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ORIGINAL RESEARCH PAPER

Architectural semiotics in the renovation of rural architecture

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ABSTRACT

This study combines theoretical research and practical case studies to explore effective methods for renovating rural architecture within the context of Chinese new rural construction. By analyzing the current state of existing rural architectures, identifying their characteristics and shortcomings, and applying the theory of architectural semiotics, this study proposes an innovative model for rural architecture renovation. The aim of this research is to provide valuable insights and optimization strategies for the revitalization of rural architectures in China, ultimately contributing to the sustainable development of rural areas and the preservation of regional culture.

KEYWORDS

rural construction, semiotics, Huizhou architecture, architecture design

1. INTRODUCTION

The new rural construction initiative is a pivotal component of the Chinese government's comprehensive revitalization strategy. Given the enduring developmental disparity between urban and rural regions in China, rural areas have encountered significant challenges, including slower progress and inadequate infrastructure. Through the upgrading of infrastructure, public services, and living conditions in rural areas, it can facilitate an environment where farmers can lead peaceful and fulfilling lives, thus improving their overall quality of life and allowing them to partake in the benefits of modernization [1].

After more than a decade of implementing the new rural construction policy, numerous villages have undergone substantial improvements. However, there remains considerable variation in the quality of rehabilitated villages, particularly at the design level. These issues are mainly in the following areas: balancing tradition and modernity, absence of design standards and norms, environmental sustainability, cultural identity, space planning and functionality, material selection and construction techniques.

2. ARCHITECTURAL SEMIOTICS

Symbols are abstract means of conveying information, using external forms to express underlying meanings. Semiotics originated from linguistics, logic, and aesthetics, and initially, this theory was primarily applied to language and art studies. However, as numerous scholars delved deeper into the study of semiotic systems of meaning, its significance expanded to the field of design [2].

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The introduction of semiotics into architecture can be credited to the Italian linguist Umberto Eco in the late 1950s [3]. During the 1960s, prominent researchers as Geoffrey Broadbent and Charles Jencks [3] further contributed to the field. In the 1970s, notable figures like Robert Venturi and the New York Five [3] delved into the theory and practice of architectural semiotics, constructing the foundational framework for the discipline [3].

The forms of architectural symbols exhibit diversity influenced by factors like function, historical period, and geographic region. Consequently, to uncover the underlying cultural symbols within architectural spaces, individuals must engage in active perception through visual, tactile, and other sensory interactions. This approach aims to effectively interpret the intricate connotations and logical structure of the architectural language system, as well as reflect the narrative nature of architecture and its role in preserving collective memory [4].

Semiotics focuses on the generation, dissemination and interpretation of symbols, and Chinese rural elements are not only physical existences, but also a kind of symbol system, which carries profound cultural connotations and conveys the values and historical inheritance of specific social groups. Through the interpretation of architectural symbols, designers can dig deeper into the historical memory, social structure and cultural system of the countryside, and provide targeted solutions for building renovation.

3. THE APPLICATION OF ARCHITECTURAL SEMIOTICS IN THE RENOVATION OF RURAL ARCHITECTURE

3.1. Geometric symbols

During rural architecture renovation, designers must depart from traditional practices of utilizing architectural symbols and instead develop contemporary architectural geometric symbols that evoke a lively and vibrant ambiance. Geometric symbols encompass geometric shapes that possess explicit design intentions, like windows, doors, and other geometric elements integrated into architectural components. Consequently, the implementation of geometric symbols in design varies based on the unique characteristics and functions of the architecture.

The utilization of geometric symbols has the potential to infuse dynamism into architecture, liberating it from the perception of being a monotonous square box. By creatively combining shapes, designers can transcend traditional architectural forms and craft a distinctive and captivating architectural aesthetic. Additionally, geometric symbols that emphasize lines and contours can accentuate the structural characteristics of the architecture, generating a dynamic and seamless visual impact [5]. Moreover, employing geometric patterns as decorative elements can enhance the visual appeal of the architecture facade, contributing to a unique visual effect (Fig. 1).

3.2. Material symbols

Material symbols, in the context of architectural semiotics, encompass the communication of distinct meanings and messages through the deliberate selection and application of architecture materials. Various architecture materials possess unique appearances, textures, and characteristics, thereby assuming symbolic roles in architectural design and serving as a means of expression and communication [6]. In rural architecture renovation projects, designers can utilize material symbols to accentuate regional characteristics, cultural heritage, and environmental integration within the architecture (Fig. 2).

3.3. Color symbols

Color holds a significant position within architectural design, serving as a highly sensitive and influential information symbol that conveys visual perceptions to individuals. The bold and extensive utilization of multiple colors is a prevalent design technique employed in architectural practices.

In rural architecture renovation projects, the application of color must be harmoniously integrated with local ethnic culture, customs, and psychological sensitivities. Consequently, color functions not only as a design tool but also as

Fig. 1. Geometric symbols in architectures (*Source*: Designed by UAO Architectural Design Company in Wuhan, (author was the member and designer of UAO Design Company) with the permission of UAO Architectural Design Company in Wuhan)

Fig. 2. Material symbols in architectures (*Source*: Designed by UAO Architectural Design Company in Wuhan (author was the member and designer of UAO Design Company) with the permission of UAO Architectural Design Company in Wuhan)

a symbol that enables people to comprehend the functions and roles of architectures through their observations and associations.

For instance, the black-and-white style of Huizhou architecture functions is not only an architectural symbol but also a representation of the distinct local culture [7]. Consequently, the utilization of color symbols within architectural design carries profound significance. It enriches people's understanding and experience of architecture, evokes emotional resonance, and fosters contemplation and exploration of architecture (Fig. 3).

3.4. Space symbols

Presently, many rural areas in China boast histories spanning tens to thousands of years. The architecture in these villages has been shaped by the evolution of local climate, geographical conditions, religious beliefs, power structures, and more.

Using the traditional Huizhou architecture as an illustration, the entire structure adheres to the courtyard house layout, incorporating a central patio to ensure ample natural light (Fig. 4). The communal area on the ground floor serves as a space for family members to partake in shared activities, with well-organized features like the living room, kitchen, and storeroom. The first floor transforms into a more private living area, with the central ancestral house holding not just familial heritage but also signifying elevated family

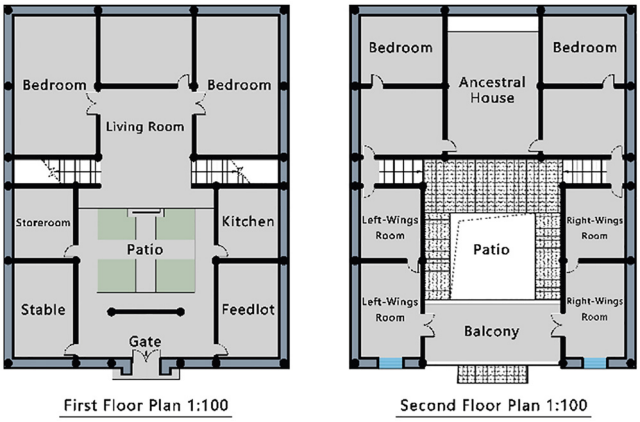

Fig. 4. Huizhou traditional architectures plan (*Source*: Designed by author)

status. This evolving spatial structure should serve as a symbolic reference for designers, offering a profound avenue for interpretation and application [8].

Within the architectural semiotics framework, space, serving as a crucial mode of symbolic expression, takes on a distinctive symbolic role. Space isn't merely a physical dimension, and it encapsulates the convergence of various elements like society, culture, and history. It carries profound symbolic significance through spatial layout, dimensions, and channel configurations. Designing and employing space

Fig. 3. Color symbols in Huizhou architectures (Photo: Author)

allows individuals to grasp and immerse themselves in the symbolic system of a specific culture and society.

4. ENVIRONMENTAL RENOVATION DESIGN IN YUANJIADIAN VILLAGE

4.1. Background

Yuanjiadian Village is situated within the Dahuashan Scenic Area, located in Jiangxia District, Wuhan City, Hubei Province. It serves as the site for the southern Wulijie Road entrance to the Huashan Sports and Culture Town planning project. The village encompasses 24 civil architectures, all constructed with brick-concrete materials. However, these architectures are generally outdated and require improvement and repair. The village's architectural layout is primarily oriented in an east-west direction, with its front facing Wulijie Road and its rear situated alongside unnamed reservoir (Fig. 5).

Currently, the scenic project is in the planning and design phase. The client (referred to as Party A) desires that the renovation of the village be prioritized, ensuring its completion prior to the commencement of the scenic project's operation, thus providing a living space for local villagers. Once the scenic project is operational, Party A intends to rent out the village as an artist village and utilize it as the functional area of the scenic area's south gate.

Additionally, Party A emphasizes that the environmental design and architectural renovation style of the village should draw inspiration from local traditional culture while integrating modern design concepts. Consequently, the village renovation program must successfully fulfill the functional requirements for local residents' habitation, cater to the aesthetic preferences of an artist village, and accommodate the future tourism needs of the scenic area within the next three to four years.

Fig. 5. Aerial photo of Yuanjiadian village (Photo: Author)

4.2. Design methodology

Jiangxia District is situated on the southern bank of the Yangtze River in Wuhan City, Hubei Province, and located in the southeastern region of Hubei. During the Ming and Qing Dynasties, Jiangxia District welcomed a wave of immigrants from Jiangxi and Anhui provinces, who brought with them the architectural style of Huizhou-style residential houses. These houses became a branch of Huizhou-style architecture in Hubei and acquired unique characteristics influenced by geography, culture, and climate.

Huizhou architecture, originating from the region of Anhui Province during the Ming and Qing Dynasties, is a significant school of traditional Chinese architecture known for its distinctive style. Beyond architectural forms and adornments, Huizhou architecture encompasses profound cultural meanings, reflecting the integration of traditional Chinese architecture with regional culture (Fig. 6).

1. *White Walls*: In Huizhou architecture, white walls hold cultural and symbolic significance, representing a pursuit of spirituality and a particular life attitude. The exterior walls are typically coated with high-quality white lime and plaster to ensure their whiteness and smoothness [9];
2. *Black Tiles*: Black tiles are a distinctive feature of Huizhou architecture, providing a striking contrast to the white walls with their deep black appearance, resulting in the classic black and white combination. Apart from their practical functions such as waterproofing and thermal insulation, black tiles contribute to a solemn and serene atmosphere of the architecture [9];
3. *Gray Brick*: Gray brick is a prevalent construction material in Huizhou architecture, contributing to the distinctive texture of the architectures. Typically made from kaolin clay, gray bricks exhibit a greenish-gray or bluish-gray hue;
4. *Horse Head Wall*: The horse head wall is a distinctive decorative element in Huizhou architecture, commonly found in gatehouses, pagodas, fences, and other sections of the architectures. It derives its name from its resemblance to a horse's head and is typically constructed using gray bricks or stones [10];

Fig. 6. White wall, Black tile, Gray brick, Horse head wall, Lattice window, Wooden element (Photo: Author)

5. *Lattice Windows*: Lattice windows are a prevalent design element in Jiangnan architecture, typically crafted from wood or stone and featuring intricate lattice patterns created through meticulous carving and inlay techniques. These windows serve both decorative and functional purposes, allowing ample light and ventilation while ensuring privacy [10];
6. *Wooden Material*: Wooden structures hold a significant place in traditional Chinese architecture. Huizhou architecture places great emphasis on the strength and aesthetic appeal of the structure, employing wood extensively in beams, eaves, arches, and other architectural elements. The mortise and tenon joints used in wooden structures enhance stability and durability.

4.3. Design practices

4.3.1. Village planning. Huashan Sports and Culture Town planning is a project that the author came into contact with when working at Wuhan Ruituo Architectural Design Consulting Company (referred to as UAO Architectural Design Company) in 2023. The author is responsible for the architectural facade design and village planning of the Yuanjiadian Village in this scenic spot. Yuanjiadian Village is situated at the entrance of the Huashan Sports and Culture Town planning project, adjacent to Wulijie Road. To create a captivating entrance to the scenic area, the decision was made to utilize the original village entrance as the location for the scenic gate and square. The existing vegetation in this area will be transformed, providing ample space for the design of the square and gate. Moreover, considering the necessity of vehicular traffic, a dedicated vehicle passage will be retained, connecting to the waterfront highway at the rear (Fig. 7).

Within the village's built-up area, square tiles will be used to pave the sidewalks, effectively separating pedestrian and vehicular traffic. Furthermore, to enhance the walking experience, a wooden sidewalk will be constructed on the north side of the village, leading to the waterfront walkway, offering visitors the opportunity to enjoy the scenic lake view. Additionally, the central vegetated area will be transformed into a small green square, providing a tranquil space for residents and visitors to rest and unwind.

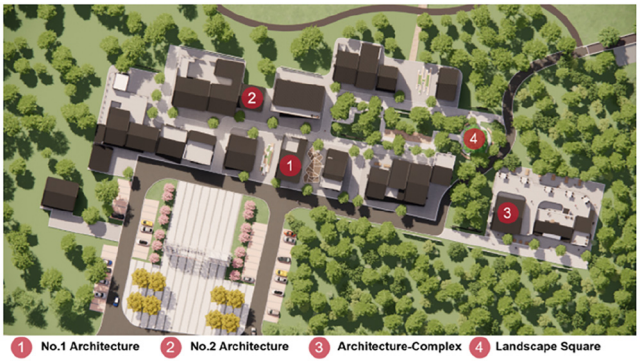

Fig. 7. Village planning (*Source*: Designed by author)

4.3.2. Renovation of individual architectures. The village currently comprises 24 architectures, all constructed with brick and concrete. The architectures feature exterior walls adorned with a combination of paint and wall tiles, while the roofs predominantly consist of red clay tiles and blue color coated steel sheets. This paper focuses on the renovation design of Residence 1 and Residence 2, as well as the architectural complex composed of Residences 3, 4, and 5, which will serve as the focal points of our discussion.

Residence 1 has a total floor area of 396.9 square meters and consists of three levels with a height of 12.4 m. Upon careful observation, it has been identified that the ground floor of the architecture features blue color-coated steel sheet roofs on both the front and rear sides, which were added by the residents at a later stage (Fig. 8). As part of the design process, it is planned to remove these blue color-coated steel sheet roofs to optimize the utilization of space. By doing so, the front area of the architecture will be transformed into a pedestrian walkway and a driveway, facilitating the convenient movement of pedestrians and vehicles within the village. The rear area of the architecture will be seamlessly integrated with the surrounding walls, creating a courtyard space.

In terms of roof design, black titanium-zinc panels have been selected as the roofing material due to their exceptional weather resistance, corrosion resistance, strength, and rigidity, as well as their ease of installation. In order to maintain the continuity of the roof design, it has been decided to remove the flat roof on the northern side of the architectural three levels and extend a section of the main roof to create a functional balcony. Furthermore, to enhance the architectural appearance of the rigid roof structure and complement the horse head wall symbol, an extension will be added to the side walls, raising them by 350 mm and covering the top with black aluminum panels.

In the architecture facade design, white architectural elastomeric coating is extensively employed as the primary exterior wall material to effectively exemplify the distinctive white wall symbol and establish a pronounced contrast with the dark-colored roof. Gray bricks are specifically utilized for the lower section of the walls to ensure both waterproofing functionality and resistance to wall staining. Furthermore, to augment the color layering of the architecture facade, warm-toned anti-corrosive wood decorative materials are incorporated on the north side of the architecture, introducing appealing elements of warmth and capturing attention within the overall black, white, and gray color scheme (Fig. 9).

Fig. 8. Original photo of residence 1, resident 2 and Architectural Complex (Photo: Author)

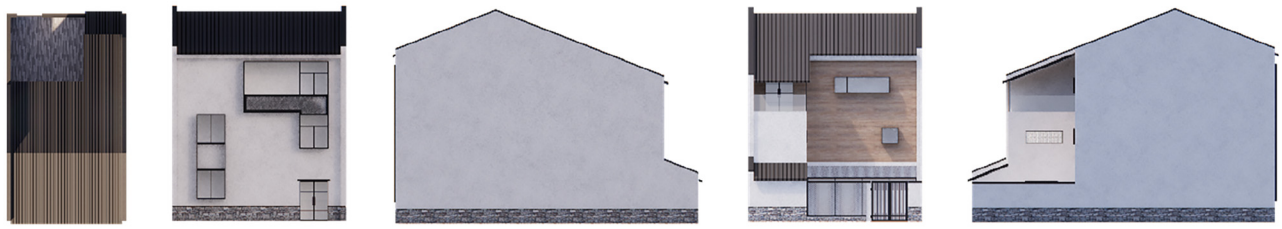

Fig. 9. Facade design of Residence 1 (*Source*: Designed by author)

In the window design, the approach will be to retain the majority of the original window openings while incorporating appropriate modifications. Black thermally broken aluminum frames will be employed, complemented by window sills constructed from 20 mm thick steel plates that protrude outward by 400 mm. Moreover, expansive floor-to-ceiling windows will be installed in areas facing the courtyard, ensuring an abundance of natural light while preserving privacy. Lastly, in select sections of the architecture facade and courtyard walls, recycled and repainted black tiles will serve as decorative elements in lattice patterns for the lattice windows (Fig. 10).

Residence 2 has a total floor area of 258.36 square meters and consists of three levels with a height of 11.5 m. The design approach for the facade and roof decoration of this architecture aligns with that of Residence 1 and will not be reiterated. Functionally, it has been observed that the second and third floors of the architecture feature balconies (Fig. 8). To enhance the visual layering of the facade, the decision has been made to enclose the second-floor balcony and a portion of the first floor, creating a continuous wall surface. Additionally, for the newly constructed ground floor wall surface, glass bricks have been selected as the window material to ensure privacy and maximize natural lighting (Fig. 11). Moreover, the north-facing facade of the original architecture consists of six evenly distributed windows and one door. During the design process, selected window openings will be integrated or eliminated to create a clean geometric shape that enhances the visual impact of the facade (Fig. 12).

4.3.3. Renovation of architectural complex. Residence 3, Residence 4, and Residence 5 have respective floor areas of 341 square meters, 353.11 square meters, and 150 square meters. All of them are three-story architectures. On the northern side of these residences, there are small brick houses that were independently constructed by the residents. Through original photo analysis (Fig. 8), it is evident that there used to be architecture between Residence 3 and Residence 4, but it has since been demolished. On-site observations reveal that the areas between these residences are characterized by blue color-coated steel sheet roofs, which were added by the residents at a later stage.

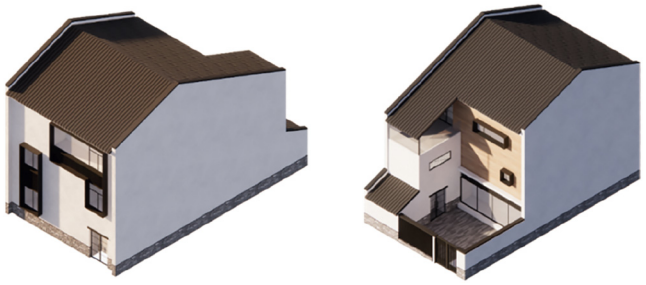

Fig. 10. Axonometric diagram of Residence 1 (*Source*: Designed by author)

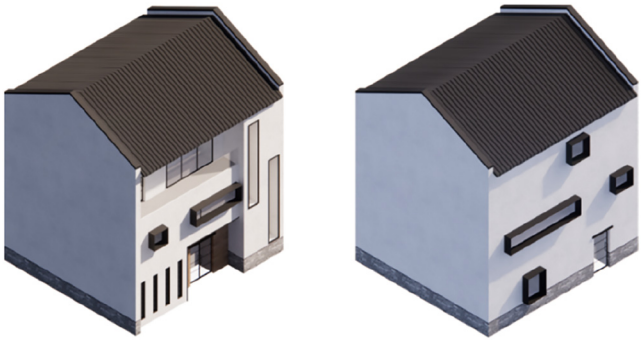

Fig. 12. Axonometric diagram of Residence 2 (*Source*: Designed by author)

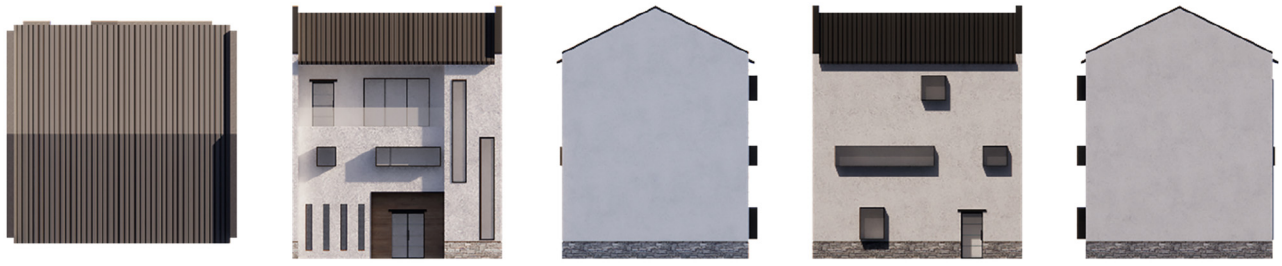

Fig. 11. Facade design of Residence 2 (*Source*: Designed by author)

Fig. 13. Facade design of architectural complex (*Source*: Designed by author)

Based on these observations, it has been decided to integrate these architectures with the small brick houses on their northern side. Firstly, the areas with blue color-coated steel sheet roofs will be dismantled, and platforms will be constructed on the foundations of the brick houses, making full use of the space between Residence 3 and Residence 4 (Fig. 13).

During the design process of this architecture complex, a significant emphasis is placed on preserving the original structures and functions. For instance, the original Residence 3 does not have balconies or corridors on its facade. Therefore, the design of Residence 3's facade maintains its flat layout, keeping the spatial hierarchy intact while focusing on facade embellishments (Fig. 14). Conversely, the original Residence 4 features a symmetrical structure and balconies. Consequently, the design of Residence 4's facade preserves its symmetrical structure while accentuating the balcony elements (Fig. 15).

Lastly, in the design of Residence 5, the focus is on enhancing the rooftop terraces. The existing roof structure of the architecture will be retained while expanding the rooftop terrace area, resulting in a more enriched design for the front facade of the architecture complex (Fig. 16).

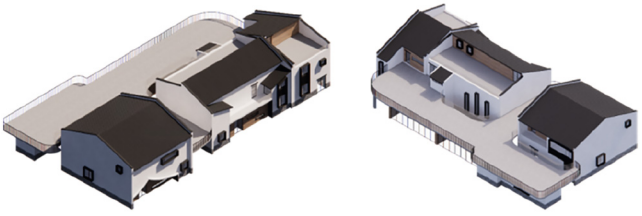

Fig. 14. Axonometric diagram of architectural complex (*Source*: Designed by author)

Fig. 15. Rendering diagram 1 of architectural complex (*Source*: Designed by author)

Fig. 16. Rendering diagram 2 of architectural complex (*Source*: Designed by author)

4.3.4. Landscape design. In terms of the landscape design for the village, light gray square bricks and dark gray bluestones have been used to distinguish the village's main thoroughfare and the areas in front of the architectures to achieve spatial functionality and providing directional guidance. To enhance the functionality of the green environment, existing trees within the village will be preserved, while trees that do not align with the design will be relocated and cultivated, ensuring the continuity of greenery and maintaining the overall ecological balance (Fig. 17).

Furthermore, the inclusion of landscape walls in select green areas not only enriches the layering and visual effects of the landscape but also offers privacy and seclusion, creating an appealing landscape environment for residents. In the central vegetated area of the village, a small green square has been planned to serve as a rest and recreational space for residents and visitors (Figs 18 and 19).

Fig. 17. Rendering diagram 1 of square (*Source*: Designed by author)

Fig. 18. Rendering diagram 2 of square (*Source*: Designed by author)

Fig. 19. Aerial view of the village (*Source*: Designed by author)

5. CONCLUSION

China is home to numerous rural areas, each with its unique folk culture and traditional architectural forms. This provides a rich source of design elements for the renovation of rural architectures under the context of new rural development. As a result, architectural semiotics holds a significant position and plays an important role in the transformation of rural areas in China. By applying the principles and methods of architectural semiotics, it is possible to create architectural images that align with the regional characteristics and cultural heritage, thereby enhancing the quality and value of rural architectures.

These design choices not only emphasized the expression of architectural symbols in the visual aspect but also prioritized the integration of functionality and practicality. It offers new perspectives and methodologies for the renovation of rural areas, promoting sustainable development and cultural preservation in rural regions.

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