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The typology of southern Jiangxi Hakka enclosed houses based on a comparative study between Yanyiwei and Wushiwei

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Abstract

Southern Jiangxi Hakka enclosed houses are an important form of vernacular architecture and can be understood as cultural–spatial systems shaped by lineage life and collective living traditions. However, existing studies mainly focus on overall form, historical background, or isolated architectural elements, and pay less attention to how core components work together to shape internal spatial organization. To address this gap, this study adopts a component-based typological approach and conducts a comparative case study of two Qing Dynasty Hakka enclosed houses in Longnan City, Yanyiwei and Wushiwei. The analysis focuses on the spatial configuration of three core architectural components—the gatehouse, courtyard system, and ancestral hall—using criteria such as access control, courtyard sequence, circulation depth, spatial hierarchy, and ritual centrality. The findings show that Yanyiwei, with a single-opening gatehouse, a single courtyard, and a smaller ancestral hall, forms a compact, inward-looking enclosure with shallow circulation and a concentrated hierarchy. In contrast, Wushiwei, with a three-opening gatehouse, multiple courtyards, and a larger ancestral hall, forms a more layered and internally differentiated enclosure. The study concludes that typological variation in southern Jiangxi Hakka enclosed houses is better explained by the combined configuration of architectural components rather than through overall form alone. The findings also provide a spatially grounded reference for heritage conservation and adaptive reuse, emphasizing the importance of preserving internal spatial relationships together with physical architectural elements.

Keywords: Southern Jiangxi Hakka enclosed houses; Component-based typology; Spatial configuration; Architectural components; Enclosure character; Comparative case study

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1. Introduction

Hakka enclosed houses in southern Jiangxi represent a distinctive form of vernacular architecture shaped by long-term clan-based settlement and collective living traditions in southern China. Asquith and Vellinga (2006) argued that vernacular architecture should be understood not only as a physical building tradition but also as a cultural system through which social values and collective identities are spatially expressed. Knapp (1986) and Ruan (2006) argued that Hakka dwellings are characterized by enclosed

layouts, axial organization, and clear internal hierarchy. Characterized by enclosed layouts, axial organization, and clear internal hierarchy, these dwellings functioned not merely as residential structures but as integrated cultural–spatial systems. Architectural components such as the gatehouse, courtyard sequence, and ancestral hall were arranged according to shared conventions that regulated movement, reinforced ritual order, and structured everyday social interaction within lineage communities.

Within the broader spectrum of Hakka architecture, enclosed houses in southern Jiangxi exhibit a spatial logic that differs from those of more widely studied dwelling types, such as Fujian Tulou or Guangdong Weilong houses. Rather than relying on monumental enclosure or standardized forms, numerous examples in southern Jiangxi employ rectilinear layouts with layered courtyards and articulated spatial sequences. As noted by Knapp (2012), enclosure is often achieved through spatial depth and controlled transitions rather than through massive perimeter walls alone. Similarly, Vellinga (2004) emphasized that spatial hierarchy and social organization are closely embedded in the arrangement of architectural components.

Existing scholarship has contributed valuable documentation of Hakka enclosed houses by describing their physical form, settlement distribution, and historical background. However, much of this work approaches architectural elements as discrete features, emphasizing enclosure walls, axial symmetry, or stylistic characteristics. As a result, limited attention has been given to how architectural components operate together as a relational system that organizes movement, access, and ritual focus within the enclosure. Cultural interpretations, while illuminating symbolic meaning and lineage practices, often rely on assumed associations between space and meaning rather than examining how cultural significance is supported by spatial configuration.

These limitations have become more visible in the context of contemporary change. In recent decades, rural depopulation, the weakening of clan-based social structures, and the spread of standardized housing have altered traditional settlement patterns in southern Jiangxi. Numerous enclosed houses in southern Jiangxi have been abandoned, modified, or adaptively reused due to rural depopulation and changing settlement patterns (Moriset *et al.*, 2021). Although conservation and revitalization initiatives have expanded in recent years, many interventions continue to prioritize physical repair or visual presentation over the preservation of internal spatial logic and ritual organization. In some cases, gatehouses have been reduced to symbolic entrances, courtyards have been enclosed or fragmented, and ancestral halls have been preserved in physical form while losing their original ritual centrality.

From a research perspective, these conditions expose several unresolved issues. Definitions of Hakka enclosed houses remain inconsistent, often based on selected physical traits or historical references rather than on integrated spatial and cultural criteria. Core architectural components are frequently identified, yet their spatial relationships and typological variation are rarely systematically examined. In particular, existing studies offer a limited explanation of how different component arrangements shape enclosure, movement patterns, and ritual focus within Hakka enclosed houses. This gap is especially evident in southern Jiangxi, where enclosed houses display pronounced internal diversity and regional specificity that cannot be fully explained by typological models derived from other Hakka regions.

Addressing these limitations requires moving beyond descriptive classification toward a relational understanding of how architectural components generate internal spatial organization. Existing studies often treat the spatial characteristics of Hakka dwellings as fixed architectural attributes rather than as outcomes of component configuration. This issue is particularly important in southern Jiangxi, where enclosed houses display considerable internal variation despite shared cultural foundations.

Accordingly, this study addresses two research questions: (i) how architectural component configuration influences internal spatial organization in southern Jiangxi Hakka enclosed houses, and (ii) how different component arrangements produce variation in enclosure character, circulation, hierarchy, and ritual emphasis. To answer these questions, a component-based typological approach is applied through a comparative analysis of Yanyiwei and Wushiwei. Focusing on the spatial relationships among the gatehouse, courtyard system, and ancestral hall, the study seeks to explain typological variation through component configuration rather than solely through overall form. In doing so, it provides a spatially grounded basis for understanding Hakka enclosed houses as cultural–spatial systems and responds to recent calls by Knapp (2024) to examine the spatial logic underlying vernacular heritage conservation.

2. Literature review

Recent studies on Hakka vernacular architecture have increasingly focused on spatial morphology and settlement distribution, cultural symbolism and lineage organization, and heritage conservation and adaptive

reuse in the context of contemporary rural transformation. Existing research has employed approaches such as spatial syntax, vernacular morphology, Geographic Information System-based settlement analysis, cultural interpretation, and studies of regional identity and symbolic expression to investigate Hakka dwellings across Fujian, Guangdong, and Jiangxi provinces (Y. Chen *et al.*, 2025; Hu & Yang, 2023; Z. Wang & Bunyasakseri, 2026; Xie *et al.*, 2022). More broadly, vernacular architecture scholarship has increasingly emphasized the relationships among cultural continuity, spatial adaptation, and heritage sustainability in contemporary rural environments (Pardo, 2023). While these studies have improved understanding of settlement form, environmental adaptation, and ritual symbolism, relatively little attention has been paid to how architectural components operate together as an integrated spatial system at the building scale, particularly in southern Jiangxi Hakka enclosed houses.

Taken together, existing scholarship provides a solid descriptive foundation for understanding Hakka enclosed houses, yet important explanatory gaps remain. This limitation is consistent with findings from recent systematic reviews, which note that vernacular architecture research often prioritizes documentation and conservation while providing less explanation of internal spatial mechanisms and typological transformation processes (Zong *et al.*, 2025). Previous studies have documented architectural form, settlement context, and cultural symbolism in detail, but they rarely clarify how internal spatial structure is generated at the building scale. As a result, enclosure, hierarchy, and ritual centrality are often treated as inherent attributes of Hakka dwellings rather than as outcomes of specific spatial configurations that can be analyzed through natural, built environment, and historical dimensions (Hu & Yang, 2023).

This limitation is particularly evident in studies of southern Jiangxi. Although enclosed houses in this region share common cultural foundations with Hakka dwellings elsewhere, they exhibit noticeable differences in spatial depth, access control, and ritual emphasis. Such variation cannot be adequately explained by environmental adaptation or settlement morphology alone (Y. Chen *et al.*, 2025; S. Liu *et al.*, 2024; Xie *et al.*, 2022). Nor can it be fully accounted for by overall plan form or stylistic classification, as buildings with similar external layouts often display distinct internal spatial hierarchies.

Much of the existing literature identifies key architectural elements—such as gatehouses, courtyards, and ancestral halls—but tends to discuss them as isolated features. Architectural descriptions frequently catalog these elements, while cultural interpretations emphasize symbolic meaning and ritual value (Knapp, 1986; Ruan, 2006). What remains insufficiently explored is how these components operate together to structure movement, regulate access, and reinforce social and ritual order. Without examining their spatial relationships, it is difficult to explain why similar components produce different spatial experiences across cases.

Typology offers a useful conceptual lens for addressing this issue when it is applied as an analytical method rather than as a rigid classificatory system. In vernacular architecture studies, typology has been used to identify recurring spatial principles while accommodating variation arising from social organization and local conditions (Jacoby, 2015). In research on Hakka dwellings, typological approaches have highlighted shared ideas such as inward orientation and ritual focus, yet most analyses continue to define architectural type primarily through overall form or symbolic order, providing limited explanation of how spatial relationships among architectural components generate typological variation at the building scale (Katayama, 2011).

Jacoby (2015) distinguished typological reasoning from formal classification by emphasizing relational spatial structure rather than visual resemblance. Traditional architectural typology has often classified Hakka dwellings according to overall form, enclosure geometry, or external morphological characteristics. Such approaches are useful for identifying regional categories and formal similarities, but they tend to treat architectural type as a relatively fixed visual or compositional outcome. In many studies, typological classification is therefore based primarily on plan form, enclosure shape, or stylistic appearance.

In contrast, this study adopts a component-based typological approach that understands architectural type as emerging through relationships among spatial components and their internal organization. Rather than focusing primarily on external form, the approach examines how the gatehouse, courtyard system, and ancestral hall interact to structure movement, access, hierarchy, and ritual focus within the enclosure. Typological variation is therefore interpreted not simply as formal difference, but as variation in internal spatial relationships generated through component configuration.

This perspective also differs from existing spatial analytical studies, which evaluate vernacular architecture primarily at the level of overall configuration. While such studies have demonstrated the importance of circulation and spatial hierarchy, they pay less attention to how individual architectural components operate together as a relational system. The component-based framework developed in this study, therefore, aims to connect

typological analysis with spatial-relational analysis at the architectural-component level.

In response to these limitations, the present study focuses on three architectural components that consistently shape internal spatial organization: the gatehouse, the courtyard system, and the ancestral hall. These components are examined through their spatial relationships and configurational roles in shaping enclosure, circulation, hierarchy, and ritual emphasis. Their analysis serves as the basis for the Built Environment dimension within the analytical framework.

On this basis, a three-dimensional analytical framework is developed to guide the comparative analysis of Yanyiwei and Wushiwei. The framework distinguishes between Natural, Built Environment, and Historical dimensions, ensuring that interpretation remains grounded in observable spatial relationships while remaining sensitive to cultural practice (Peponis *et al.*, 1997). The Natural dimension accounts for site-driven differences in settlement layout, enclosure form, and courtyard configuration, drawing on environmental and settlement studies (Y. Chen *et al.*, 2025; Rapoport, 1969; Xie *et al.*, 2022). The Built Environment dimension serves as the primary analytical level, focusing on the configuration of three key architectural components—the gatehouse, the courtyard system, and the ancestral hall—to explain variation in enclosure, circulation, spatial hierarchy, and ritual emphasis (Peponis *et al.*, 1997). The Historical dimension provides temporal and socio-historical context, examining lineage structure, construction period, and functional evolution to explain spatial adaptation and divergence between cases (Knapp, 1986, 2012; Ruan, 2006). The structure of this framework is summarized in Table 1, which provides a clear bridge between the literature review and the analytical sections that follow.

2.1. Building-level spatial and structural characteristics

Hakka enclosed houses in southern Jiangxi share several building-level spatial and structural characteristics. Most examples are 2–3 stories tall and are constructed primarily of rammed earth, brick, and timber. The timber structural system commonly employs locally available Chinese fir (*Cunninghamia lanceolata*), pine, and camphor wood, which are widely used in traditional Hakka architecture in southern China due to their structural durability, workability, and resistance to humid climatic conditions (Knapp, 2012; Ruan, 2006). Timber elements are typically applied in roof framing systems, beams, columns, corridor structures, and decorative architectural components, forming an essential part of the structural and cultural character of southern Jiangxi Hakka enclosed houses.

Wall thickness typically ranges from 1.0 to 1.5 m, contributing to structural stability and environmental control (Moriset *et al.*, 2021), as illustrated by the relationship between wall mass, roof structure, and drainage system (Figure 1).

Spatial organization commonly follows a central axial arrangement. Movement proceeds from the main gate through one or more courtyards toward the ancestral hall. Corridors, internal passages, and covered circulation routes form a continuous movement network that connects different functional zones within the enclosure. This internal circulation system, together with integrated drainage channels and layered roofing, allows everyday movement while reducing exposure to external weather conditions (Fu *et al.*, 2021; L. Chen *et al.*, 2022) (Figure 2).

Southern Jiangxi Hakka enclosed houses were constructed using locally available materials and vernacular building knowledge. Rammed-earth walls typically consisted of compacted soil mixed with lime, sand, and organic fibers, improving structural stability, moisture resistance, and thermal performance. The layered wall construction shown in Figure 3 reflects traditional ramming techniques widely documented in studies of earthen vernacular heritage (Carlos *et al.*, 2022).

Roof construction was designed for the humid subtropical climate of southern Jiangxi. Steep roof pitches facilitated rainwater drainage, while layered grey-tile roofing improved ventilation and reduced heat accumulation. Extended eaves protected rammed-earth walls from rain exposure and solar radiation, contributing to the environmental adaptability and durability of Hakka enclosed houses (Figure 4).

These shared spatial and structural characteristics provide a common architectural background against which the specific configurations of Yanyiwei and Wushiwei are documented and compared in subsequent sections.

These shared features also explain why this study focuses specifically on the gatehouse, courtyard system, and ancestral hall as the principal analytical components. In southern Jiangxi Hakka enclosed houses, the primary spatial sequence commonly extends from the entrance through successive courtyards toward the ancestral hall, making these components central to the organization of movement, access control, and ritual focus. Therefore, analyzing their spatial relationships provides a more effective basis for explaining typological variation than classification based solely on overall form or stylistic appearance.

Table 1. Cultural–spatial analytical framework for southern Jiangxi Hakka enclosed houses

Main dimension	Focus	Representative elements	Key references	Analytical role
Natural	Topography, orientation, water sources, and farmland context	Hilly basins vs. valley plains; south-facing orientation; proximity to water; scattered farmland	Xie *et al.* (2022); Y. Chen *et al.* (2025)	Explains site-driven differences in settlement layout, enclosure form, and courtyard configuration
Built environment	Spatial composition at building scale	Gatehouse; courtyard system; ancestral hall	Peponis *et al.* (1997); field documentation	Primary analytical level: explains variation in enclosure, circulation, spatial hierarchy, and ritual emphasis
Historical	Lineage structure, construction period, functional evolution	Single-lineage vs. multi-lineage cohabitation; mid-Qing vs. late-Qing origin; exhibition vs. community-oriented adaptation	Knapp (1986, 2012); Ruan (2006)	Provides a temporal and socio-historical explanation for spatial adaptation and divergence between cases



Figure 1. Wall thickness, roof drainage, and structural layering. Source: Photos by the authors



Figure 2. Corridor of a traditional Hakka enclosed house. Source: Photo by the authors

3. Research method and case selection

This section presents the research method, case selection, data sources, and analysis of the study. It uses a comparative case study approach and focuses on two Hakka enclosed houses in southern Jiangxi, Yanyiwei and Wushiwei. The comparative case-study strategy follows the methodological principles proposed by Gerring (2006) and further discussed by Hollweck (2015), emphasizing analytical comparison between carefully selected cases under shared contextual conditions. The data were collected through site visits and secondary sources, including field observations, photographs, spatial records, and related historical materials. Using the three dimensions in Table 1, each case is first analyzed individually. The two cases are then compared side by side to identify their main spatial similarities and differences. This section, therefore, shows clearly how the study moves from case data to analysis and comparison.



Figure 3. Wall material composition and layered rammed-earth structure. Source: Diagram by the authors

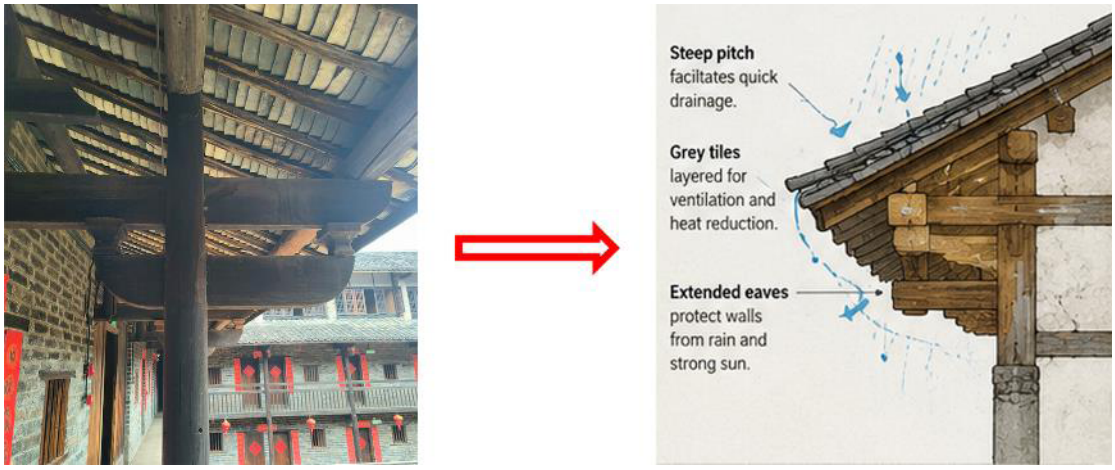


Figure 4. Roof drainage and layered tile roofing structure. Source: Photo and drawing by the authors

3.1. Data collection and field documentation

This study is based on field investigations conducted in Longnan City, southern Jiangxi, where Yanyiwei and Wushiwei were selected as representative examples of Qing Dynasty Hakka enclosed houses. Fieldwork was carried out in February and September 2025 and included two on-site investigations. The study combined direct observation, photographic documentation, video recording, and spatial analysis to examine relationships among key architectural components and internal spatial organization.

Architectural plans and spatial diagrams were produced through field measurement and on-site documentation conducted by the author. Recent research has also highlighted the potential of computational approaches for investigating genealogical relationships and typological evolution in vernacular architecture, providing useful directions for future comparative studies (Xue *et al.*, 2025). To improve the accuracy and historical reliability of the architectural information, field documentation was supplemented and cross-checked with published studies on Hakka settlements and vernacular architecture in southern Jiangxi, particularly Xie *et al.* (2022) and Y. Chen *et al.* (2025).

Data collection followed the three-dimensional analytical framework developed in this study. The Natural dimension was documented through site observation, topographical conditions, and analysis of settlement

context. The Built Environment dimension focused on the configuration of the gatehouse, courtyard system, and ancestral hall through measurement, circulation mapping, and component-based spatial analysis. The Historical dimension was examined through comparative analysis of construction history, lineage organization, and adaptive transformation, based on field observations and documentary sources.

To ensure analytical consistency, both cases were documented using the same recording procedures. Comparative analysis then examined how differences in component configuration generated variation in enclosure, circulation depth, spatial hierarchy, and ritual focus.

3.2. Research scope

Southern Jiangxi is widely recognized as one of the core regions of Hakka cultural development. Xie *et al.* (2022) demonstrated that the distribution of Hakka traditional settlements in Jiangxi, Fujian, and Guangdong was strongly influenced by migration history, environmental adaptation, and regional geography. Building upon this perspective, Y. Chen *et al.* (2025) further argued that Hakka settlement formation was closely associated with topographical conditions, agricultural resources, and lineage-based social organization.

Through successive waves of southward migration triggered by political instability and warfare in the Central Plains (Figure 5), Hakka communities gradually established settlement networks across southern China (Xie *et al.*, 2022). Southern Jiangxi subsequently became one of the most important centers of Hakka cultural development and expansion of settlement. Traditional Chinese rural dwellings have long been understood as cultural products shaped by regional environment, social organization, and everyday practices (Knapp, 1986). According to Knapp (2012), clan organization, ancestral worship, and collective living traditions became major social foundations of Hakka communities. Ruan (2006) similarly noted that these social structures were directly reflected in the spatial organization of traditional Hakka dwellings through hierarchical arrangements of ritual and residential spaces. Fan *et al.* (2021) further argued that Hakka architecture serves as an important material expression of Hakka cultural identity and collective memory.

Hakka enclosed houses developed within this historical and cultural context as spatial settings that accommodated residential, ritual, and communal activities. Knapp (2012) reported that traditional Chinese lineage dwellings commonly integrated domestic life and ancestral worship within a unified spatial framework. Similarly, Hu and Yang (2023) demonstrated that Hakka residential compounds organize movement, access, and social interaction through hierarchical spatial sequences. Within this context, the internal organization of Hakka enclosed houses is structured through the arrangement of architectural components such as the gatehouse, courtyard system, and ancestral hall. These components regulate access, structure movement, and organize internal spatial sequences. Over time, repeated everyday use reinforced the relationship between spatial configuration and cultural practice.

Figure 6 illustrates the spatial distribution of Hakka enclosed house settlements in southern Jiangxi in relation to regional topography. Recent studies of traditional villages further suggest that long-term environmental adaptation can also be reflected in the visual and material characteristics of settlement landscapes, including building color, material selection, and spatial composition (Tan *et al.*, 2024). Y. Chen *et al.* (2025) indicated that Hakka settlement patterns were strongly influenced by terrain conditions, agricultural resources, and accessibility. Similarly, Xie *et al.* (2022) identified low-hill basins and valley-edge environments as important geographical settings for Hakka settlement development. The concentration of settlements within these environments reflects the influence of terrain,

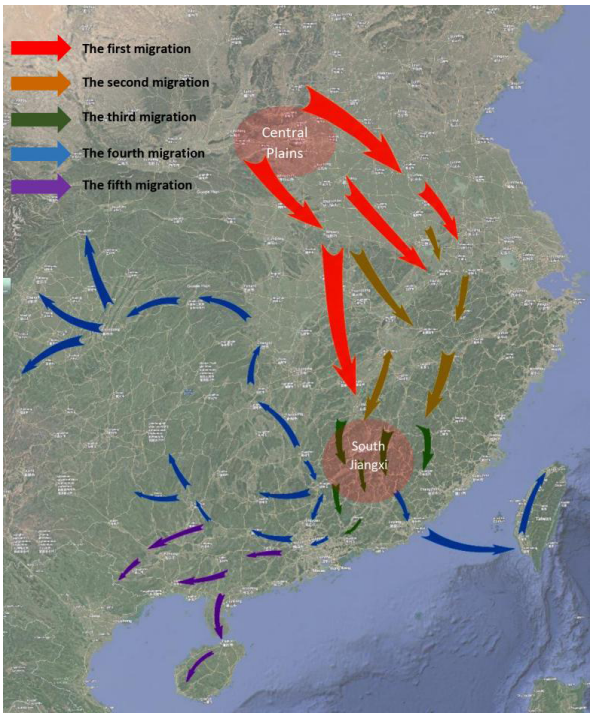


Figure 5. Major southward migration routes associated with the historical formation of Hakka settlements in southern China. Source: Map by the authors

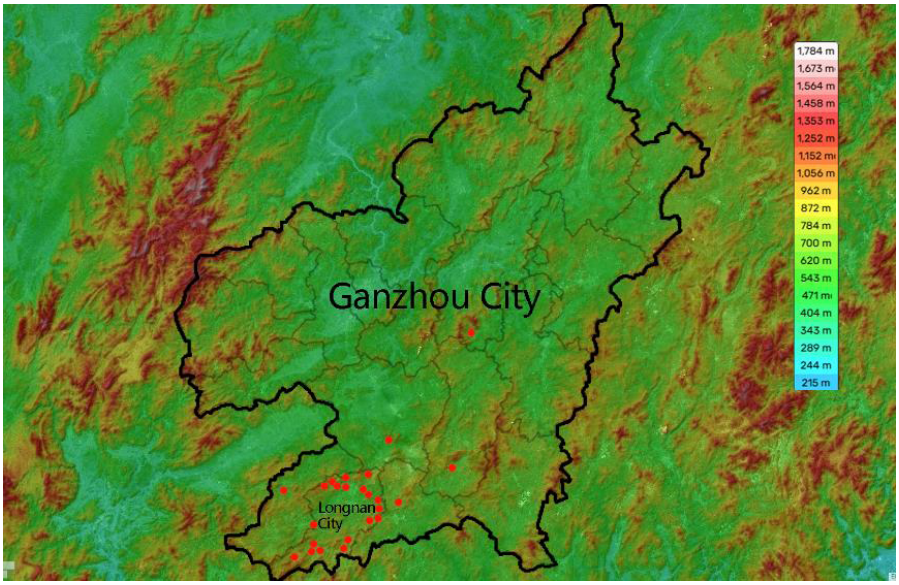


Figure 6. Topographical context and spatial distribution of Hakka enclosed house settlements in southern Jiangxi. Source: Map by the authors

water access, and agricultural conditions on settlement formation and enclosure organization. Longnan City, where Yanyiwei and Wushiwei are located, represents one of the most concentrated regions of preserved Hakka enclosed houses in southern Jiangxi.

From this perspective, Hakka enclosed houses are treated in this study as culturally structured spatial systems rather than as isolated architectural objects. This understanding defines the scope of analysis and provides the contextual basis for the component-based framework adopted in the following sections.

Based on the analytical framework described above, Yanyiwei and Wushiwei were selected as comparative cases. Both are well-preserved Hakka enclosed houses constructed during the Qing Dynasty and are located within the same regional and cultural context of southern Jiangxi. This shared background ensures comparability in historical conditions, construction traditions, and cultural foundations.

At the same time, the two cases exhibit clear differences in internal spatial configuration. Yanyiwei is characterized by a compact square enclosure with a single-opening gatehouse, a single courtyard, and a relatively modest ancestral hall. Wushiwei displays a more extensive layout, including a three-opening gatehouse, multiple courtyards, and a larger multi-bay ancestral hall.

The cases were selected for their configurational contrast rather than for statistical representativeness. Their comparison allows differences in spatial organization to be examined under controlled cultural and regional conditions, with analytical attention focused on the internal component configuration. The selection enables controlled regional comparison while preserving meaningful variation in internal spatial organization.

3.3. Analytical framework and component-based spatial logic

The three-dimensional analytical framework established in Section 2 (Table 1) provides the conceptual basis for examining internal spatial organization in Yanyiwei and Wushiwei. As illustrated in Figure 7, the framework distinguishes among natural, built environment, and historical dimensions. Among these, the built environment dimension serves as the primary analytical level, focusing on the configuration of three architectural components: the gatehouse, the courtyard system, and the ancestral hall. The natural and historical dimensions provide contextual and temporal explanations for observed spatial variation.

Three architectural components are identified as primary analytical units in this study: the gatehouse, the courtyard system, and the ancestral hall. Each component is examined through specific spatial attributes.

The gatehouse is the interface between exterior and interior space. It is analyzed in terms of the number of openings (single vs. multiple), degree of openness, and level of access control. These attributes determine how the boundary between outside and inside is structured.

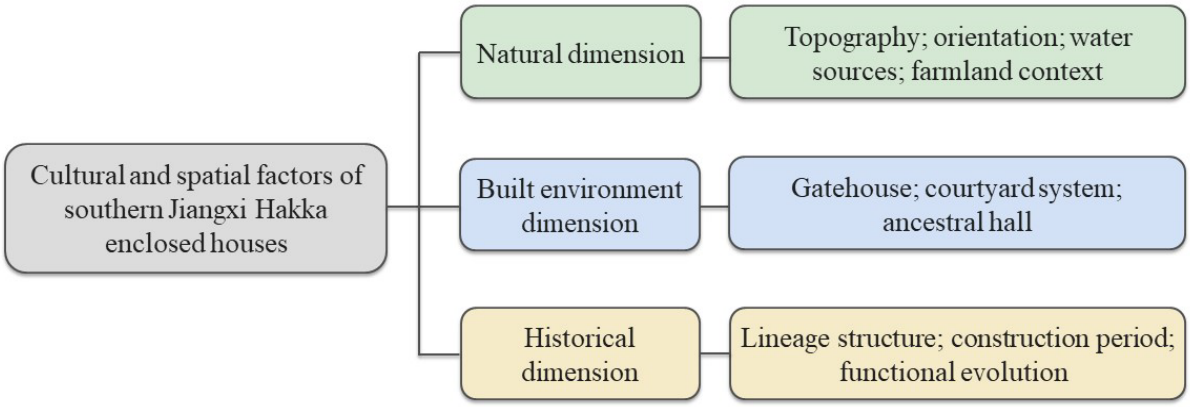


Figure 7. Cultural–spatial analytical framework for Hakka enclosed houses in southern Jiangxi. Source: Diagram by the authors

The courtyard system organizes internal movement and spatial sequence. It is analyzed in terms of the number of courtyards, their arrangement along the axis, and the resulting circulation depth. These attributes shape how spaces are connected and how movement progresses through the enclosure.

The ancestral hall is the main ritual space within the enclosure. It is analyzed in terms of its position within the axial sequence, its size (single-bay vs. multi-bay), and its spatial relationship with surrounding components. These attributes indicate how ritual emphasis is expressed spatially.

These three components and their attributes provide a consistent basis for documenting and comparing Yanyiwei and Wushiwei in the following sections.

3.4. Data organization and case documentation

To ensure consistency and comparability between cases, all spatial and cultural information was documented using a unified recording structure based on the three analytical dimensions established in this study. Architectural components, circulation patterns, spatial hierarchy, and ritual functions were recorded using the same observational criteria in both Yanyiwei and Wushiwei. This documentation structure ensures systematic comparison and consistent representation across both cases (Hua *et al.*, 2018).

3.4.1. Analytical dimensions for identifying Hakka enclosed houses

Table 2 presents a comparative analytical matrix for examining the spatial and cultural identities of Hakka enclosed houses. It organizes the gatehouse, courtyard system, and ancestral hall according to three analytical dimensions: natural context, built environment, and historical condition. The natural dimension describes settlement-scale environmental background, the built environment dimension addresses component configuration and spatial organization, and the historical dimension reflects lineage structure and patterns of continuity and change. Applied consistently to Yanyiwei and Wushiwei, this framework enables systematic identification of differences in enclosure, spatial hierarchy, circulation, and ritual emphasis as outcomes of component configuration rather than isolated features.

3.4.2. Typological comparison of Yanyiwei and Wushiwei

Building on the comparative framework outlined in Table 2, the spatial and cultural characteristics of Yanyiwei and Wushiwei are documented separately in Tables 3 and 4, respectively, using the same analytical structure. Each table examines the gatehouse, courtyard system, and ancestral hall through the same three dimensions, ensuring direct comparability between the two cases. Table 3 characterizes Yanyiwei as a compact, inward-oriented enclosure defined by a single axial sequence, strong access control, and concentrated ritual centrality. Table 4 characterizes Wushiwei as a more extensive and differentiated enclosure, marked by higher permeability, deeper circulation, and distributed ritual and social functions. Together, Tables 3 and 4 provide an explicit empirical basis for the typological comparison developed in the following sections.

Table 2. Comparative analytical matrix of Yanyiwei and Wushiwei

Analytical framework	Yanyiwei	Wushiwei
Gatehouse		
Natural	Low-hill basin setting, inward-oriented settlement context	Valley plain setting, outward-connected agrarian context
Built environment	Single entrance gatehouse; strong access control	Three-opening gatehouse; shared and permeable access
Historical	Mid-Qing origin; single-lineage construction	Late-Qing origin; multi-lineage cohabitation
Courtyard		
Natural	Compact courtyard responding to the basin micro-climate	Expanded courtyards aligned with open farmland
Built environment	Single courtyard on a strict central axis	Multiple courtyards with layered circulation
Historical	Conserved as an exhibition-oriented space	Adapted as a community-oriented public space
Ancestral hall		
Natural	Axial core embedded in enclosed settlement	Central node within an open courtyard network
Built environment	Single-bay hall emphasizing axial centrality	Multi-bay hall emphasizing spatial capacity
Historical	Lineage-specific ritual space	Communal ritual and meeting space

4. Typological comparison of spatial structure and architectural components of Yanyiwei and Wushiwei

4.1. Typological comparison between Yanyiwei and Wushiwei

Yanyiwei and Wushiwei are both Hakka enclosed houses in Longnan City, Ganzhou, Jiangxi Province, and both were built during the Qing Dynasty. Because they are in the same regional and cultural setting in southern Jiangxi, they share a similar historical background, settlement traditions, building materials, and a clan-based social foundation. This makes them suitable for comparison.

This section follows the analytical framework developed in the previous section. The comparison focuses on typology at the building level, especially the arrangement of three main components: the gatehouse, the courtyard system, and the ancestral hall. These components are used to explain differences in enclosure character, spatial hierarchy, circulation depth, and ritual emphasis.

The analysis is based on the same three dimensions used in Tables 2, 3, and 4: natural context, built environment, and historical condition. Among them, the built environment is the main focus, because it shows how the number, position, openness, and sequence of components shape spatial structure. The other two dimensions provide a supporting background for interpretation.

Under this framework, the two houses show clear typological differences. Yanyiwei is more compact and inward-oriented, with a single-opening gatehouse, one central courtyard, and a relatively small ancestral hall on the main axis. This produces strong access control, shallow circulation, and concentrated hierarchy. Wushiwei is more open and internally layered, with a three-opening gatehouse, multiple courtyards, and a larger multi-bay ancestral hall. This creates deeper circulation, more spatial variation, and a more distributed ritual center. Overall, this section compares how different component arrangements produce different typological forms within the same southern Jiangxi Hakka tradition.

At the same time, these spatial differences are not treated solely as formal variation. Following the analytical framework in Table 1, they can also be interpreted in relation to cultural and social context, especially lineage organization, ritual practice, and patterns of communal use. These factors do not replace the analysis of spatial composition, but help explain why similar architectural components were configured differently in the two case studies.

4.2. Comparison of spatial structure

Both Yanyiwei and Wushiwei follow the common architectural features of southern Jiangxi Hakka enclosed houses, including enclosure, axial order, and the combination of living and ritual spaces. However, the two houses differ in how these features are organized internally through the arrangement of architectural components.

Yanyiwei has a compact and inward-looking spatial structure. Its layout follows a short sequence from the gatehouse to a single courtyard and then to the ancestral hall. This creates a clear and direct spatial order, with concentrated hierarchy and a strong ritual focus along the central axis (Figure 8).

Table 3. Analytical characteristics of the Yanyiwei Hakka enclosed house

Building element	Natural	Built environment	Historical
Gatehouse	Basin landscape; agricultural settlement context	Single-opening gate on the central axis; strong threshold and access control	Mid-Qing construction; lineage-specific ritual entrance
Courtyard	Low-hill basin micro-climate; inward-oriented open space	Single central courtyard; linear sequence linking gatehouse and ancestral hall	Ritual–domestic core; later exhibition adaptation
Ancestral hall	Settlement-scale ritual focal point within an enclosed environment	Single-bay hall at axial terminus; concentrated ritual focus	Lineage-based ancestral worship space; preserved with minimal alteration

Table 4. Analytical characteristics of the Wushiwei Hakka enclosed house

Building element	Natural	Built environment	Historical
Gatehouse	Valley plain and open agrarian setting	Three-opening gatehouse; high permeability and shared access	Late-Qing construction; multi-lineage communal entrance
Courtyard	Open farmland context supporting outward-oriented use	Multiple courtyards; layered spatial sequence and deep circulation	Evolved as a community-centered shared space
Ancestral hall	Ritual core embedded within an open internal network	Multi-bay hall functioning as a spatial node rather than an axial terminus	Communal hall for ritual and social gathering

Wushiwei, in contrast, has a larger and more layered spatial structure. Its layout includes multiple courtyards, broader circulation routes, and more connected spaces. As a result, its hierarchy is spread across a deeper spatial sequence rather than being focused on a single main axis. The enclosure character of Wushiwei is therefore achieved primarily through spatial depth and internal differentiation rather than through centralized spatial control (Figure 8).

This comparison shows that the spatial structure of an enclosed house depends not only on the enclosure itself, but also on how the internal spaces are arranged. Yanyiwei is more compact and centralized, while Wushiwei is more layered and differentiated. From a spatial-theoretical perspective, these differences suggest two distinct modes of internal organization. Karimi (2012) argued that spatial configuration influences accessibility and movement patterns within built environments. Recent studies have further demonstrated that spatial complexity and wayfinding are influenced not only by planar configuration but also by three-dimensional volumetric relationships within built environments (Zhang & Chiaradia, 2020). Likewise, Peponis *et al.* (1997) emphasized that spatial depth and connectivity contribute to different forms of circulation and social interaction. Therefore, Yanyiwei relies on a highly centralized spatial sequence that concentrates movement and ritual focus along a single axis, whereas Wushiwei distributes circulation and social interaction across a deeper, more interconnected spatial network.

As illustrated in Figure 8, the three core architectural components—the gatehouse, courtyard system, and ancestral hall—form distinct spatial sequences in the two case studies. In Yanyiwei, these components are organized along a compact, centralized axis, whereas in Wushiwei, they are distributed across a deeper and more interconnected spatial structure.

4.3. Typological comparison of architectural components

4.3.1. Gatehouse

In Yanyiwei, the gatehouse has a single opening along the main axis, creating a strong entrance threshold and limiting access to a single controlled point. This direct transition from outside to inside strengthens the house's inward-looking character and guides movement toward the ancestral hall. In Wushiwei, the gatehouse has three openings, making the entrance more open and permeable. Although it still marks the boundary of the enclosure, it allows easier access and reduces the sense of compression at the entrance. The gatehouse in Wushiwei thus connects inner and outer spaces more actively, consistent with shared communal use. These differences in gatehouse openness may also reflect differences in social organization

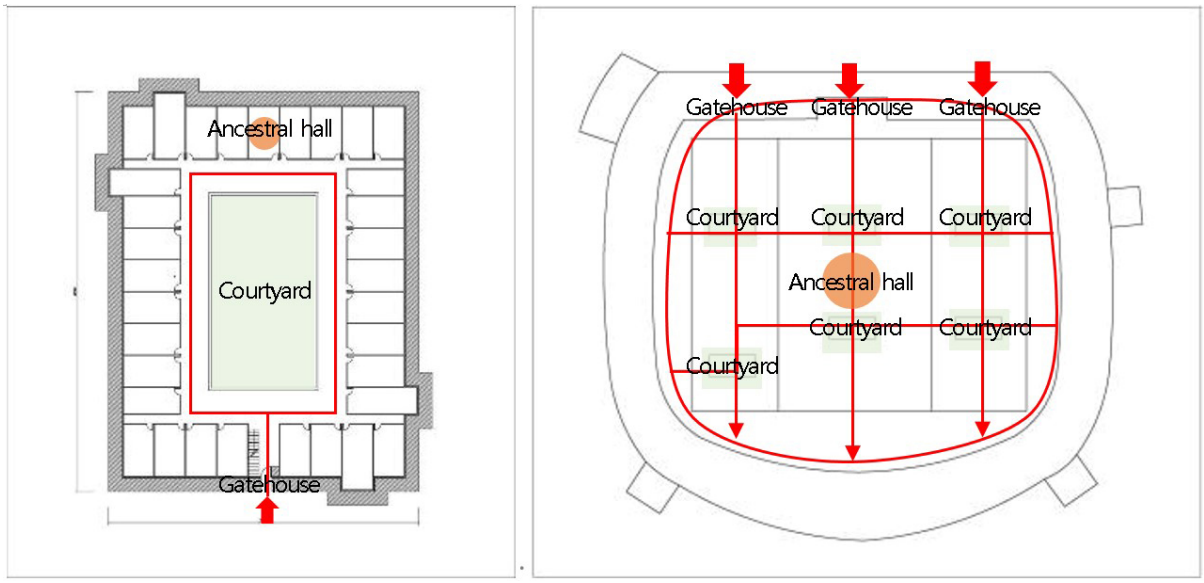


Figure 8. Comparative spatial configuration of Yanyiwei and Wushiwei. This schematic diagram highlights the spatial relationship among the gatehouse, courtyard system, and ancestral hall, illustrating differences in access control, circulation depth, and ritual centrality between the two enclosure types. Source: Drawings by the authors

and patterns of collective use. The stronger threshold control in Yanyiwei corresponds to a more lineage-centered and inward-oriented spatial order, whereas the more permeable entrance structure in Wushiwei suggests a broader communal function and more flexible interaction between internal and external social activities.

A direct comparison shows that Yanyiwei has only one entrance on the main axis, while Wushiwei has three entrances (one main entrance in the middle and two smaller side entrances). As a result, Yanyiwei exhibits stronger enclosure and access control, while Wushiwei is more open and easier to access.

4.3.2. Courtyard system

In Yanyiwei, the layout is organized around a single main courtyard along the central axis. This courtyard links the gatehouse and the ancestral hall, forming a short and direct spatial sequence. Hierarchy is clear and concentrated, and movement through the house is relatively shallow. In Wushiwei, the courtyard system includes multiple courtyards arranged in sequence, creating a more layered spatial structure with several intermediate spaces. Movement passes through a series of connected spaces, increasing circulation depth and making the internal structure more differentiated. The courtyards in Wushiwei also support broader communal use and function as active shared spaces within the enclosure. The difference in courtyard sequence also reflects different approaches to spatial organization within southern Jiangxi Hakka settlements. In Yanyiwei, the single courtyard reinforces a centralized and controlled spatial order, while in Wushiwei, the multiple courtyards create a more differentiated internal structure that supports varied circulation routes and collective activities. This finding aligns with vernacular morphology studies, in which spatial complexity emerges through the gradual adaptation of architectural layouts to changing social and communal needs. Khei *et al.* (2024) demonstrated that variations in vernacular residential typologies often result from long-term adaptation to environmental and social requirements, while Liu *et al.* (2024) similarly emphasized the role of organizational patterns in shaping spatial complexity and settlement morphology. Comparable findings have also been reported in studies of traditional regional dwellings, where differences in courtyard organization significantly influence spatial relationships and settlement structure (Q. Wang *et al.*, 2025).

4.3.3. Ancestral hall

In Yanyiwei, the ancestral hall is smaller and placed clearly at the end of the central axis. Its importance comes mainly from its position rather than its size. Because the gatehouse and courtyard lead directly to it, the ancestral hall becomes the clear ritual focus of the entire enclosure, creating a strong and concentrated sense of ritual centrality. In Wushiwei, the ancestral hall is larger and has multiple bays,

giving it a stronger physical presence. However, because it is located within a larger multi-courtyard system, its importance is shown less by axial position alone and more by its size, accessibility, and connections with other spaces. It functions as an important node within the internal spatial network, reflecting a broader communal function.

This comparison shows that ritual emphasis is expressed differently in the two houses. In Yanyiwei, ritual centrality is more concentrated and axis-based. In Wushiwei, it is broader, more distributed, and integrated into a more complex spatial structure. This difference suggests that ritual organization in Hakka enclosed houses is not expressed through a single spatial model. In Yanyiwei, ritual authority is reinforced through axial concentration and controlled access, while in Wushiwei, ritual importance is embedded within a broader communal network of circulation and gathering spaces. The ancestral hall, therefore, functions not only as a symbolic element but also as a spatial mechanism that structures social interaction and collective identity.

4.4. Relationship between component configuration and typological character

These configurational differences may also reflect different patterns of lineage organization and communal use within southern Jiangxi Hakka settlements. In Yanyiwei, the single-opening gatehouse, centralized courtyard sequence, and strongly axial ancestral hall correspond to a more lineage-centered spatial structure associated with single-lineage occupation. Under such conditions, stronger boundary control and concentrated ritual organization helped reinforce internal cohesion, hierarchical order, and the separation between lineage space and external activity. The relatively shallow circulation system also reflects a more centralized mode of social organization in which ritual and domestic functions were closely integrated along a single spatial axis.

In contrast, the more permeable gatehouse arrangement and multiple courtyard sequence in Wushiwei suggest adaptation to broader communal interaction and multi-lineage cohabitation. The deeper and more differentiated circulation system enabled shared access, distributed social activity, and greater flexibility in the use of internal space. Multiple courtyards provided intermediate spaces capable of accommodating communal gatherings, circulation overlap, and interaction among different lineage groups. Within this larger spatial network, the ancestral hall functioned not only as a ritual center but also as a communal node connected to broader patterns of collective activity and social exchange.

From this perspective, typological variation in southern Jiangxi Hakka enclosed houses can be understood not simply as a formal architectural difference but as a spatial response to changing patterns of lineage organization, collective living, and communal interaction. Rather than treating enclosure, hierarchy, and ritual focus as fixed architectural attributes, the comparison demonstrates that these qualities emerge through configurational relationships among architectural components shaped by both spatial and social conditions. This component-based interpretation extends typological analysis beyond formal classification and supports a spatially grounded understanding of how social structure and cultural practice are embedded within vernacular architecture. This interpretation is also consistent with Jacoby (2015), who emphasized that typological reasoning should focus on relational spatial structures rather than solely on formal architectural resemblance. The relationship between social organization and spatial configuration has been widely discussed in vernacular architecture studies. Vellinga (2004) argued that domestic spatial arrangements often reflect kinship structures and collective social practices. Similarly, Fu *et al.* (2021) demonstrated that spatial organization in traditional settlements is closely associated with social interaction and cultural values. Recent research on Hakka enclosed houses by Li *et al.* (2025) further suggested that lineage organization, communal activities, and collective identity remain important factors influencing spatial hierarchy and heritage value.

5. Key typological findings from the comparative study

Section 4 compared Yanyiwei and Wushiwei with respect to spatial structure and architectural components. The comparison shows that the typological differences between the two houses do not stem from a single element. They come from the arrangement of the gatehouse, courtyard system, and ancestral hall. Based on this, this section summarizes the main typological findings from the comparative study.

5.1. Gatehouse openness and enclosure strength

One important finding is that the gatehouse is closely associated with a sense of enclosure. The gatehouse is not only an entrance, but also an important boundary between the outside and the inside.

The comparison shows that a more controlled entrance usually creates a stronger sense of enclosure and inward orientation. In contrast, a more open entrance reduces the degree of spatial enclosure and is more connected to the outside. This means that gatehouse openness can help explain differences in enclosure strength between Hakka

enclosed houses. This finding suggests that entrance configuration functions as a spatial mechanism through which enclosure and social boundary control are materially expressed.

5.2. Courtyard sequence and spatial depth

Another important finding is that the courtyard system affects internal spatial depth. The number and sequence of courtyards influence how people move through the house and how internal spaces are connected.

The comparison shows that a simpler courtyard arrangement typically creates a shorter, clearer spatial sequence. A more complex courtyard arrangement creates a deeper and more layered internal structure. This finding indicates that the courtyard sequence is an important part of the typological difference. Therefore, the courtyard sequence serves not only as a circulation device but also as an organizational framework that structures accessibility and spatial hierarchy.

5.3. Ancestral hall and ritual expression

A third finding is that the ancestral hall is the main ritual space in both houses, but its role can be expressed in different ways. The comparison shows that in some cases, the ancestral hall becomes important mainly because of its position on the axis. In other cases, its importance is shown more by its larger size and stronger connection with surrounding spaces. These results suggest that ritual emphasis does not always come from the same spatial method. The ancestral hall can therefore be understood as both a ritual symbol and a configurational anchor within the enclosure's spatial system.

5.4. Combined component configuration and typological difference

The most important finding of this study is that typological differences should be understood through the combined configuration of the gatehouse, courtyard system, and ancestral hall. These three components should not be studied separately when defining the Hakka enclosed house typology. Their meaning becomes clearer when read together as a single spatial system. In this way, the enclosure's character, hierarchy, circulation, and ritual focus are shaped by the overall arrangement of components, not by any single feature.

From this perspective, typological variation in southern Jiangxi Hakka enclosed houses should be understood as a configurational phenomenon rather than as a purely formal distinction. The findings suggest that spatial hierarchy, circulation depth, and ritual organization are produced through relationships among architectural components, consistent with spatial syntax approaches that interpret architectural space as a social structure shaped through patterns of access, movement, and integration. At the same time, the study contributes to vernacular morphology research by demonstrating how regional dwelling types evolve through changing social organization, communal practices, and internal spatial adaptation. The study, therefore, provides a methodological alternative to conventional form-based classifications by demonstrating that architectural type can be interpreted through component configuration and relational spatial structure.

5.5. Implications for conservation and adaptive reuse

The conservation of southern Jiangxi Hakka enclosed houses should address not only architectural appearance but also material integrity and spatial continuity. Traditional materials such as rammed earth walls, timber structural members, grey brick masonry, and tiled roofing require compatible preservation techniques to maintain structural authenticity and environmental performance. Previous studies have identified moisture accumulation, biological decay, and material incompatibility as major causes of deterioration in traditional brick-and-timber heritage structures, highlighting the importance of material compatibility, minimum intervention, and reversible repair strategies (Hao *et al.*, 2024). In particular, timber components made from Chinese fir and pine are highly vulnerable to moisture damage, biological decay, and insect attack under humid climatic conditions. Environmental monitoring, moisture management, ventilation control, and routine maintenance should therefore be regarded as essential conservation measures (Brimblecombe & Richards, 2022). Recent studies have also explored the use of protective surface treatments, including silica dioxide nanoparticles and Paraloid B72 coatings, to improve moisture resistance and material durability in historic timber structures (Mitani *et al.*, 2024).

Recent heritage conservation research further underscores the importance of digital documentation and structural monitoring. Heritage building information modeling, digital twin technologies, and structural visualization methods provide effective tools for heritage recording, condition assessment, deterioration-risk evaluation, and conservation decision-making (Giuliani *et al.*, 2024; Pan *et al.*, 2024; Qian *et al.*, 2024; Zhuo *et al.*, 2024). Accordingly, damaged rammed-earth walls should be repaired with compatible earthen mixtures rather than replaced with reinforced concrete, while deteriorated timber members should be conserved through partial replacement and traditional joinery techniques whenever possible. Maintaining courtyard drainage systems and roof-

water management is also critical for preventing moisture-related deterioration within enclosed environments.

Equally important is the preservation of internal spatial relationships. Recent scholarship argues that vernacular heritage conservation should maintain the unity of architectural form, cultural practice, and spatial organization rather than preserving isolated physical elements alone (de Miguel *et al.*, 2025). Alterations that interrupt courtyard sequences, remove circulation corridors, or isolate ancestral halls may fundamentally change the spatial hierarchy and ritual organization embedded within the enclosure. Studies of renovated historic districts similarly demonstrate that modifications to the spatial configuration can significantly influence movement patterns, visitor activity, and perceptions of heritage environments (Liao *et al.*, 2025).

Adaptive reuse projects should therefore retain the configurational relationships among the gatehouse, courtyard system, and ancestral hall in order to preserve both tangible and intangible cultural values. Consistent with recent studies on vernacular heritage conservation, maintaining spatial relationships and cultural landscapes is essential for sustaining authenticity, cultural continuity, and long-term heritage resilience (Do, 2025; Han *et al.*, 2024).

6. Conclusion

This study examined southern Jiangxi Hakka enclosed houses as cultural–spatial systems rather than as architectural forms alone. This understanding aligns with recent scholarship that interprets vernacular heritage as an integrated process linking architecture, cultural memory, social practice, and collective identity (de Miguel *et al.*, 2025; Knapp, 2024). Using a component-based analytical framework structured through Natural, Built Environment, and Historical dimensions, the study compared Yanyiwei and Wushiwei to investigate how the gatehouse, courtyard system, and ancestral hall generate differences in enclosure, circulation, hierarchy, and ritual organization.

The comparison demonstrates that typological variation in southern Jiangxi Hakka enclosed houses is produced through configurational relationships among architectural components rather than through overall form alone. Although Yanyiwei and Wushiwei share similar regional and cultural foundations, differences in gatehouse openness, courtyard sequence, and ancestral hall organization generate distinct spatial structures and social–ritual experiences. This finding suggests that enclosure, hierarchy, and ritual centrality should not be understood as fixed architectural attributes, but as spatial conditions emerging through the arrangement and interaction of architectural components. The findings further suggest that differences in spatial configuration were closely related to variations in lineage organization, communal interaction, and patterns of collective living within southern Jiangxi Hakka settlements.

The study also contributes to vernacular architectural typology by shifting attention from formal classification toward component-based spatial analysis. Such an approach responds to recent calls for expanding typological research beyond formal description toward relational and process-oriented interpretations of vernacular architecture (Pardo, 2023; Zong *et al.*, 2025). Traditional typological studies of Hakka dwellings have often emphasized external form, symbolic meaning, or stylistic categories. In contrast, this research demonstrates how typological differences can be interpreted through observable spatial relationships such as access control, circulation depth, and spatial hierarchy. In this sense, the study establishes a closer connection between vernacular morphology, spatial organization, and social practice. The findings further support spatial-theoretical interpretations that understand architectural space as a socially structured system shaped through movement, accessibility, and ritual organization. Our study provides a methodological alternative to conventional form-based classifications by demonstrating that architectural type can be understood through relational spatial configuration.

In terms of heritage conservation and adaptive reuse, the research highlights the importance of preserving internal spatial relationships rather than focusing solely on external appearance or material repair. Alterations to gatehouses, courtyard systems, or ancestral halls may significantly change circulation patterns, ritual focus, and the social logic embedded within the enclosure. Conservation strategies should therefore consider how architectural components function together as an integrated spatial system. This perspective provides a basis for more context-sensitive approaches to the conservation and adaptive reuse of vernacular settlements in southern Jiangxi and other Hakka regions undergoing social and functional transformation.

Our study has several limitations. First, the research focuses on only two case studies within one regional context, limiting the broader representativeness of the findings. Second, the analysis primarily relies on qualitative and component-based interpretation rather than quantitative spatial measurement. Future research may incorporate additional case studies across different Hakka regions and combine a component-based typology with quantitative methods, such as spatial syntax analysis, to further

examine relationships among spatial configuration, social organization, and vernacular architectural transformation.

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Conflict of interest

The authors declare they have no competing interests.

Author contributions

Conceptualization: Denghui Song
Investigation: Denghui Song
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Writing–original draft: All authors
Writing–review & editing: All authors

Ethics approval and consent to participate

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Consent for publication

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No datasets were generated or analyzed during the current study.

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