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ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN MODERN DESIGN

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This paper investigates how AI-driven design tools can reimagine Lingnan architectural aesthetics for contemporary practice. A new perspective on design in the context of new technologies has allowed us to propose an approach through which it is possible to create facades in which the traditional Lingnan architectural style is combined with innovative design solutions. This approach to design offers modern designers and architects new ways to preserve cultural heritage through creative interpretation of historical architectural styles.

Key words: *AIGC; Lingnan architecture; architectural design; façade design; style synthesis*

INTRODUCTION

Generative AI (AIGC) technologies create new possibilities for architectural design innovation, especially when working with regional styles like Lingnan architecture — known for its arcades, courtyards, and climate-adaptive features — now threatened by rapid urbanization. This research explores how AI generation tools (Stable Diffusion, LoRA, and ControlNet) can transform façade design processes, enabling architects to create designs that honor Lingnan traditions while satisfying contemporary requirements [1].

PURPOSE

This study aims to develop a new design approach for contemporary architectural façades that authentically express Lingnan's cultural heritage.

RESULTS AND DISCUSSION

By exploring creative applications of emerging AI-generative design tools, we seek to establish methodologies that help architects interpret traditional Lingnan architectural elements in innovative ways. The research examines how designers can leverage AIGC technologies to enhance the design process — generating multiple design iterations, extracting essential stylistic features, and visualizing hybrid architectural expressions that might otherwise be difficult to conceptualize. Through this technology-enhanced design approach, architects can more thoughtfully balance regional identity with contemporary expression, translating Lingnan's distinctive spatial qualities into modern architectural contexts [2].

Our design explorations revealed the rich potential of AI-assisted approaches for architectural façade design. The resulting visual studies

successfully captured the distinctive character of Lingnan architecture — its rhythmic proportions, textural qualities, and spatial compositions.

Through iterative design experimentation, we identified an optimal creative balance where the generated designs maintained strong connections to traditional Lingnan architectural language while allowing for contemporary interpretation. This sweet spot in the design process yielded façades with both cultural authenticity and design flexibility.

The research revealed three promising design approaches:

1.Design Variation Studies: Designers can rapidly generate and evaluate multiple façade compositions, expanding their creative exploration beyond conventional boundaries while maintaining cultural references.

2.Architectural Element Library: The approach allows extraction of essential Lingnan design motifs — arcades, decorative details, structural rhythms — which can be thoughtfully reinterpreted in contemporary architectural vocabulary.

3.Cultural Fusion Compositions: By carefully adjusting design parameters, architects can create nuanced façades that harmonize Lingnan heritage with contemporary aesthetic sensibilities, fostering design innovation deeply rooted in cultural context.

Table 1.

Data sources and processing statistics.

Data set name	**Data sources**	**Number of images**	**key feature**	**Size of processed image**
Traditional Lingnan architecture	Flickr, Baidu map, Google	200	Traditional grey brick and green tile buildings	512 x 512 px
Modern Lingnan Architecture	Design portfolios, streetscapes	100	Modern Lingnan Architectural Design	512 x 512 px

We observed certain limitations in translating the full spatial richness of Lingnan architecture, particularly regarding complex three-dimensional relationships and the subtle material qualities of traditional craftsmanship. These challenges point toward opportunities for further design research [3].

Fig.1. Lingnan Architecture Atlas with Screening Analysis

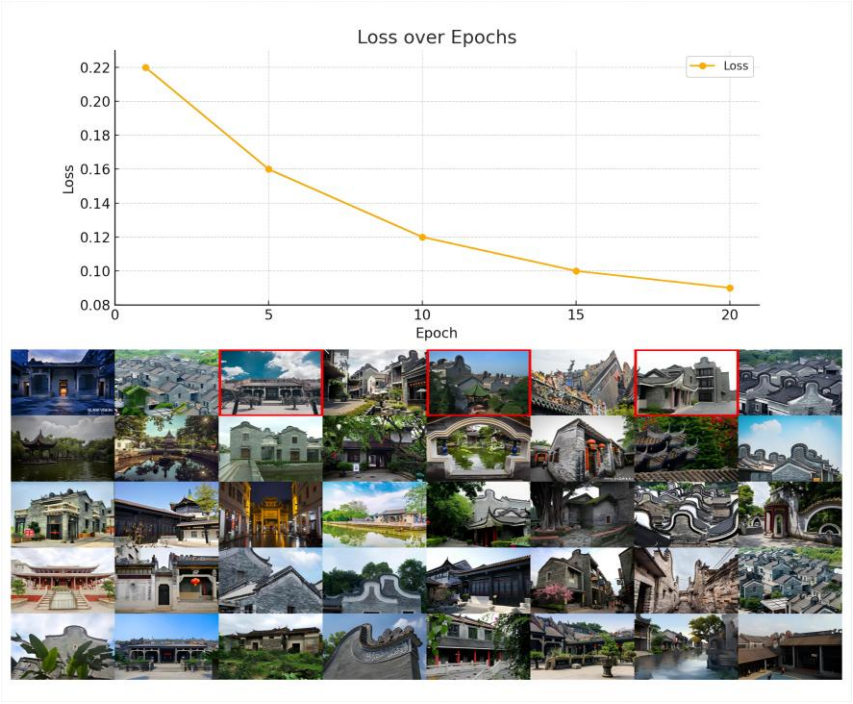

Fig. 2. Dynamic comparative analysis of generated images of Loss and Lingnan buildings

CONCLUSIONS

This research establishes a new design approach for creating Lingnan-inspired architectural façades that bridges tradition and innovation. By integrating AI tools into the design process, architects can explore more nuanced interpretations of cultural elements — from arcade rhythms to courtyard light patterns — while maintaining design authenticity. The methodology expands creative possibilities for translating regional architectural language into contemporary expressions with cultural resonance. Future design research should focus on better representing Lingnan's spatial qualities and material sensibilities, while incorporating its environmental responsiveness into sustainable façade systems. This approach ultimately strengthens architectural practice by providing designers with new ways to create meaningful connections between cultural heritage and contemporary design needs.

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ТЕХНОЛОГІЇ ШТУЧНОГО ІНТЕЛЕКТУ В СУЧАСНОМУ ДИЗАЙНІ

У цій роботі досліджується, вплив штучного інтелекту на сучасні інструменти проєктування, що дозволяє переосмислити архітектурну естетику Lingnan в сучасній дизайнерській практиці. Новий погляд на дизайн в контексті використання новітніх технологій дозволив запропонувати підхід, за допомогою якого можливо створити фасади, в яких традиційний архітектурний стиль Lingnan поєднаний з інноваційними дизайнерськими рішеннями. Такий підхід до проєктування пропонує сучасним дизайнерам та архітекторам нові шляхи збереження культурної спадщини за допомогою творчої інтерпретації історичних архітектурних стилів.

Ключові слова: *AIGC (Штучний інтелект, що генерує контент); архітектура Lingnan; архітектурний дизайн; дизайн фасаду; синтез стилів.*