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RESEARCH ON THE AI TRANSFORMATION AND DYNAMIC VISUAL DESIGN OF QIANG EMBROIDERY PATTERNS FROM A SEMIOTIC PERSPECTIVE

Research article

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Abstract

The cultural significance and semiotic complexity of Qiang embroidery patterns are widely acknowledged as essential elements of intangible heritage. The emergence of Artificial Intelligence (AI) has catalyzed a significant transformation in their digital representation, facilitating the integration of traditional techniques with contemporary technological advancements and enhancing the dissemination of cultural heritage. This study employs semiotic theory to investigate the impact of AI on the evolution of Qiang embroidery patterns. It introduces a comprehensive framework for transformation encompassing material, behavioral, and spiritual aspects. Furthermore, the study offers a systematic analysis the application strategies of AI-driven tools in cultural innovation and design, thereby providing a solid theoretical basis and methodological pathways for the preservation and development of Qiang embroidery culture.

Keywords: semiotics, Qiang embroidery, AI transformation, dynamic visual design.

ИССЛЕДОВАНИЕ ТРАНСФОРМАЦИИ ОРНАМЕНТОВ ЦЯНСКОЙ ВЫШИВКИ С ИСПОЛЬЗОВАНИЕМ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА И ДИНАМИЧЕСКОГО ВИЗУАЛЬНОГО ДИЗАЙНА С СЕМИОТИЧЕСКОЙ ТОЧКИ ЗРЕНИЯ

Научная статья

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Аннотация

Культурное значение и семиотическая сложность орнаментов Цянской вышивки широко признаются важными компонентами нематериального культурного наследия. Стремительное развитие технологий искусственного интеллекта (AI) стало важным фактором трансформации способов цифровой репрезентации данных орнаментов, способствуя интеграции традиционных художественных практик с современными технологическими возможностями и расширяя каналы распространения культурного наследия. В настоящем исследовании на основе семиотического подхода анализируется влияние технологий искусственного интеллекта на процессы эволюции орнаментальных форм Цянской вышивки. Предлагается комплексная модель трансформации, охватывающая материальный, поведенческий и духовно-символический уровни. Кроме того, проводится системный анализ стратегий применения инструментов искусственного интеллекта в сфере культурных инноваций и дизайна. Полученные результаты формируют теоретическую основу и определяют методологические подходы к сохранению, цифровой трансформации и дальнейшему развитию культурных традиций Цянской вышивки.

Ключевые слова: семиотека, Цянская вышивка, трансформация с AI, динамический визуальный дизайн.

Introduction

As a central expression of Qiang culture, the artistic design of Qiang embroidery reflects the deep emotional connection of the Qiang people with their natural environment, religious beliefs, and daily life. These patterns carry profound semiotic significance, embedding layers of symbolic meaning [1]. Recently, advancements in AI — propelled by big data, enhanced computational capacity, and novel algorithms — have generated remarkable breakthroughs. Concurrently, AI-generated art has emerged as a novel form that interprets and transforms the symbolic expressions intrinsic to human art through specific algorithms, effectively simulating creative processes. This phenomenon exhibits attributes of artistic creativity and constitutes a vital trend in the evolution of disciplines within the humanities and arts [2], [3]. AI-powered methods now enable symbolic interpretation of Qiang embroidery patterns, supporting their seamless incorporation into contemporary visual communication. This integration not only increases their applicability in modern design practices but also intensifies their communicative power and practical utility in dynamic visual contexts [4].

Ai-based transformation of Qiang embroidery patterns

Pattern transformation is a multidisciplinary artistic practice involving the adaptation of a pattern from its original medium to alternative formats using specialized techniques, while preserving its cultural connotations and aesthetic qualities [6]. This process, following semiotic theory as a guiding framework, focuses primarily on control around the stylistic features and cultural value of the traditional patterns. In utilizing AI technologies, traditional Qiang embroidery patterned motifs can be reinterpreted and reconstructed from multidimensional technical methods and theoretical considerations. And this versatile approach pushing textile designs into all sorts of substrates — as in paper, metal, and plastic — expanding possibilities. For success in adaptation, special care is required in material properties such as texture, grain, and color fidelity to remain authentic to the original work. AI plays a crucial role by using image processing algorithms and material emulation to facilitate optimal adaptation of patterns and optimize them for media. These AI-driven offerings enhance both precision, efficiency, and accuracy for reproducing Qiang embroidery, and for maintaining the modern aspect of the design. Computational image analysis such as computerized image analyzing makes it easy to identify and re-contextualize significant design features in a systematic way: one typical traditional theme of “Butterfly” can be automatically identified within AI and coded into classification algorithms leading to modern render of graphic illustrations in a modern style (Fig. 1). To do so, these adaptations are in an attempt to maintain the essential cultural nature and extend pragmatic implementation within the established design paradigms.

Figure 1 - Qiang embroidery AI illustration butterfly
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Behavioral transformation and cultural contextualization

Qiang embroidery’s transformation through behavioral methods in multicultural and socio-behavioral paradigms shows a range of approaches. Historically, these motifs are found in clothing, ritual, and domestic objects, each of which carries a certain symbolic and cultural value. Contemporary challenges involve recontextualizing these patterns for modern domain such as fashion, interior design, and digital media. An illustrative case is the transformation of the iconic “White Ram’s Horn” pattern into a woolen doll, facilitated by AI, producing multimedia presentations aligned with today’s audience preferences and emotional sensibilities (Fig. 2).

Figure 2 - "Qiang" AI dolls
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Symbolic exegesis powered by AI assists in deciphering the semiotic structure encoded within these designs, ensuring their profound meanings are faithfully communicated in modern settings. This methodology not only preserves the spiritual core of Qiang embroidery but also enhances its resonance on a global scale, fostering expanded appreciation and understanding. Specifically, the “White Ram’s Horn Flower” motif, deeply rooted in nature veneration, has been reinterpreted through AI-

driven visual design to highlight the intricate relationship between the Qiang people and the natural world. This modern adaptation strengthens the cultural significance while augmenting its relevance in contemporary visual expression.

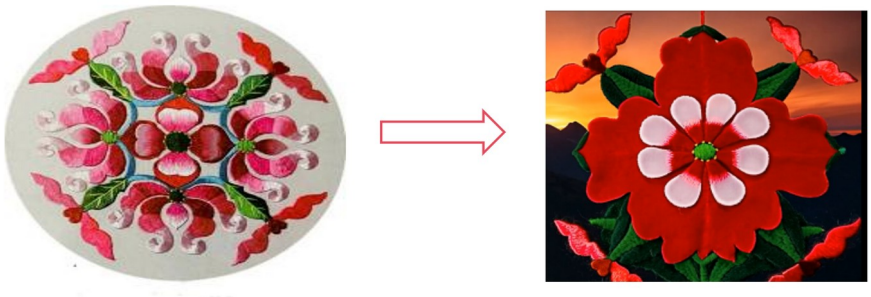

Figure 3 - Qiang Embroidery White Arm's Horn Flower Pattern Blossom
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Dynamic visual design process enabled by AI

The AI-enabled dynamic visual design of Qiang embroidery patterns adheres to a structured workflow comprising content collection, element identification, content interpretation, element extraction, compositional arrangement, and final application (Fig. 3).

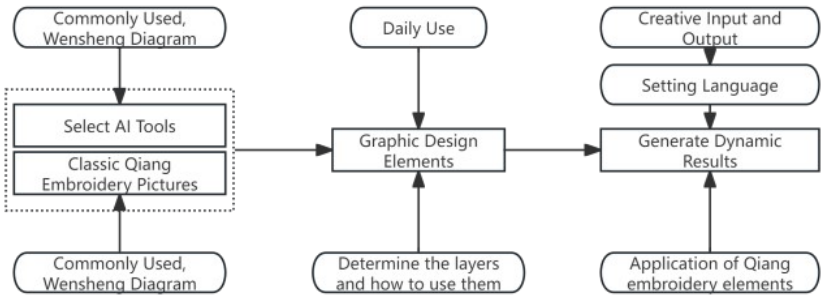

Figure 4 - AI design process of dynamic visual map of Qiang Embroidery Pattern
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This research implements comprehensive data gathering via fieldwork, literature surveys, and digital repositories to systematically accumulate design materials characteristic of Qiang embroidery. Its unique aesthetic and cultural identity are exemplified through its prototypical pattern styles. Within semiotic image-symbol theory, this study extracts and reconstructs the “form” and “meaning” of embroidery motifs. At the symbolic-semantic level, these designs are indexical signs, which create causal relations with their referents. The “White Ram’s Horn Pattern” is representative of such a thing: it is an entire symbolic system, which combines material and symbolic elements. Through the study of symbolic relations from inside their system, it constructs a dynamic visual language that captures cultural and modern expression alike. By means of image analysis, symbol extraction and dynamic visual design methods, Qiang embroidery motifs of traditional design and embroidery are converted into dynamic and visualizable performances. This innovative method secures their contemporary relevance and accessibility.

Figure 5 - Static rendering of Qiang embroidery cross-stitch “Longevity Peach”
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Dynamic visuals powered by AI combine cognitive and emotional contexts through animated transformations, which enhances retention and accurate transmission of information. For instance, the kinetic interpretation of the “White Ram” motif enhances understanding by communicating semantic meaning through motion, thus reinforcing cultural identity and emotional connection (Fig. 6).

Figure 6 - Qiang embroidery AI dynamic picture
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Additionally, the immersive qualities of the dynamic graphic — including mobile interaction through QR code scanning (Fig. 7) — present new avenues for cultural transmission. Such an interactive mode of communication intensifies audience involvement, enabling effective transmission and articulation of design concepts while promoting resonance, thereby harmonizing Qiang embroidery heritage with social needs today.

Figure 7 - AI dynamic display diagram
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Conclusion

This study combines semiotic theory and AI technologies in order to achieve a dynamic visual transformation of Qiang embroidery patterns. Through a formal and symbolic interpretation-oriented analytic approach, it goes further than depicting material and reflects more in-depth cultural stories of the traditional pattern. AI-based algorithms also improve pattern recognition and allow for fidelity of adaptation that still retains spiritual and aesthetic integrity to the designs and is responsive to current audiences. Animating and interacting elements also encourage viewer engagement, increase cultural understanding, and maintain a sense of community. Notably, this framework powered by AI is scalable and sustainable to both safeguard and creatively adapt intangible cultural heritage, guaranteeing continuity of Qiang embroidery traditions amidst a changing environment.

Конфликт интересов

Не указан.

Рецензия

Все статьи проходят рецензирование. Но рецензент или автор статьи предпочли не публиковать рецензию к этой статье в открытом доступе. Рецензия может быть предоставлена компетентным органам по запросу.

Conflict of Interest

None declared.

Review

All articles are peer-reviewed. But the reviewer or the author of the article chose not to publish a review of this article in the public domain. The review can be provided to the competent authorities upon request.

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