

Translation Techniques of Regional Cultural Elements in Contemporary Architectural Facade Design

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Abstract: Contemporary architecture pursues regional cultural identity and functional innovation. In the translation of Guangdong regional cultural elements in architectural facade design, there are problems such as fragmented element extraction, disconnection between methods and functions, and imbalance between characteristics and aesthetics. This paper systematically extracts symbols of Lingnan dwellings and Guangfu intangible cultural heritage elements, and combines parametric and BIM technologies to innovate translation methods, balancing cultural expression and practical functions of facades. It clarifies practical points from proportion and scale control, climate-adapted material selection, and environmental coordination enhancement, providing a feasible path for the effective translation of Guangdong regional culture in contemporary architectural facades and promoting the deep integration of regional culture and architectural design.

Keywords: Guangdong regional culture; architectural facade design; translation techniques; Lingnan dwellings; parametric design

Online publication: August 26, 2025

1. Introduction

In the context of urban construction, architectural space planning needs to focus on the effect of cultural inheritance and propose innovative cultural integration plans. In recent years, culturally integrated architectural design has gradually become a focus of attention in both academia and industry. This not only highlights the importance of architectural design but also reflects how to integrate diverse cultural elements under globalization to create architectural works with contemporary characteristics. Guangdong, as the core area of Lingnan culture, has a wealth of traditional architectural symbols and intangible cultural heritage elements, providing a unique sample for culturally integrated architectural design. However, the current architectural space planning faces problems such as fragmented cultural inheritance and insufficient innovative integration.

2. Existing Problems in the Translation of Guangdong Regional Cultural Elements in Architectural Facades

2.1. Fragmented Extraction of Traditional Regional Cultural Elements

The fragmented extraction of traditional regional cultural elements is evident in the superficial selection of symbols from Guangdong's regional culture, without delving into the intrinsic connections within the cultural system^[1]. When

extracting elements from Lingnan dwellings, designers often isolate the form of the pot-eared gable or the patterns of Manchu windows, ignoring their traditional functional logic for ventilation and lighting, as well as their association with the Guangfu folk custom of “wind prevention and rain avoidance.” Similarly, when extracting Guangfu intangible cultural heritage elements, designers frequently select specific patterns from Cantonese embroidery or shapes from gray sculpture without considering their traditional decorative integration with the cultural connotations of “auspicious meanings.” This results in elements lacking cultural context support, failing to form a coherent regional cultural expression system. Consequently, the cultural symbols presented on the architectural facade appear disjointed and unable to convey the overall characteristics of Guangdong’s regional culture.

2.2. Disconnection Between Translation Techniques and Contemporary Architectural Functions

The disconnection between translation techniques and contemporary architectural functions is prominently seen when traditional regional cultural elements are translated into architectural facades without considering the functional requirements and usage scenarios of modern buildings. In an effort to preserve the original form of traditional elements, designers often overlook the contemporary building’s demands for space utilization and equipment integration. For example, the high-side windows used for ventilation in traditional Lingnan dwellings are directly copied to modern high-rise building facades without integrating modern air conditioning systems and natural ventilation designs. This results in window sizes and positions that do not meet the airflow organization requirements of contemporary buildings. When translating Cantonese embroidery patterns, designers focus solely on visual presentation, using heavy decorative materials for facade shapes without considering the modern building’s requirements for lightweight, energy-saving designs. This increases the building load and affects the facade’s thermal insulation performance, contradicting the contemporary building’s goals of efficiency and energy conservation.

2.3. Imbalance Between Regional Cultural Characteristics and Facade Aesthetics

The imbalance between regional cultural characteristics and facade aesthetics is mainly manifested in either failing to integrate with the contemporary aesthetic logic of architectural facades when emphasizing regional cultural expression, or weakening regional cultural characteristics when highlighting contemporary aesthetics^[2]. When designers overly emphasize the accumulation of regional cultural elements, they haphazardly overlay traditional Lingnan dwelling elements such as bricks, tiles, and gray sculptures on modern building facades, ignoring the contemporary pursuit of simplicity and fluidity in facade aesthetics. This leads to a chaotic facade shape lacking overall visual unity. Conversely, when designers strictly follow contemporary minimalist aesthetics, using only glass and metal materials for facades, they achieve visual simplicity but fail to incorporate any Guangdong regional cultural symbols. This results in a facade lacking regional recognizability, unable to resonate with Guangdong’s local cultural environment and urban landscape. This disconnect between architecture and regional culture makes it difficult for users to feel a sense of cultural belonging and prevents the formation of a contemporary architectural facade style with Guangdong’s regional characteristics.

3. Implementation Paths for the Translation of Guangdong Regional Cultural Elements in Architectural Facades

3.1. Systematic Extraction of Traditional Regional Cultural Symbols in Guangdong

3.1.1. Refining the Core Symbols of Lingnan Dwellings

Refining the core symbols of Lingnan dwellings requires a deep exploration of the key forms in architectural typology that carry regional culture and functional demands^[3]. This involves a layered analysis from spatial layout, construction details to visual identification. Lingnan dwellings have developed unique forms to adapt to the humid and hot climate. The pot-eared gable is not only a symbolic shape but also functions to guide airflow and accelerate its discharge, reducing the stuffiness inside the building. It is necessary to capture the relationship between the curvature of the gable, its height, and

the proportion of the wall. The Manchu window, which combines lighting and decoration, contains the wisdom of Guangfu architecture in the use of light and shadow through its colored glass patterns, the lattice structure of the window frame, and the way it is embedded in the wall. It is important to extract the arrangement rules of the window patterns and the color matching logic of the glass, while also considering its traditional functions of space separation and light regulation in dwellings. This ensures that the refined symbols retain visual recognizability while carrying the cultural and practical values of Lingnan architecture.

3.1.2. Selecting Characteristic Elements of Guangfu Intangible Cultural Heritage

Selecting characteristic elements of Guangfu intangible cultural heritage requires focusing on the visual carriers in intangible cultural heritage techniques that can be integrated into architectural facades. This involves screening from the perspectives of craftsmanship, pattern connotations, and material properties. Cantonese embroidery, as a representative of Guangfu intangible cultural heritage, features delicate textures formed by the interweaving of silk threads and symmetrical or continuous pattern compositions, such as “Hundred Birds Paying Homage to the Phoenix” and “Peony Twining Branches,” which contain auspicious meanings and regional aesthetics. It is necessary to select elements with smooth lines that are suitable for facade-scale enlargement, while also considering the possibility of translating the texture of silk threads into architectural materials. Gray sculpture, often used for decorations on the ridge and gable corners of traditional buildings, creates three-dimensional shapes with lime, such as auspicious animals and flowers, which have distinct Lingnan folk characteristics. When selecting, attention should be paid to the three-dimensionality and durability of the shapes to ensure that the elements reflect the characteristics of gray sculpture craftsmanship and meet the installation and maintenance requirements of contemporary architectural facades. This enables the intangible cultural heritage elements to achieve a functional and aesthetic fit with architectural facades. See **Figure 1**.

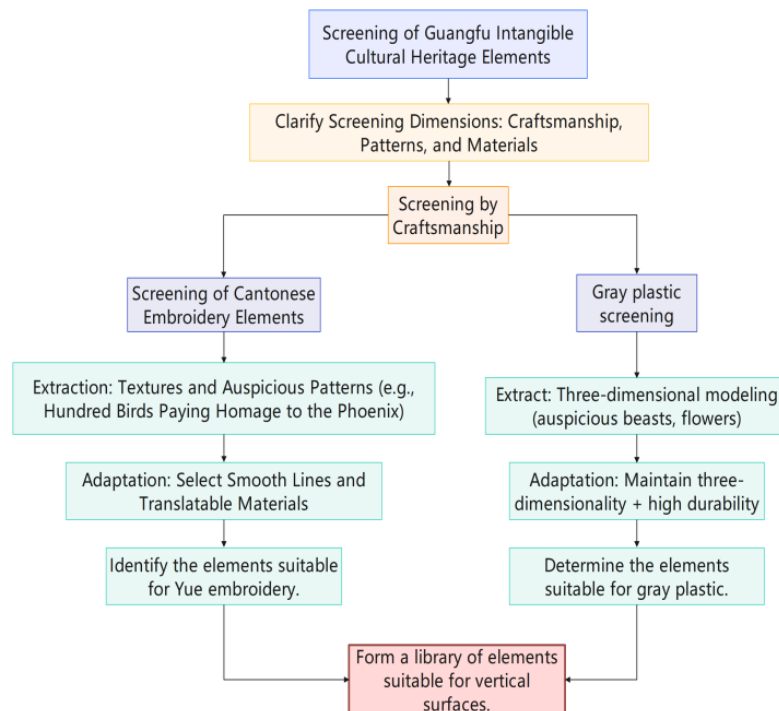


Figure 1. Flowchart for the selection of Guangdong intangible cultural heritage architectural facade elements

3.2. Parametric Design for Reconstructing Traditional Symbol Arrangements

Parametric design can reconstruct the arrangement of traditional symbols by converting their core features into adjustable parameters through digital models, achieving orderly reconstruction and dynamic variation of facade symbols. Taking the grid patterns of Manchu windows in Lingnan dwellings as an example, the line spacing, angle, unit size, line width, and

repetition frequency are extracted as basic parameters. Algorithms are used to set interrelated rules, allowing the patterns to be arranged differently on various floors. For the building's ground floor, which is suitable for commercial display and security, the window grid unit is 300mm×300mm, with a spacing of 50mm×50mm and a line width of 8mm, repeating every 1.2 meters to restore the traditional density. Floors 2 to 5, designated as office areas, balance lighting and privacy with a unit size of 400mm×400mm, spacing of 65mm×65mm, and a line width of 7mm, repeating every 1.5 meters. Floors 6 to 10, which are apartments, focus on transparency with a unit size of 450mm×450mm, spacing of 80mm×80mm, and a line width of 6mm, repeating every 1.8 meters. Floors 11 to 15, high-end apartments, consider energy efficiency with a unit size of 500mm×500mm, spacing of 95mm×95mm, and a line width of 5mm, repeating every 2.0 meters. The top floor, which shelters equipment, has a unit size of 350mm×350mm, spacing of 55mm×55mm, and a line width of 9mm, repeating every 1.4 meters. This floor-by-floor adjustment retains cultural recognizability while meeting functional needs, creating a rhythmic visual sequence. See **Table 1**.

Table 1. Parametric Design Parameters for Manchu Window Grid Patterns

Building Floor	Core Functional Needs	Grid Unit Size (Length×Width)	Arrangement Spacing (Horizontal/Vertical)	Line Width	Pattern Repetition Frequency	Design Objective
Ground Floor	Street-level commercial display, theft prevention	300mm×300mm	50mm/50mm	8mm	Every 1.2m, repeat 1 set	Restore traditional grid density, ensure displayability
Floors 2-5	Office space lighting, ventilation	400mm×400mm	65mm/65mm	7mm	Every 1.5m, repeat 1 set	Balance lighting and privacy, adapt to office scenarios
Floors 6-10	Apartment living, clear view	450mm×450mm	80mm/80mm	6mm	Every 1.8m, repeat 1 set	Increase light transmittance, optimize living view
Floors 11-15	High-end apartment, energy saving and noise reduction	500mm×500mm	95mm/95mm	5mm	Every 2.0m, repeat 1 set	Reduce wind noise, adapt to high-rise energy-saving needs
Top Floor	Equipment room shielding, heat insulation	350mm×350mm	55mm/55mm	9mm	Every 1.4m, repeat 1 set	Shield equipment and pipelines, enhance heat insulation effect

3.2.1. Integration of Cultural Elements and Facade Structure with BIM Technology

When integrating cultural elements with facade structure using BIM technology, the three-dimensional modeling platform can be utilized to precisely align the models of cultural elements with the facade structure models, achieving coordinated matching in terms of spatial location and size specifications. For example, when translating the pot-eared gable element, a curved surface model of the gable is first established in the BIM software, specifying key dimensions such as the bottom width, top height, and curvature. The beam and column structure models of the facade are then imported. Using the software's collision detection function, the installation position of the gable element is adjusted to ensure that the distance between the bottom of the gable and the facade frame column is maintained at 600 millimeters, and the cantilever length at the top is controlled at 1200 millimeters, avoiding conflicts with the roof load-bearing structure. Meanwhile, the material thickness of the gable element is marked in the model (for example, the outer decorative layer is 80 millimeters thick, and the inner support layer is 150 millimeters thick), ensuring that the form design of the cultural element is compatible with the load-bearing capacity and installation process of the facade structure. This guarantees that the translated element meets both cultural expression requirements and structural safety standards.

3.3. Balancing Regional Cultural Expression and Facade Practical Functions

3.3.1. Adapting Translated Elements to Facade Lighting and Ventilation

To adapt translated elements to facade lighting and ventilation, it is necessary to consider the high demands for ventilation and lighting in Guangdong's humid and hot climate while translating traditional regional cultural elements, and to design facade openings and airflow guidance simultaneously^[4]. When translating the Manchu window element from Lingnan dwellings, the traditional window grid pattern can be transformed into the shape of a facade shading grille. The grille unit adopts a rectangular frame of 300 millimeters $\times$ 400 millimeters, with a frame spacing set at 150 millimeters. This not only retains the cultural form of the window grid but also guides outdoor airflow into the interior through the orderly arrangement of the grille, while avoiding direct sunlight. When translating the pot-eared gable element, the curved contour of the gable can be incorporated into the design of the facade ventilation opening. A ventilation channel with a height of 600 millimeters and a width of 800 millimeters can be set below the gable curve, with rainproof louvers installed inside the channel. This ensures that the translated gable element not only has cultural identifiability but also meets the dual needs of natural ventilation and rain prevention on the facade, adapting to Guangdong's rainy climate and the need for enhanced air circulation.

3.3.2. Coordinating Cultural Symbols with Facade Insulation and Heat Insulation

To coordinate cultural symbols with facade insulation and heat insulation, it is necessary to take into account Guangdong's climatic characteristics of high temperatures in summer and mild winters, and to incorporate considerations of insulation and heat insulation into the material selection and form design of cultural symbols. When translating Guangfu gray sculpture patterns, light-weight terracotta materials can be used to replicate the three-dimensional patterns of gray sculpture, with the terracotta plate thickness controlled at 50 millimeters and a 20-millimeter-thick air layer reserved on the back of the plate. The air layer can form an insulating barrier to reduce the heat transfer from the exterior through the facade into the interior. When translating Cantonese embroidery patterns, the patterns can be printed on the interlayer film of the facade glass, using double-glazed glass with a low thermal transmittance coefficient. The glass thickness is set at 5 millimeters + 12 millimeters air layer + 5 millimeters. This not only presents the cultural patterns of Cantonese embroidery through the interlayer film but also reduces building energy consumption through the insulating performance of the double-glazed glass. By combining cultural symbols with insulating materials and structures, the facade can meet the energy-saving requirements of Guangdong while conveying regional culture.

4. Practical Points for the Translation of Guangdong Regional Cultural Elements in Architectural Facades

4.1. Controlling the Proportion and Scale of Translated Regional Cultural Elements

The proportion and scale of translated regional cultural elements should be controlled in accordance with the overall dimensions of the architectural facade and the laws of visual perception to avoid the disharmony caused by elements that are too large or too small^[5]. When the facade height is 24 meters, the height of the translated pot-eared gable shape can be controlled at 6-8 meters, with the width maintaining a 1:3 ratio with the facade bay width. The curvature of the top of the shape should follow the traditional gable slope ratio of 1:0.8. This ensures that the gable retains its iconic form without squeezing functional areas such as facade windows and equipment pipelines due to oversized dimensions, or losing cultural recognizability on a large facade due to undersized dimensions. When the facade window size is 3 meters $\times$ 2.4 meters, the translation of the Manchu window grid pattern can set the grid unit at 300 millimeters $\times$ 300 millimeters, with a spacing of 50 millimeters between units and a grid line width controlled at 15 millimeters. This ensures a clear visual hierarchy of the pattern on the facade while matching the window lighting requirements and glass division logic, ensuring that the proportion and scale of the translated elements are highly integrated with the overall form and functional layout of the architectural facade.

4.2. Focusing on the Adaptability of Translated Materials to Guangdong's Regional Climate

The adaptability of translated materials to Guangdong's regional climate should be considered in light of the local characteristics of high temperatures, frequent rainfall, high humidity, and frequent typhoons in summer. Materials with good weather resistance, strong moisture resistance, and excellent wind pressure resistance should be selected. For the translation of gray sculpture elements, fiber-reinforced cement boards can be used instead of traditional lime materials. These boards have excellent moisture and seepage resistance, which can prevent mold and cracking caused by rainy weather in Guangdong. With a flexural strength of 15MPa and wind pressure resistance values that meet the architectural design standards of coastal areas, they can satisfy the structural stability requirements for facade decoration and avoid the risk of material detachment during typhoon weather. When translating Cantonese embroidery patterns for facade decorative panels, fluorocarbon-coated aluminum alloy panels can be used, with a coating thickness of $\geq 25\mu\text{m}$. These panels can resist fading and aging caused by strong ultraviolet radiation in Guangdong. The corrosion resistance of aluminum alloy can also cope with the humid air and salt corrosion in coastal areas, avoiding a shortened service life due to climatic effects, ensuring that the translated materials meet cultural expression needs while adapting to regional climatic conditions and long-term usage requirements.

4.3. Enhancing the Coordination of Translated Results with the Surrounding Environment

To enhance the coordination of translated results with the surrounding environment, a comprehensive consideration of the regional style characteristics, spatial scale, and ecological environment of the building location is necessary, allowing the translated facade to form a visual and functional resonance with the surrounding environment. When a building is located in the old town area of Guangzhou with arcade-style architecture, the translation of Lingnan dwelling elements can draw on the arcade spacing of 3-4 meters and the facade rhythm of 2-3 stories. The spacing of the translated Manchu window elements should be consistent with the surrounding arcade windows, and a light gray color similar to the arcade walls should be selected as the main facade color, complemented by dark brown metal lines to echo the wooden details of the arcade. This avoids conflicts in color and scale. When a building is located in the coastal area of Shenzhen, the translation of Guangfu marine culture-related symbols (such as boat patterns and wave patterns) can be combined with the surrounding coastal architecture's transparent and lightweight style. Ultra-clear glass and brushed stainless steel can be used to present the symbol shapes. Ultra-clear glass reduces the impact of light reflection on the marine ecosystem and pedestrian vision, while the metallic luster of brushed stainless steel echoes the sheen of the waves. This ensures that the architectural facade conveys regional culture while coordinating with the open and dynamic environmental atmosphere of the coastal area, avoiding visual fragmentation with the surrounding natural landscape and architectural style.

5. Conclusion

The translation of Guangdong regional cultural elements in contemporary architectural facade design is a crucial intersection for the inheritance of regional culture and the innovation of architectural functions. The preceding text analyzes the existing problems in translation, proposes implementation paths for systematic extraction of cultural symbols, innovative translation methods through technological means, and balancing culture with functionality. It also clarifies practical points from three aspects: proportion and scale, climate adaptation, and environmental coordination, providing a clear framework for translation practice. This exploration enables Guangdong cultural symbols such as the pot-eared gable and Cantonese embroidery to regain vitality in contemporary architecture, avoiding the homogenization of architectural styles. It also strengthens the emotional connection between architecture and regional culture, offering references for the translation of other regional cultures in architectural design and contributing to the construction of architectural styles that are both culturally distinctive and contemporary.

Disclosure statement

The author declares no conflict of interest.

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