for storage or as a bedroom. The rooms on both sides of the hall are divided into a front fireplace room and a rear bedroom. The fireplace is the main functional space, where daily family activities such as eating, heating, entertaining, and socializing are carried out. In terms of internal spatial layout, the Tujia and Yao dwellings are relatively similar, but the fireplace room is less directly open to the outside and still needs to be accessed through the hall, with relatively high spatial depth values (Table 7).

The Han in East Xiangxi: one bright and two dark

The large-scale and planned migration of Han into Xiangxi began in the middle of the Ming Dynasty when the garrison system was implemented. During the Qing Dynasty, the "Bureaucratization of native officers" policy abolished local autonomy and sent administrative officials to govern the region. A large number of migrants who were involved in agriculture and business moved into Xiangxi along the Yuan River basin, gradually establishing settlements in which Han and ethnic minorities mixed. Han immigrants who moved into Xiangxi usually settled in low-lying towns along the river or in mountain basins because of the economic, military, and social advantages. They built typical Han dwellings, which included three bays and were usually called "one bright and two dark". The middle is the hall, with a shrine at the back for ancestor worship, which is the most sacred and important space in the house. The dark rooms on both sides are divided into two small rooms at the front and back, with the front being the fireplace room or kitchen and the back being the bedroom. The difference with Yao and Tujia dwellings is that small rooms are no longer left in the rear of the hall, so the hall is larger and occupies the entire central axis, resulting in a significant axial symmetry of the entire spatial structure. Moreover, except for

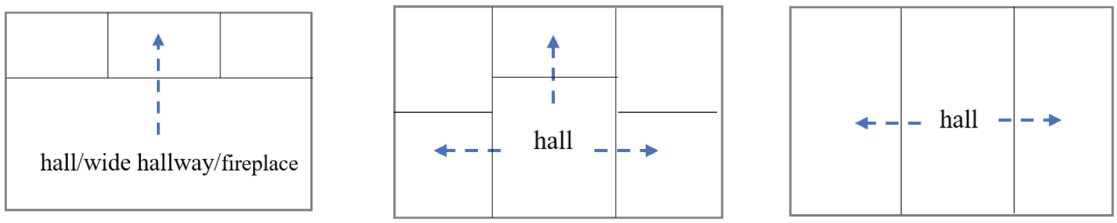


(a) floorplan (b) "J" graph (c) the center hall

Fig. 8 Spatial syntactic model of typical vernacular dwellings in the Han area

Table 8 Spatial syntactic attribute values of typical vernacular dwellings in the Han area

Number	Functional spaces	Main functions	Mean depth	Control values	RRA values
1	Hall	Ritual/gathering/living/activity/connection/festive ceremony	1.4	2	0.57
2	Fireplace	Living/heating/eating/hospitality/connection	1.8	1.33	1.15
3	Kitchen	Dining/heating/connection/storage	1.8	1.33	1.15
4	Bedroom 1	Sleep/rest	2.6	0.5	2.29
5	Bedroom 2	Sleep/rest	2.6	0.5	2.29
	Outdoor space	Connection	2.2	0.33	1.72



(a) Western Miao/Southern Dong (b)Yao/Northern Dong/Eastern Miao (c) Han

Fig. 9 The evolution of the spatial organization sequence of residential planes

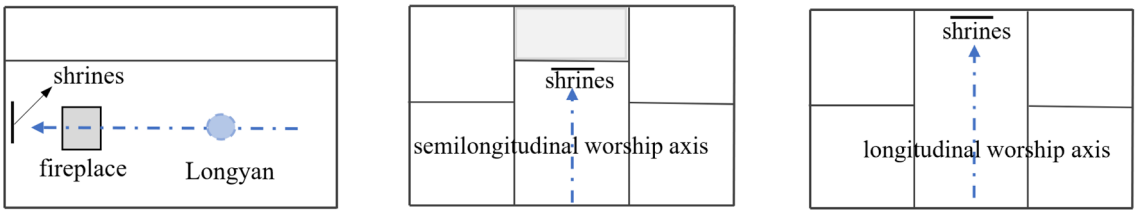
the door opening in the front to enter the fireplace room (kitchen) on both sides, there are no more doors in the rear, which reduces the traffic function (and therefore the control value and integration degree are relatively low), showing the stronger spatial integrity and importance of the hall (Fig. 8, Table 8).

Comparison of the internal spatial configuration of line-shaped dwellings of different ethnic groups

A comparison of the spatial configuration of the dwellings of the minority groups in Xiangxi reveals that the dwellings of each ethnic group show different degrees of cultural sinicization, forming a certain sequence of differences.

The layout is gradually approaching the "central axial symmetry" of the Han ethnic group

The overall layout of the dwelling plan shows a "front-rear" organization of Southern Dong and Western Miao, and a "center-surrounding" organization of Northern Dong, Eastern Miao, Tujia, and Yao, gradually approaching the "left-center-right" central axisymmetric spatial organization of Han (Fig. 9). This forms a sinicization sequence of Western Miao, Southern Dong, Northern Dong, Yao, Eastern Miao, Tujia, and Han. There is no clear division in the interior of the Western Miao dwelling, and the functions of the fireplace and the hall are mixed and laid out in the front of the dwelling. The organizational sequence of Southern Dong dwellings is from the outside to the inside, followed by wide corridors, fireplace, and bedrooms. In the case of the Eastern



(a) Western Miao/Southern Dong (b) Yao/Northern Dong/Tujia/Eastern Miao (c) Han

Fig. 10 Average depth values and RRA values in the external space of each ethnic group

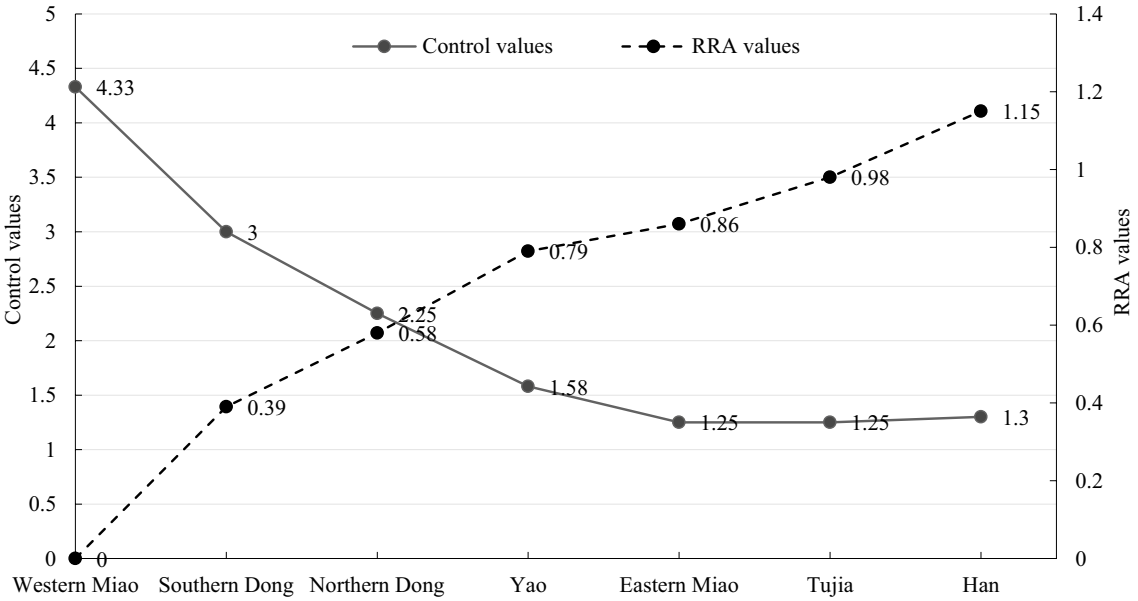


Fig. 11 Change in fireplace control values and RRA values

Miao, Northern Dong, and Tujia families, the hall and fireplace are separated, forming a layout with the hall in the middle and the functional space around it. Hans retained the traditional central axial symmetrical layout with the hall in the middle and the bedrooms on both sides.

Worship axis: from lateral to longitudinal

Western Miao and Southern Dong dwellings adopt a "front-rear" spatial layout, forming a large hall in the front. Longyan,[6] fire-pit, and shrines are located successively along the connecting line between the center of the hall and the left central pillar, forming a lateral worship axis. By contrast, the halls in the dwellings of the Tujia, Northern Dong, and Yao ethnic groups are in the middle, with shrines set up at the rear of the halls, forming a semi-longitudinal worship axis (Fig. 10). Although the ritual space is similar to that of Han, it does not form a strict and complete longitudinal worship axis of the central hall as it does in Han dwellings. For example, the Northern Dong usually have a fireplace room behind the hall, which is juxtaposed with the ritual space on the central axis, weakening the sanctity and importance of the hall. Many studies have pointed out that the "front hall and back room" is one of the main characteristics of the residential culture of ethnic minorities in southern China [21]. The Tujia, North Dong, and Yao ethnic groups have retained this feature to some extent in the longitudinal sacrificial space of the front hall, presenting a transitional state of the fusion of Han's sacrificial culture and minorities' fireplace culture.

Fireplace: weakening of functions and marginalization of position

From Western Miao, Southern Dong, Northern Dong, Yao, Eastern Miao, Tujia, to Han, the RRA value of

[6] The Miao people worship dragons, and when a new house is completed, a circle will be drawn on the floor in the hall symbolizing the dragon's nest to ensure the safety of the dragon god.

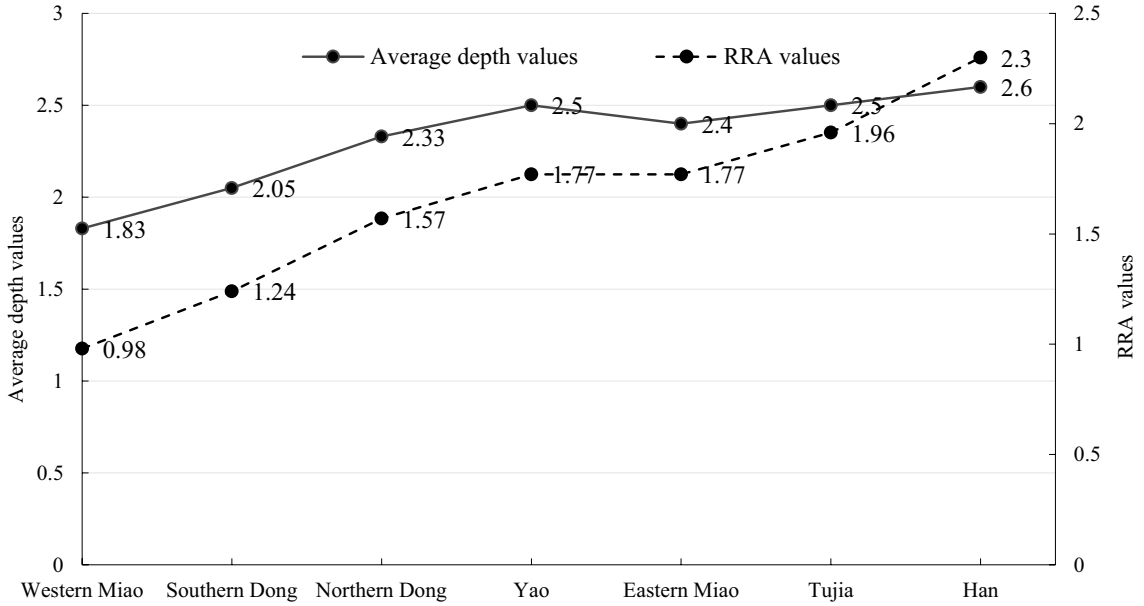


Fig. 12 Change in bedroom RRA values and mean depth values

fireplace kept increasing, the integration decreased, the control value kept decreasing (Fig. 11), and importance decreased. In term of form, the fireplace changed from the fire-pit type of the Miao to the fire-bed type of the Northern Dong, and then to the fire-pits and stoves coexisting in the Tujia and Han. The height of the fire-pits increased, gradually conforming to the physical scale of people's daily work and evolving into a kitchen stove of a certain height. In terms of location, the fireplaces of the Western Miao and Southern Dong are located on the axis from the hall to the shrine, while that of the Northern Dong, Yao, Tujia, and Han ethnic groups are located on both sides of the axis. Functionally, the fireplaces of the Western Miao and Southern Dong have multiple functions such as offering sacrifices, gathering, living, heating, cooking, and receiving guests, while the fireplaces of the Eastern Miao and Han only retain the basic living functions of heating and cooking, shifting the functions of worship, rituals, receiving guests, and living to the hall and other rooms.

Bedrooms: from open to isolated, with an increase in overall spatial hierarchy

From Western Miao, Southern Dong, Northern Dong, Yao, Tujia, to Han, the internal spatial hierarchy has increased respectively, gradually forming a spatial hierarchy of external space, transitional space, hall room, fireplace, and bedroom. The RRA value and average depth value of the bedroom continue to increase (Fig. 12), and the bedroom gradually shifts to the edge of the space, improving privacy. The living room of the Western Miao is completely open to the main room with no obvious partition. Yao need to enter the fireplace room from the outdoors before entering the bedroom, while Tujia and Han need to enter the main entrance and then pass through the fireplace room to enter the bedrooms, thus the depth and the privacy of the bedroom increased accordingly.

Spatial differentiation of dwelling space configuration

Projection of the aforementioned differences in spatial configuration of dwellings onto geographical space will lead us to consider the next question: why does the spatial configuration of dwellings show significant differences between Western Miao and Eastern Miao, and Southern Dong and Northern Dong, who have common ethnic origins and geographical proximity? In the multi-ethnic area, why is the spatial configuration of dwellings of Tujia, whose settlements are relatively far away from the Han and the main stream of Yuan River and deep in the Wuling Mountains, present more similarity to Han than Yao, who are geographically closer to the Han (Fig. 13)? Focusing on the above questions, we will discuss the reasons for the geographic pattern and the sequence of differences in the spatial grouping of dwellings of various ethnic groups in Xiangxi.

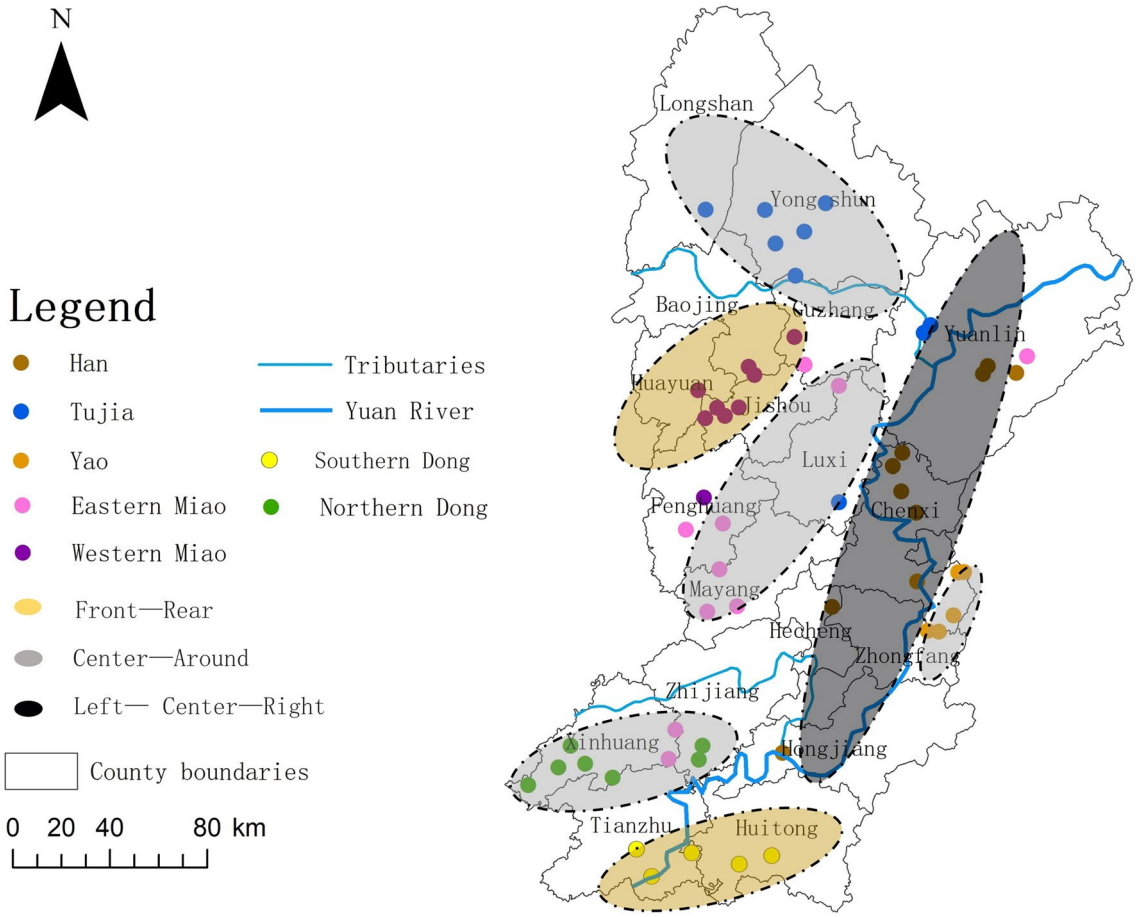


Fig. 13 Spatial configuration type and distribution of vernacular dwellings in Xiangxi region

The formation of the spatial configuration differentiation: military entry, institutional reform, and cultural diffusion

The sequence of differentiation in the spatial configuration of dwellings in Xiangxi is formed under the comprehensive effects of the geographical and cultural individuality, ethnic segregation, and cultural diffusion of various ethnic groups in different periods.

Adaptation of the dwelling forms to the physical geographical and socio-economic environment, and the reinforcement of ethnic residential culture by the Tusi system

First of all, the low level of productivity and the rugged and humid geographical environment are the underlying conditions for the adoption of the line-shaped dwelling form by the minority groups in Xiangxi. The construction of line-shaped dwelling is based on local materials, with low economic costs, low construction difficulty, and flexible spatial division, making it a commonly used form of dwellings among various ethnic groups in Xiangxi. For example, the Southern Dong lives in hot and humid mountainous areas, the semi-open wide hallway can improve the sealed, hot, and humid indoor conditions, while the fireplace behind the hallway also become the main place for heating and gathering in the damp and cold winter. Secondly, the original religious beliefs and lifestyles of the ethnic groups have led to the formation of spatial configurations with ethnic characteristics. For example, the Miao believe in many gods and worship mostly indoors, with the interior space of their dwellings usually undivided in order to form a larger space for ritual activities. The Dong group had a tradition of living together as a large patrilineal family, and the wide hallway, as a transition place between interior and exterior and public and private, met the space needs of the large patrilineal families for public activities. Finally, the minority areas in Xiangxi have a long history of practicing the Tusi system granting them greater autonomy, which, combined with the rugged terrain and less contact with the outside world, protected and reinforced the

cultural individuality of the ethnic minorities living there to a certain extent.

The central dynasty's development and control over the Xiangxi region and the differentiation of ethnic culture

Since the Ming Dynasty, the Central Dynasty of China has set up a large number of linearly distributed military stations and garrisons in Xiangxi to increase the development and control of the ethnic minority areas. With the establishment of military facilities, Han soldiers, their families, and handicraftsmen migrated and settled around the garrison, forming a Han military garrison belt, leading to the culture differentiation of ethnic minorities in Xiangxi. For example, during the Hongwu period of the Ming Dynasty (1368–1398), the central government set up an east–west belt of military stations in the Dong area, stationing there for a long period and making the Dong split into two subgroups. The Northern Dong in Xinhuang and Zhijiang counties, which have close interaction with the Han, have a high degree of sinicization. Their dwellings combine the Han form with their own fireplace culture, forming an indoor type of central hall, side room, and rear fireplace. The "Great wall in Miao Borde", which was built in the third year of Jiajing in the Ming Dynasty (1524) and starts from Tingziguan in Tongren in the south and ends at Magpie Camp in Guzhang in the north, was connected by military institutions such as guards, stations, battalions, posts, and forts. It divided the Miao into "Western Miao" areas and "Eastern Miao" areas and prohibited commercial trade and cultural interaction between the Western Miao and Han. The Eastern Miao were incorporated into the household register and paid taxes. They learned Han culture and their dwelling forms and spatial configurations followed Han patterns. The "Western Miao", on the other hand, had been isolated for a long period, which has strengthened their ethnic and cultural individuality, and their dwellings retain the structure of a front hall and a rear bedroom. The physical barrier of the border wall and the implicit isolation of military and policy played a significant role in the differentiation of Dong and Miao dwellings in Xiangxi, initially forming the geographic differentiation of the spatial configuration of dwellings in Xiangxi (Fig. 14).

Spatial effects of different diffusion patterns of Han culture and the differentiation of ethnic residential culture

In order to further promote the development of the Xiangxi region, the Qing Yongzheng period (1723–1735) comprehensively promoted the policy of "Bureaucratization of native officers" (hereinafter referred to as BNO policy), abolished the Tusi system, set up a large number of prefectures and counties, forming a clear hierarchical administrative system. Yongshun Prefecture (now Yongshun County), although not adjacent to the main stream of the Yuanjiang River and far from the migration route of Han people, was the seat of the former Xiangxi Tusi. The central government carried out the most thorough reform there, establishing Han schools in the local area, promoting Han culture education, and eliminating old customs. With these administrative centers as the core to promote Han culture and customs to the surrounding Tujia and Eastern Miao areas of Baojing, Longshan, Guzhang, Mayang, and Fenghuang, a hierarchical culture diffusion pattern based on the administrative system was formed in geographic space (Fig. 14). For example, the Tujia originally worshiped their clan ancestors in the public Baishou-Hall (Hands-waving Hall) in the village, and only started to carry out worship activities in the hall after the BNO policy. However, the Western Miao in Huayuan and Jishou, and the Southern Dong in Huitong County, resisted the central government's BNO policy, even starting many riots and long-term segregation and autonomy, which intensified the division among ethnic groups. On the other hand, the central government encouraged Han to migrate to Xiangxi during the process of BNO policy, and a large number of Han population, including farmers, merchants, and craftsmen, traveled up the Yuan River basin, reclaiming farmland along the way and settling in the towns of Chenxi, Zhongfang, and Hongjiang counties in the middle reaches of the Yuan River. The cultural diffusion triggered by migration is mainly relocation diffusion and contagious diffusion, which is greatly influenced by the number of migrants and migration distance, showing a significant negative correlation with distance. Although the Yao in eastern Xiangxi were close to the main stream of the Yuan River, they were located in a mountainous area with high mountains and steep roads, and had poor accessibility. The Dong (including the Northern Dong and Southern Dong) were also limited by topography and distance and had fewer Han migrations, therefore the ethnic group retained more of its own residential culture which still shows some differences from Han.

From the perspective of cultural diffusion, in the early period, Han culture was brought to the Dong and Miao in the form of military cantonments and guard garrisons, forming a relocation diffusion pattern and having a linear cultural impact on the minority groups. The tangible physical separation, such as the Miao border wall, had a more significant impact on cultural diffusion. In the middle period, the institutional reform in Xiangxi formed a hierarchical diffusion pattern, in which the Tujia and Eastern Miao areas, where the BNO policy was implemented, had higher administrative rank, and were more

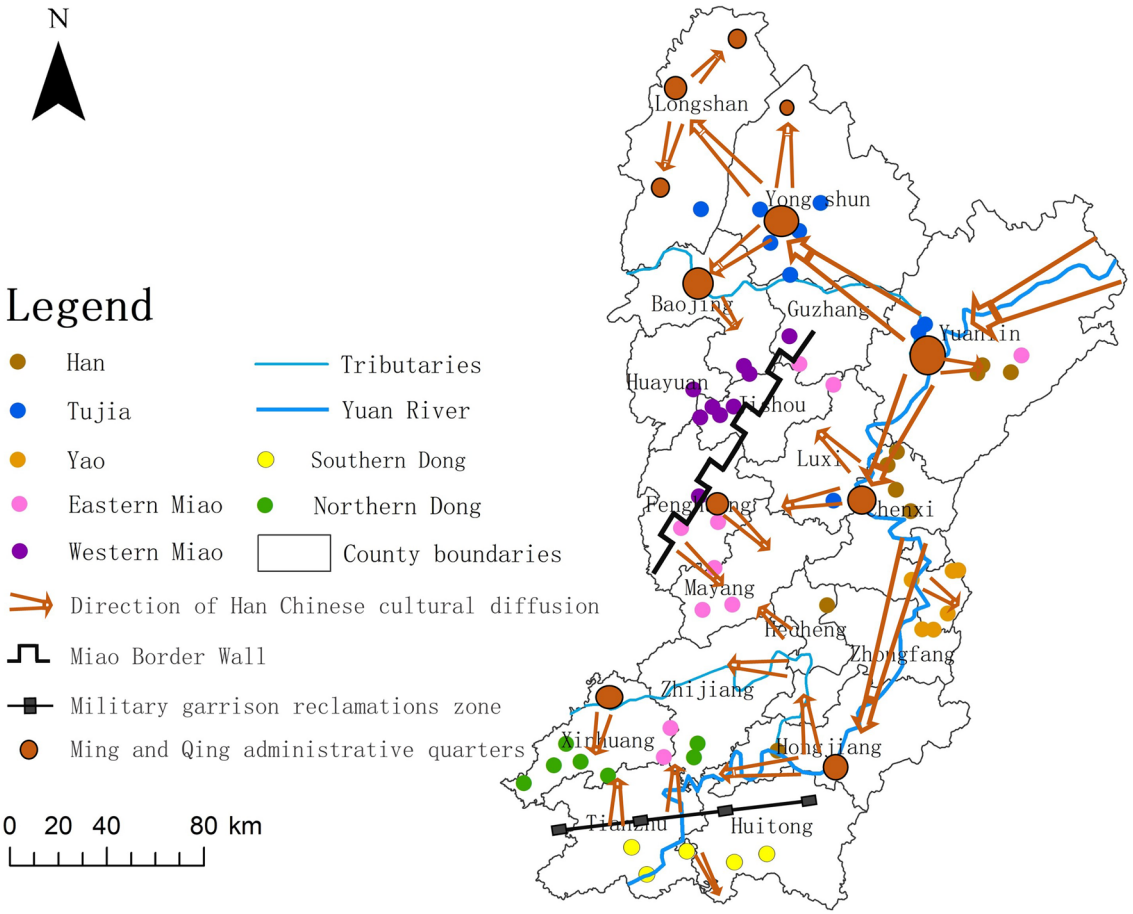


Fig. 14 The process of forming the spatial grouping of traditional dwellings in Xiangxi region. The larger the arrow, the greater the degree of diffusion of Han culture

economically developed, being more directly and significantly influenced by Han culture. Meanwhile, the Western Miao and Yao, which were farther away from the central cities and had lower administrative rank, were less influenced by the hierarchical diffusion. In the later period, the cultural diffusion brought by large population migration was mainly relocation diffusion and contagious diffusion, with obvious characteristics of economic gradient and decreasing with distance.

Discussion and conclusion

Discussion

When exploring the formation and evolution of residential culture in ethnic integration areas, attention should be paid to the influence of specific historical events in specific regions. The thrust, direction, and mode of cultural diffusion varied in different historical stages, and the impact of Han culture on minority cultures should not be explored in a single or generalized manner. The differences in geographical effects caused by different ways of cultural diffusion in different periods have been overlooked or insufficiently emphasized in our previous explanations of the evolution dynamics of residential culture.

On the other hand, Bill Hillier believes that there is an inherent "cultural genotype" between ethnic groups and the spatial structure of their dwellings, which is not suitable for the multi-ethnic integration area like the Xiangxi region in China. It is also important to pay attention to the differences within ethnic groups. For example, in this article, there are differences to varying degrees between the Western and Eastern Miao ethnic groups, as well as between the Southern and Northern Dong ethnic groups. The differences between the two Miao ethnic groups are even greater than those between the Miao and their neighboring Dong ethnic groups. Therefore, we believe that the expression "cultural genotypes" is more applicable to the cultural core areas of a certain ethnic group,

while in cultural periphery areas or areas where multiple ethnic cultures blend, "cultural genotypes" will undergo differentiation and evolution under the influence of cultural integration. The above research on the ethnic differences in the spatial structure of traditional dwellings in the multi-ethnic Xiangxi region in China has demonstrated this phenomenon.

The ethnicity of ethnic minority dwellings is not a static historical category, but a dynamic, open, and evolving process. Identifying the ethnic identity and grasping the evolution pattern in the context of ethnic integration is of guiding significance for the preservation of the diversity of ethnic minority dwelling culture and its inheritance in the era.

Conclusion

In general, this article places the research of various ethnic dwellings in Xiangxi region in a similar historical development process, establishes the relationship between the diffusion path of Han culture in Xiangxi and the spatial configuration differentiation pattern of various ethnic dwellings through the analysis and comparison of the internal space of the dwellings in the ethnic blending areas, elaborates on the patterns and paths of Han culture diffusion in the multi-ethnic areas of Xiangxi, and compares and discusses the spatial effects of cultural hierarchical diffusion and relocation diffusion from the regional level.

(a) From the existing phenomenon of dwellings, the internal space of ethnic minority dwellings in Xiangxi presents ethnic differences. The spatial configuration of each ethnic minority dwelling has constructed the relationships between the interior and exterior, public and private, society and family, old and young, and human and God through isolation or integration. Among them, the hall and the fireplace are the core spaces of the spatial configuration of residential spaces, and the worship and social spaces are the key factors in the formation and evolution of Xiangxi residential spaces.

(b) From the diffusion process of Han culture in Xiangxi, the geospatial effect brought by different diffusion patterns is the main reason for the differentiation of spatial configuration of dwellings in Xiangxi. The degree of cultural intermingling between various ethnic minorities and Han varies significantly, among which the Dong and Miao were introduced to Han culture mainly by the relocation diffusion of the military-tunnel population, which was greatly influenced by spatial and physical isolation and caused a division within the ethnic group. The cultural hierarchical diffusion triggered by political reform had a more direct and significant impact on the Tujia and Eastern Miao.

(c) From the existing state, each ethnic group has different spatial responses to the diffusion patterns of Han culture. The geographical spatial effects brought about by the different diffusion patterns of Han culture make the internal spatial structure of various ethnic dwellings roughly follow the sequence of differentiation gradually approaching the Han culture as "Western Miao, Southern Dong, Northern Dong, Yao, Eastern Miao, Tujia, Han". In this order, the internal layout of the dwellings has shifted from "front-rear" and "center-surrounding" to "left-center-right", while the worship axis has shifted from "lateral axis" to "longitudinal axis". The overall spatial hierarchy of the dwellings has increased, as has the privacy of the bedrooms. However, the importance of the fireplace, as a characteristic space of ethnic minority dwellings, has gradually decreased.

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CD, Full text writing, collated and collected relevant data and made tables for explanation, data analysis and visualization; XZ, Writing-review & editing, funding; DX, Project management, funding.

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Availability of data and materials
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Declarations

Competing interests
The authors declare no competing interests.

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