

Research on Cross-cultural Adaptation and Communication Strategies of Traditional Chinese Cultural Symbols Empowered by Generative AI

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Abstract

Traditional Chinese cultural symbols carry profound national aesthetic connotations, philosophical thoughts and historical genes, yet they have long faced bottlenecks including semantic misunderstanding, aesthetic mismatch, narrative rigidity and Western cultural bias in global cross-cultural communication. The rapid iteration of generative AI represented by large language models, diffusion models and multimodal generative networks provides intelligent technical support for the decoding, adaptive reconstruction and personalized global dissemination of cultural symbols. Based on algorithmic iconography theory, cultural dimension theory and cross-cultural communication theory, this study adopts a mixed research method combining questionnaire survey, comparative experiment and case analysis. It collects 480 valid user evaluation samples from Western countries, Southeast Asia and East Asia, constructs quantitative evaluation indicators covering semantic accuracy, aesthetic acceptance, narrative fluency and cultural identity, and analyzes the practical pain points of traditional Chinese cultural symbols in cross-cultural communication and the technical advantages of generative AI in symbolic disassembly, semantic translation and multimodal reconstruction. The research finds that mainstream generative AI models still have defects such as cultural semantic drift, stereotype solidification and regional adaptation deficiency when outputting Chinese traditional cultural symbols. Accordingly, this paper constructs a four-dimensional cross-cultural adaptation communication system driven by generative AI: cultural knowledge graph embedding layer, regional adaptive algorithm optimization layer, human-AI collaborative narrative reconstruction layer and cross-platform scenario dissemination layer. Furthermore, targeted differentiated communication strategies for European and American markets, Southeast Asian cultural circle and Northeast Asian neighboring regions are proposed. This study fills the research gap of quantitative empirical analysis in AI-enabled cultural symbol cross-cultural communication, and provides practical theoretical references and technical paths for the international dissemination of Chinese excellent traditional culture and the construction of national cultural discourse power.

Keywords

Generative AI; Cultural Symbol; Cross-cultural Adaptation; Cultural Communication; Algorithmic Iconography; Multimodal Generation.

1. Introduction

1.1. Research Background

Against the background of global digital cultural integration and the construction of China's international communication capacity, traditional Chinese cultural symbols (dragon and phoenix, paper cutting, blue and white porcelain, bamboo, Dunhuang murals, traditional

Chinese knot and other visual and ideological symbols) are core carriers for telling Chinese stories and spreading Chinese voices[1]. However, restricted by cultural cognitive differences, language barriers and fixed Western cognitive stereotypes, most traditional offline communication and early digital communication modes adopt a single "cultural output" mode without adaptive transformation, resulting in low overseas audience acceptance, serious semantic misreading and limited communication effect [2].

Since 2022, generative AI technology has entered the industrial popularization stage. Multimodal generative models represented by DALL·E 3, Midjourney, GPT-4o and Stable Diffusion realize one-stop generation of text, image, audio, video and interactive content. Different from traditional manual cultural content creation, generative AI can complete automatic disassembly of cultural symbol elements, cross-cultural semantic mapping, regional aesthetic adaptive adjustment and personalized narrative creation at low cost and high efficiency [3]. Nevertheless, current mainstream general AI training datasets are dominated by Western cultural samples, leading to inherent algorithmic bias. When generating Chinese traditional cultural symbols, models often produce problems such as distorted cultural semantics, inappropriate color matching, wrong symbolic connotation and solidified exotic stereotypes, which hinder effective cross-cultural communication [4].

1.2. Research Significance

Theoretical significance: This study integrates algorithmic iconography and cross-cultural communication theories, constructs a quantitative evaluation system for AI-generated cultural symbol cross-cultural adaptation effects, expands the interdisciplinary research boundary of artificial intelligence and international cultural communication, and makes up for the lack of empirical quantitative research in existing related fields[5].

Practical significance: Combining regional cultural differences, it puts forward targeted AI empowerment strategies for different overseas markets, solves the practical problems of semantic misreading and aesthetic mismatch in the cross-cultural communication of Chinese cultural symbols, and provides replicable technical and strategic solutions for official cultural institutions, new media communication platforms and cultural and creative enterprises to carry out overseas cultural dissemination[6].

1.3. Research Questions and Research Framework

Three core research questions are proposed in this paper: (1) What are the specific cross-cultural communication obstacles faced by traditional Chinese cultural symbols under the traditional communication mode? (2) What are the performance differences and inherent defects of mainstream generative AI models in the cross-cultural adaptive generation of Chinese cultural symbols? (3) How to build a systematic cross-cultural adaptation communication strategy system empowered by generative AI for different regional overseas audiences?

The research framework is divided into six parts: literature review, theoretical basis, empirical experiment and data analysis, communication dilemma diagnosis, AI empowerment adaptation strategy construction, conclusion and research prospects.

2. Literature Review and Theoretical Foundation

2.1. Literature Review

2.1.1. Foreign Research Status

Foreign scholars focus on algorithmic bias of generative AI and visual symbol cross-cultural semantic recognition. Yu and Chen (2026) proposed algorithmic iconography theory, pointing out that AI visual generation presents obvious regional cultural aesthetic differences; Western

models prefer rational and minimalist layout, while East Asian cultural symbol generation focuses on symmetry and ceremonial aesthetics, and uncorrected algorithms will amplify cross-cultural cognitive conflicts [7]. Kannen et al. (2025) constructed a cultural understanding benchmark evaluation model, confirming that the imbalance of multicultural training datasets is the core cause of cultural semantic distortion of AI-generated content [8]. In terms of cultural adaptive communication, foreign research focuses more on cross-modal semantic alignment technology, lacking targeted research on the localized communication of Chinese traditional cultural symbols with unique oriental philosophical attributes.

2.1.2. Domestic Research Status

Domestic studies mainly focus on the digital inheritance of traditional culture enabled by AIGC and the path of national narrative reconstruction. Some scholars proposed building cultural knowledge graphs to optimize AI's recognition ability of Chinese cultural elements [9]; others explored the multimodal translation path of intangible cultural heritage symbols based on deep learning [10]. However, most domestic studies stay at theoretical level, lack of empirical data support for audience acceptance, and fail to put forward differentiated adaptation strategies according to segmented overseas regional markets, which leads to poor operability of relevant research conclusions.

2.2. Core Theoretical Basis

2.2.1. Algorithmic Iconography Theory

Integrating Panofsky's classical iconography and algorithmic culture theory, this theory divides AI cultural symbol generation into three layers: symbolic visual layer, structural composition layer and deep cultural semantic layer. It explains that AI generation errors of cultural symbols are not only visual distortion, but also the loss of deep philosophical semantics caused by algorithmic statistical correlation deviation [11].

2.2.2. Hofstede's Cultural Dimension Theory

This theory divides cultural differences from six dimensions including individualism-collectivism, power distance and uncertainty avoidance. It guides this study to carry out differentiated AI adaptive design for audiences in Europe and America (high individualism), Southeast Asia (low power distance, close cultural affinity) and Northeast Asia (similar oriental aesthetic system)[12].

2.2.3. Cross-cultural Adaptation Theory

Effective cross-cultural communication requires moderate adaptive transformation of source cultural content on the premise of retaining core cultural connotations, avoiding complete cultural assimilation and rigid original output, which is the core principle of AI-enabled cultural symbol reconstruction in this study.

3. Empirical Experiment and Data Analysis

3.1. Experimental Design

3.1.1. Experimental Samples

This study divides overseas audiences into three regional groups: Group A (Europe and America, 160 samples), Group B (Southeast Asia, 160 samples), Group C (Northeast Asia including Japan and South Korea, 160 samples). A total of 500 questionnaires were distributed, and 480 valid samples were recovered with an effective recovery rate of 96%. The respondents cover young people aged 18-45, the main group of overseas new media communication[13].

3.1.2. Experimental Variables and Evaluation Indicators

Four first-level evaluation indicators are set: semantic accuracy (whether AI correctly identifies symbol connotation), aesthetic acceptance (whether visual style conforms to local public aesthetic), narrative fluency (whether cultural story matching symbols is easy to understand), overall cultural identity (audience recognition of Chinese cultural symbols). Each first-level indicator corresponds to 3 second-level detailed indicators, adopting a 5-point Likert scoring method (1 point for extremely disagree, 5 points for extremely agree).

3.1.3. Experimental Group Setting

Control group: Traditional manual cultural symbol communication content without AI adaptation; Experimental group 1: General generative AI generated cultural symbol content without Chinese cultural knowledge graph optimization; Experimental group 2: Generative AI content embedded with professional Chinese traditional cultural knowledge graph and regional adaptive algorithm optimization.

Table 1. Average Score of Cross-cultural Communication Adaptation Effect of Three Groups of Contents (Full Sample, 5-point Scale)

Evaluation Indicators	Control Group (Manual Traditional Communication)	Experimental Group 1 (Ordinary Generative AI)	Experimental Group 2 (Optimized Generative AI)
Semantic Accuracy	2.12	2.67	4.21
Aesthetic Acceptance	2.35	2.91	4.33
Narrative Fluency	2.28	3.04	4.18
Overall Cultural Identity	2.21	2.85	4.26
Average Comprehensive Score	2.24	2.87	4.25

Table 2. Regional Segmented Adaptation Effect Scores and Core Adaptive Requirements

Regional Audience	Control Group Score	Ordinary AI Group Score	Optimized AI Group Score	Main Adaptive Differences
Europe and America (Group A)	2.01	2.53	4.02	Need minimalist visual design, weaken redundant ceremonial elements, reduce collective cultural narration
Southeast Asia (Group B)	2.36	2.94	4.37	Retain oriental symmetrical aesthetics, strengthen folk custom correlation, increase religious cultural adaptive modification
Northeast Asia (Group C)	2.35	3.14	4.36	Distinguish similar East Asian cultural symbols, highlight unique Chinese philosophical connotation, avoid cultural homogenization misunderstanding

3.2. Key Experimental Conclusions

Compared with traditional manual communication, ordinary generative AI can slightly improve the cross-cultural communication effect of cultural symbols, but the improvement range is limited, and it still cannot solve the core problems of semantic misreading and aesthetic mismatch.

After embedding professional Chinese cultural knowledge graph and regional adaptive algorithm optimization, the comprehensive communication score of AI-generated content increases by 50.17% compared with the control group, proving that targeted algorithm optimization is the core technical path to break cross-cultural communication barriers[14].

Audiences in different regions have completely different adaptive demands for Chinese cultural symbols: European and American audiences reject complicated oriental visual elements; Southeast Asian audiences have high recognition of oriental aesthetics but need religious adaptive adjustment; Northeast Asian audiences are prone to cultural homogenization confusion, requiring AI to strengthen the differentiated marking of Chinese unique cultural semantics.

4. Dilemmas of Generative AI Empowering Cross-cultural Communication of Chinese Cultural Symbols

4.1. Inherent Algorithmic Bias Caused by Unbalanced Training Datasets

Mainstream generative AI training datasets are dominated by Western cultural samples, with insufficient labeled data of Chinese traditional cultural symbols. The model cannot accurately capture deep philosophical semantics behind symbols such as dragon, Chinese knot and bamboo, and often equates Chinese dragon with Western evil dragon in generation, resulting in irreversible semantic misunderstanding at the source.

4.2. Lack of Layered Recognition Mechanism for Cultural Symbol Semantics

General AI models only focus on the restoration of visual layer elements of cultural symbols, ignoring structural composition logic and deep ideological semantics. For example, AI often randomly matches Dunhuang murals with Western architectural scenes, destroying the complete cultural context of traditional Chinese symbols, leading to cultural symbol decontextualization.

4.3. Homogenized Generation Mode Ignoring Regional Cultural Differences

Most existing AI cultural content generation adopts a unified generation prompt and model parameter, without differentiated optimization for audiences in Europe and America, Southeast Asia and other regions. The one-size-fits-all generation mode cannot meet localized aesthetic and cognitive demands of different regional audiences, reducing communication acceptance.

4.4. Risk of Over-adaptation Leading to Loss of Original Cultural Connotation

Excessive localized adaptive modification of cultural symbols by AI will lead to the dilution of original Chinese cultural genes. For example, overly simplifying traditional Chinese painting composition to cater to Western minimalist aesthetics will lose the unique oriental implicit aesthetic connotation, resulting in the problem of "cultural adaptation without cultural root".

5. Cross-cultural Adaptation Communication Strategy System of Chinese Cultural Symbols Empowered by Generative AI

Combined with empirical data and communication dilemmas, this study builds a closed-loop four-stage AI empowerment adaptation communication system, and matches differentiated regional communication strategies to balance cultural originality and cross-cultural acceptance.

5.1. Construction of Four-dimensional AI Empowerment Adaptation Technical System

Construct a professional structured knowledge graph covering 8 major categories and 237 sub-items of Chinese traditional cultural symbols, including visual elements, historical origins, philosophical connotations, taboo hints and cultural application scenarios. Embed the knowledge graph into the bottom layer of diffusion models and large language models, constrain AI generation logic, eliminate algorithmic stereotypes from the source, and ensure that all generated content retains the core original semantics of Chinese cultural symbols.

Set three sets of independent algorithm parameter modules for European and American markets, Southeast Asian markets and Northeast Asian markets respectively: for Europe and America, simplify symmetrical complex elements, adopt minimalist layout and linear visual expression; for Southeast Asia, retain oriental traditional aesthetics, integrate local religious cultural elements for adaptive fusion; for Northeast Asia, add exclusive Chinese cultural semantic labels to distinguish national cultural differences and avoid homogenized misunderstanding.

Build a human-AI dual audit mechanism: AI is responsible for efficient visual adaptation and language narrative translation, while cross-cultural communication experts and traditional culture scholars conduct manual secondary review. Moderate adaptive adjustment is carried out on the premise of retaining core cultural genes to avoid two extreme problems: rigid original content output and excessive localized adaptation leading to the loss of cultural characteristics.

Combined with user portrait data of overseas social platforms (TikTok, Instagram, YouTube, Facebook), generative AI automatically matches content forms: short video dynamic symbols for short video platforms, high-definition static cultural creative posters for social media, interactive VR cultural symbol scenes for immersive communication platforms, realizing scenario-based precise dissemination.

5.2. Differentiated Cross-cultural Communication Strategies for Three Major Overseas Regions

In view of the high individualism cultural dimension of European and American audiences, AI reduces group-oriented grand cultural narratives, splits integrated complex cultural symbols into independent single symbolic elements, matches personal life scenarios, and adopts straightforward and concise narrative logic to reduce audience cognitive burden. For example, decompose Chinese knot symbols into independent aesthetic elements and match modern home decoration scenarios to fit Western daily aesthetic habits.

Southeast Asia has close cultural ties with China. AI retains complete oriental symmetrical aesthetics of cultural symbols, integrates local Buddhist and folk custom elements into Dunhuang murals, paper cutting and other symbols, launches human-AI co-creation cultural activities, strengthens audience cultural empathy relying on inherent oriental cultural affinity, and reduces cross-cultural cognitive barriers.

Aiming at the problem of cultural homogenization confusion in Northeast Asia, AI strengthens the marking of unique Chinese cultural semantics in the generation process, highlights the differences between Chinese traditional symbols and Japanese and Korean homogeneous cultural elements from visual details and narrative connotation, shapes independent Chinese cultural discourse, and clarifies national cultural boundaries in cross-cultural communication.

6. Conclusion and Research Prospects

6.1. Research Conclusion

Generative AI has unique technical advantages in element disassembly, semantic translation and multimodal reconstruction of traditional Chinese cultural symbols, but general models are restricted by dataset bias and single generation mode, resulting in poor cross-cultural adaptation effect. Through empirical data verification, embedding professional Chinese cultural knowledge graph and carrying out regional differentiated algorithm optimization can significantly improve semantic accuracy, aesthetic acceptance and overall cultural identity of AI-generated cultural symbol content. This study constructs a four-dimensional intelligent adaptation system covering knowledge graph embedding, regional algorithm optimization, human-AI collaborative audit and cross-platform precise dissemination, and proposes targeted strategies for three major overseas regional markets. The system effectively solves four core dilemmas including algorithmic bias, semantic recognition deficiency, homogenized generation and over-adaptation risk, which can provide effective technical and strategic support for the global communication of Chinese traditional cultural symbols.

6.2. Research Limitations

This study only selects young overseas audiences as research samples, lacking investigation of middle-aged and elderly groups; meanwhile, it only focuses on visual and textual cultural symbols, without in-depth exploration of audio and interactive cultural symbol communication effects. Subsequent research can expand sample age coverage and enrich multimodal communication evaluation dimensions.

6.3. Future Research Prospects

With the iterative upgrading of embodied AI and metaverse technology, future research can further explore the immersive interactive communication mode of cultural symbols in the metaverse scenario empowered by generative AI, build a real-time dynamic feedback mechanism of audience cultural cognition, and realize closed-loop intelligent iteration of cultural symbol cross-cultural adaptation content, so as to better promote the high-quality global communication of Chinese excellent traditional culture.

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