Research on the Innovation of Cultural Tourism Art Design in the Human-Machine Collaborative Creation Mode: Application and Exploration Based on AIGC Technology

Xue Han

Liaoning Communication University, Shenyang, Liaoning, 110136 China

eleven101@163 .com

Abstract. With the rapid development of Artificial Intelligence Generated Content (AIGC) technology, the integration of art design and the cultural tourism industry has ushered in new opportunities and challenges. Shenyang Shenbei New District, as an important cultural tourism region in Liaoning Province, boasts rich historical, cultural, and ecological tourism resources. This paper takes the human-machine collaborative creation mode as the entry point and uses Shenbei New District as a case study to explore the application scenarios, innovative models, and practical pathways of AIGC technology in cultural tourism art design. Through literature research, case analysis, and experimental verification, this paper constructs a theoretical framework for human-machine collaborative creation and proposes innovative pathways for AIGC-enabled cultural tourism art design. Combining the cultural characteristics and industrial needs of Shenbei New District, it suggests innovative approaches such as cultural tourism IP design, virtual-real fusion experiences, and personalized services. The research shows that AIGC technology can significantly improve the efficiency and creativity of cultural tourism art design, but it also faces challenges in technology, culture, and ethics. In the future, the human-machine collaborative creation mode will become an important development direction for cultural tourism art design, promoting the digital transformation of regional cultural tourism industries.

Keywords: Human-Machine Collaboration; AIGC; Cultural Tourism Art Design; Innovative Models; Cultural Communication; Art and Design.

1. Introduction

1.1 Research Background

Shenyang Shenbei New District is an important cultural tourism region in Liaoning Province, with abundant historical and cultural resources (such as Xibo ethnic culture) and ecological tourism resources (such as Guaipo Scenic Area). In recent years, Shenbei New District has actively promoted the digital transformation of its cultural tourism industry. With the rapid development of digital technologies, AIGC technology has gradually become an essential tool in the field of art design. AIGC, through technologies such as Generative Adversarial Networks (GANs) and Diffusion Models, can efficiently generate images, texts, audio, and other content, providing new possibilities for art design. At the same time, the cultural tourism industry is facing the need for digital transformation, urgently requiring art design to enhance cultural experiences and visitor engagement. In this context, the human-machine collaborative creation mode offers an innovative pathway for cultural tourism art design.

1.2 Research Significance

This paper takes Shenbei New District as a case study to explore the application scenarios and innovative models of AIGC technology in cultural tourism art design, constructs a theoretical framework for human-machine collaborative creation, and proposes practical pathways. The research not only has theoretical value but also provides actionable AIGC application solutions for the cultural tourism industry, promoting the deep integration of art design and cultural tourism.

1.3 Research Methods

This paper adopts literature research, case analysis, and experimental research methods. By combining the cultural resources and industrial needs of Shenbei New District with domestic and Typical case, it analyzes the application effects and challenges of AIGC in cultural tourism art design.

2. Cultural Tourism Resources and Industrial Status of Shenbei New District

With the development of artificial intelligence, the scene of man-machine collaboration is becoming more and more common. Especially in the field of art design, the application of AIGC tools gradually lowers the threshold of design, promotes the popularization of artistic creation, realizes the reflection and reconstruction of the art itself, and makes the artistic creation more diverse and creative. Under the blessing of advanced technology, AIGC can realize automatic learning from a large number of samples, not only can help designers solve design problems, improve the accuracy of the visual information, reduce the cost of human resources, but also can provide better display effect, greatly improve the flexibility and efficiency of design, bring people more efficient, convenient, personalized design experience, promote the development of the whole art design industry.[1]

2.1 Cultural Resources

Xibo Ethnic Culture: Shenbei New District is an important settlement of the Xibo ethnic group, with rich ethnic cultural resources such as the Xibo Ethnic Museum and Xibo Folk Village.

Historical Culture: The region has numerous historical and cultural sites, including ancient pagodas from the Liao Dynasty and ancient buildings from the Qing Dynasty.

Ecological Resources: Natural landscapes such as Guaipo Scenic Area and Qixing Mountain provide significant support for the cultural tourism industry.

2.2 Industrial Status

Development of Cultural Tourism Industry: In recent years, Shenbei New District has actively promoted the integration of cultural tourism, creating multiple cultural tourism projects such as the Xibo Cultural Festival and Guaipo Ice and Snow Festival.

Demand for Digital Transformation: With the diversification of tourist demands, the regional cultural tourism industry urgently needs to enhance cultural experiences and service quality through digital means.

3. Literature Review

In the digital age, the field of art and design is undergoing historic changes. The emergence and development of AIGC technology provides new innovative design methods and tools for visual communication designers, realizes the automation and quality optimization of creative design, provides designers with important data-based decision support for design, and greatly improves the efficiency of art design. On the one hand, driven by algorithm optimization and deep learning technology, AIGC shows unprecedented intelligent ability, capable of intelligent color matching, pattern generation and material combination, so as to optimize the design of works and improve the production efficiency. This technological advance not only frees designers from repetitive work, but also opens up a new path to focus on innovative design.[2]On the other hand, AIGC has the ability of data analysis and prediction, and can automatically collect and analyze massive user data, design indicators and market development trends in the field of art and design according to instructions, so as to help designers better understand market needs and make them make design decisions more in line with consumer needs. Advertising design companies, for example, can use AI technology collection, processing, analysis of a large number of user data, data cleaning, collection and transformation, using the new design concept and algorithm, and the user data reflected to the design elements, help designers to make more design decisions consistent with consumer expectations,

generate personalized advertising, accurately into the target audience, so as to effectively improve the efficiency of marketing.

3.1 Research Status of AIGC Technology

AIGC technology has made significant progress in recent years, particularly in the fields of image generation, text generation, and audio generation. For example, OpenAI's DALL·E and Stable Diffusion excel in image generation, while the GPT series models are widely used in text generation.

3.2 Theoretical Research on Human-Machine Collaborative Creation

With the continuous development of AI technology, human-machine collaboration will become an important trend in the design industry and promote the change and development of the visual communication industry. In the process of generating design materials, AIGC technology shows its unique capabilities. Through in-depth algorithm learning, AIGC provides designers with the possibility of extracting unique inspiration from complex data and information, broadens the creative vision of designers in the process of integrating different art fields and cultures, and becomes the key force to promote the continuous innovation of creative design with their efficient transformation and refining functions. In terms of commercial operation design, Midjourney and other AI drawing tools can quickly batch generate background drawings of different styles. [3] Designers can choose the appropriate background drawings according to the design theme and integrate them with their own design content to explore new design possibilities and promote the diversified expression of artistic design.

Human-machine collaborative creation refers to the process of humans and AI systems working together to complete creative tasks. Existing research mainly focuses on role allocation, collaboration processes, and evaluation of creative outcomes.

3.3 Research Status of Cultural Tourism Art Design

Under the background of man-machine collaboration, AIG C in the optimization of art design information presentation role, not only can provide new design perspective and auxiliary design means, help designers improve design efficiency and innovation ability, can also optimize the form of art design and content, in order to better meet the needs of the audience and preferences. First, the integration of AI with virtual reality (VR) and augmented reality (AR) technology can provide art designers with a new design perspective and interactive form. Designers can intuitively show the design works in the virtual environment, conduct more immersive and intuitive interaction and design preview with their own works, better evaluate and understand the design scheme from the perspective of customers or consumers, and optimize and adjust it, to improve the visual effect of the design works. Second, ai image generation and synthesis technology is an important part of AIGC, which can help art designers improve their design efficiency and innovation ability. Artificial intelligence image generation technology can help art designers quickly generate a large number of visual elements, used for product publicity, poster design and other scenarios.

Cultural tourism art design is an important component of the cultural tourism industry. Current research primarily focuses on the visual expression of cultural symbols, user experience design, and the creation of cultural tourism IPs.

4. Theoretical Framework of Human-Machine Collaborative Creation Mode

AIGC technology is widely used in the fields of image generation, video generation and text generation. It can automatically generate high-quality visual content and help designers to meet the personalized and diversified needs of consumers. Designers only need to give specific basic design elements according to the design theme. AIGC can analyze and learn from a large number of language data through big data technology, understand and simulate a large number of art design cases and consumer needs according to the design theme, and generate multiple design schemes that are highly

consistent with the instructions. Designers can choose solutions in line with their own design ideas and optimize them, so that they can design personalized products to meet the diversified needs of consumers.[4]

4.1 Role Allocation in Human-Machine Collaborative Creation

In the cultural tourism art design of Shenbei New District, the roles of AI and humans can be divided into the following modes:

AI as an Inspiration Tool: Generating Xibo cultural symbols, historical story scripts, creative sketches, color schemes, and cultural element extraction.

AI as an Efficiency Tool: Automating the design of cultural tourism IPs, guide systems, modeling, scene rendering, and user behavior prediction.

AI as an Interaction Medium: Real-time generation of interactive content for tourists, such as virtual guides and AR cultural experiences.

4.2 Process Design of Human-Machine Collaborative Creation

The process of human-machine collaborative creation includes the following stages:

Requirement Analysis: Clarifying the design goals and user needs of cultural tourism projects.

Content Generation: Using AIGC technology to generate preliminary design solutions.

Creative Refinement: Designers optimizing and adjusting AI-generated content.

User Feedback: Optimizing design solutions through user testing and feedback.

4.3 Evaluation of Human-Machine Collaborative Creation

The effectiveness of human-machine collaborative creation can be evaluated from the following aspects:

Design Efficiency: Whether AI significantly improves design efficiency.

Innovation: Whether the design solutions exhibit unique creative expressions.

User Satisfaction: The acceptance and satisfaction of tourists with the design solutions.

5. Application Scenarios of AIGC in Cultural Tourism Art Design

By providing designers with inspiration sources, creative design ideas, automated design processes and visual presentation of design works, AIGC provides art designers with more accurate and reliable design decision support and creation possibilities. However, the development of AIGC technology and its wide application in the field of art and design have ushered in many new challenges and caused many academic and ethical problems. Designers should deeply learn and understand the characteristics of AIGC, and on the basis of protecting their own privacy and respecting others' creative achievements, give full play to the advantages of AIGC in auxiliary art design to create more creative works.

5.1 Intelligent Generation of Cultural Tourism IPs

AIGC technology can be used to generate local cultural IPs, narrative scripts, and visual symbols. For example, using AI to create virtual spokespersons and immersive narrative content based on local historical data.

5.2 Virtual-Real Fusion Experience Design

By combining AIGC with AR/VR technologies, virtual-real fusion cultural tourism experiences can be designed. For example, AI-generated dynamic cultural stories presented to tourists through AR technology.

5.3 Personalized Cultural Tourism Service Design

AIGC technology can generate customized tourism routes and experiences based on tourist preferences. For example, AI analyzes tourist behavior data to generate personalized guide routes.

6. Practical Cases and Analysis

6.1 AI-Assisted Design in the Palace Museum's "Digital Heritage Library"

The Palace Museum uses AI technology for digital restoration and display of cultural relics, enhancing tourists' cultural experiences.

6.2 AI Art Interactive Installations at the Van Gogh Museum in the Netherlands

The Van Gogh Museum enhances visitor engagement through AI-generated art interactive installations.

6.3 Immersive Light and Shadow Art Projects by Japan's TeamLab

TeamLab creates immersive art spaces using AI and light-shadow technologies, providing unique cultural tourism experiences.

7. Challenges and Future Directions

Although AIGC has obvious advantages in the field of art and design, due to technical limitations, it has obvious understanding deviation between complex instruction data and knowledge, resulting in a large deviation between the generated content and the expectations of designers, and the availability is not strong. First, emotional and aesthetic understanding deviation. Human beings have a very complex emotional system and a unique aesthetic ability, so it is difficult for AIGC to accurately capture and understand the subtle emotional needs and aesthetics of consumers. At the same time, due to the limitations of technology, AIGC is difficult to reach the level of top designers in terms of reasoning ability and creativity, and even with accurate instructions, it is still difficult to complete highly innovative design tasks. Second, the deviation of data and knowledge understanding caused by human-machine collaboration mode and process. In the process of human-machine collaboration, a clear division of tasks and a smooth collaboration process are crucial to ensure efficient collaboration between AI-generated content and designers. However, due to the limitations of designers' understanding of the working mechanism and generating characteristics of AIGC, deviations between data and knowledge understanding often occur in practice.[5]For example, typing keywords into the Midjourney software, based on the impact of the training data, the nuances of the AIGC, can be very different from what the designer originally intended to do. This limitation leads to the obstacles in understanding and communication between man and machine, which then makes the results of AIGC deviate from the original intention of the designer, and ultimately affects the overall design effect.

7.1 Technical Challenges

The lack of original homogeneous design works enter the market, which makes the whole art and design field face the risk of innovation frustration and creative exhaustion. In the long run, it will bring negative impact on the healthy development of the design market. On the other hand, the emergence of AIGC technology has greatly lowered the threshold of art design. Many non-professionals join the ranks of art design. They enter the market with a number of homogenized works generated by AIGC, which will have an impact on the survival and development of designers. [6]AIGC technology enables the rapid generation of a vast array of design works based on data and models. This has introduced competitive pressures within the design industry, with traditional designers facing reduced employment opportunities and their creative space being constricted.

Consequently, it becomes challenging for creations to stand out amidst a trend towards homogeneity, leading to a diminished creative value for designers and posing a significant challenge to their professional development.

The application of AIGC technology in cultural tourism art design still faces technical limitations, such as homogenization issues and insufficient real-time responsiveness.

7.2 Cultural Challenges

Accurately expressing and disseminating cultural symbols through AIGC technology is an important research direction.In the context of man-machine collaboration, the integration of AIGC and art design not only presents the collision between digital technology and creative design, but also provides designers with a new way of working and thinking path. In this process, designers need to systematically improve their digital literacy to better cooperate with AI technology to create more creative and valuable works.

7.3 Ethical Challenges

The application of AIGC technology involves ethical issues such as intellectual property and privacy protection, requiring the formulation of relevant regulations.

On the one hand, the creation ownership and originality of AIGC generated works should be identified. From the perspective of creation, due to the participation of AIGC, the works generated by AI are generated by AI programs and algorithms, which require the designer to carry out the overall framework conception and instruction output, and the AIGC program needs to imitate the human creation to produce the works, so how to distinguish the real creators of the works in the actual creation? In terms of originality, the generation technology of AIGC can provide a new creation tool for designers. Some works generated by AI may be generated based on the existing art works or design style, but lack of originality. However, there are also some AI-generated works that may be generated based on completely new artistic ideas or design styles, with a very high degree of originality. How to recognize the originality of AIGC-generated works and how to protect them legally is still a complex issue. On the other hand, under the background of human-machine collaboration, there is still no clear definition of the copyright of art works generated by AIGC and whether their creation infringes on the copyright of other original art designers

Nowadays, the way of generation of AIGC still requires a massive learning and algorithm model based on human-created works, which does not have the ability to independently create art works, but is only the splicing and reconstruction of the learning content. If AIGC works are strictly protected in accordance with the copyright law, more and more people may give up their own creation and generate various kinds of works with AIGC, leading to the gradual exhaustion of human creation. [7]Therefore, at the policy level, relevant departments should establish relevant AIGC norms and legal protection to prevent AIGC software from unauthorized use of original creators' works, clearly stipulate the copyright ownership, copyright protection, data protection, information security and other issues of AI-generated content, and provide relevant relief and punishment measures.

7.4 Future Directions

In the future, AIGC technology will deeply integrate with cultural tourism scenarios, promoting the intelligent and personalized development of cultural tourism art design.

With the continuous development of AI technology, designers should master the characteristics of AIGC technology and constantly optimize their own design driven by data. Relevant departments should improve relevant copyright policies and regulations based on the current situation of AIGC application and its ethical issues, so as to create a good living space for "technology + art".[8] At the same time, designers need to improve their digital literacy through systematic training, give full play to the auxiliary function of AIGC in art design, be alert to the risks brought by excessive reliance on technology, and make joint efforts in multiple dimensions to stimulate and release the enabling effect of AIGC technology on art design.

8. Conclusion

AIGC has had a profound impact on art design, improved the creativity and efficiency of art design, optimized the design process, and promoted the diversified expression of visual communication, so that it can better meet the personalized and diversified needs of consumption. However, the integration process of AIGC and art design also faces many challenges and ethical problems, such as data knowledge understanding deviation, copyright ownership of design works, intelligence gap and homogenization of works. Designers should strengthen the learning of AIGC and other knowledge and skills, systematically improve their digital literacy, make full use of their creative thinking and professional knowledge, and create excellent design works with the help of AIGC. At the same time, relevant departments need to further clarify the copyright issues of AIGC through policy guidance and laws and regulations, protect the originality of art works, give full play to the auxiliary creation function of AIGC, and create more potential visual communication works.

Through theoretical analysis and case studies, this paper explores the application scenarios and innovative models of AIGC technology in cultural tourism art design. The research shows that the human-machine collaborative creation mode can significantly improve the efficiency and creativity of cultural tourism art design, but it also faces challenges in technology, culture, and ethics. In the future, AIGC technology will play an increasingly important role in cultural tourism art design.

Acknowledgments

The authors acknowledge the Basic Scientific Research Project of Liaoning Provincial Department of Education in 2023, project approval number: JYTMS20230343.

References

[1] Lu Zhaolin, Song Xinheng, Jin Yucheng. The current situation and development of intelligent design under the trend of AIGC technology. Packaging Engineering, 2023.44 (24), pp.18-33.

[2] Liu Liang. Challenges and opportunities of the packaging design industry driven by AIGC intelligence. Packaging Works, 2023,44 (S2), pp.236-240.

[3] Zhang Mu, Gu Qunye, Tian Jinliang. AIGC brings opportunities and challenges to new media art education. Young Reporter, 2024, 3, pp.109-112.

[4] Zhai Xiufeng. Intelligent generation of platform content economy challenges to the academic publishing industry. Journal of Shandong Normal University (Social Science Edition), 2023,68 (5), pp. 104-113.

[5] Guo Yao. Analysis of the application, potential risks and governance of AIGC in the field of GTV listening. News Research Guide, 2023, 14 (16), pp. 1-3.

[6] Li Yanyan, Zheng Yafeng. Educational Applications of Generative Artificial Intelligence[J]. People's Tribune, 2023, (23):69-72.

[7] Miao Fengchun. Basic Controversies and Countermeasures of Generative Artificial Intelligence and Its Educational Applications[J]. Open Education Research, 2024,2(30):4-15.

[8] Ren Zhifang. Research on Integrating Traditional Chinese Elements into Graphic Design Teaching in Universities[J]. Art Education, 2019(11):256-257.