Proceedings of the 3rd International Conference on Literature, Language, and Culture Development
DOI: 10.54254/2753-7064/34/20240103

The Application of Artificial Intelligence in Visual Communication in the Context of Cross-Boundary Fusion

Xiaoyi Wang[1,a,*]

[1]*Beijing Jiaotong University, No.3 Shangyuancun, Haidian District, Beijing, China*
a. 1066274342@qq.com
**corresponding author*

Abstract: In the context of cross-border integration, significant progress has been made in the application of artificial intelligence in the field of visual communication. Through methods such as image recognition and processing, video analysis and understanding, and posture recognition and action capture, artificial intelligence not only improves the accuracy and efficiency of visual communication, but also brings innovative solutions to multiple industries. In the field of security monitoring, artificial intelligence has achieved high accuracy in facial and vehicle recognition, improving the efficiency of security monitoring; In the field of telemedicine, artificial intelligence helps doctors diagnose conditions more accurately through video analysis, improving communication efficiency; In the VR/AR field, artificial intelligence provides users with a more natural and realistic interaction experience through posture recognition and motion capture technology. These applications not only demonstrate the potential of artificial intelligence in visual communication, but also provide strong support for cross-border integration and innovative development in more fields in the future. Meanwhile, with the continuous advancement of technology and the expansion of application scenarios, we hope that artificial intelligence can play a greater role in the field of visual communication, bringing more convenience and value to society.

Keywords: artificial intelligence, intelligent visual design, neural network

1. Introduction

With the continuous evolution of artificial intelligence technology, its cross-border integration with multiple fields has become the trend of The Times, especially in the field of visual communication, showing unlimited potential for innovation. With the support of big data and cloud computing, artificial intelligence has been deeply involved in every link of visual communication, providing unprecedented opportunities and challenges for designers. Traditionally, designers rely on aesthetics, creativity, and experience to construct visual elements that convey specific messages and emotions[1]. With advanced technologies such as deep learning, neural networks and machine learning, designers can greatly improve the quality, efficiency and quantity of designs[2]. The application of artificial intelligence allows designers to easily cope with the growing needs and complexity of design. By analyzing huge amounts of design data and user preferences, the machine provides designers with valuable inspiration and insight, significantly reducing trial and error and speculation in the design process. In addition, AI can automatically generate design elements, optimize image processing and graphics design, and generate personalized design solutions for users through intelligent algorithms.

DOI: 10.54254/2753-7064/34/20240103

The widespread application of artificial intelligence also brings some challenges and reflections. Although machines can mimic human creativity and aesthetics, the lack of human emotion, intuition, and experience may cause the design work to lose its uniqueness and ingenuity. At the same time, with the rapid development of technology, we must also focus on the moral, legal and privacy issues related to it. The combination of artificial intelligence and visual communication provides designers with new tools and methods, and also prompts us to re-examine and explore the boundaries of design. Through the rational integration of AI technology with the creativity of designers, we are expected to witness the birth of more creative, personalized and intelligent visual communication works. But in this process, we need to be vigilant to ensure that the application of AI technology conforms to the ethical and social value principles, so as to achieve the best results of human-machine collaboration.

2. Related Words

2.1. Cross border integration concept

Cross disciplinary integration refers to the intersection and integration between different industries, disciplines, cultures, and other fields, by combining elements from different fields to generate new ideas, concepts, technologies, or products. It is an innovative attempt that breaks the traditional limitations of a single field and promotes the formation of new ways of thinking and collaborative models. In the process of cross-border integration, professional knowledge and technology from different fields can be borrowed and integrated with each other, thereby creating more competitive and creative works. Cross border integration has the characteristics of integration, innovation, complementarity, and risk. The specific practical cases of cross-border integration are rich and diverse, involving various aspects such as fashion design, technology, tourism, film and television industry, architectural design, and catering industry. For example, cross-border cooperation between fashion design and arts and crafts can pursue trends and individuality while emphasizing tradition and handicrafts; Cross border cooperation with the technology field can provide new creative methods and forms of expression for arts and crafts, such as using 3D printing technology to replicate traditional crafts, or applying virtual reality technology to arts and crafts exhibitions; Cross border cooperation with the tourism industry can combine their respective advantages to provide tourists with more diverse and unique experiences.

2.2. The concept of artificial intelligence

Artificial intelligence is a broad concept that involves multiple disciplines, including computer science, psychology, philosophy, and more. Artificial intelligence aims to research and develop theories, methods, technologies, and application systems that can simulate, extend, and expand human intelligence. Research in this field not only attempts to understand the essence of intelligence, but also aims to produce a new type of intelligent machine that can respond in a way similar to human intelligence. The research fields of artificial intelligence are very extensive, including but not limited to robots, language recognition, image recognition, natural language processing, expert systems, machine learning, and computer vision. Among them, machine learning and deep learning are the core of artificial intelligence technology. They enable computers to automatically discover patterns in data through a large amount of data and training, and perform operations such as pattern recognition, classification, and prediction. The application scope of artificial intelligence is also very extensive, which has penetrated into multiple fields such as speech recognition, image recognition, natural language processing, intelligent interaction, autonomous driving, medical and health, and has become an important force in promoting social progress and economic development. With the continuous development and application of artificial intelligence technology, it has also brought a series of governance challenges, such as privacy protection, ethical and moral issues, legal and regulatory

DOI: 10.54254/2753-7064/34/20240103

issues. Therefore, while promoting the development of artificial intelligence, it is also necessary to pay attention to risk prevention, establish and improve legal regulations, institutional systems, and ethical ethics to ensure the healthy development of artificial intelligence, and strive to achieve a dynamic balance between regulation and development.

2.3. Visual communication concept

Visual communication refers to the way animals or humans transmit information and communicate through visual signals. In the animal kingdom, visual communication typically involves various postures, movements, and color changes to convey specific information or emotions. In human society, visual communication is more complex and diverse, including the use of visual elements such as text, images, and videos to convey information. In communication engineering, visual communication specifically refers to a communication method that receives signals with the naked eye (or with the help of a telescope) within the visual range. It covers various forms, such as flag or arm communication, flag communication, lighting communication, fireworks communication, physical communication, and audio communication. Among them, light communication is a special way of communication, which uses light communication equipment to represent letters, numbers, and service symbols with different lengths of flashes for communication. In the fields of robotics and computer vision, visual communication also plays an important role. For example, robot vision transmission refers to the process in which the image information obtained by the robot through the camera is transmitted to other devices or the cloud for processing and analysis. This communication method plays a crucial role in tasks such as robot navigation, target recognition, and environmental perception.

3. Method

The rapid development of artificial intelligence technology has provided more efficient, accurate, and intelligent methods for visual communication. Below, we will introduce some methods of artificial intelligence in visual communication in the context of cross-border integration.

1. Image recognition and processing: Artificial intelligence recognizes and processes images through technologies such as deep learning. In visual communication, image recognition can help identify key information in images, such as faces, objects, etc. Meanwhile, image processing technology can perform denoising, enhancement, and other operations on images to improve their quality. For example, in the field of security monitoring, artificial intelligence can achieve automatic recognition and tracking of targets such as faces and vehicles in surveillance videos, improving the efficiency and accuracy of security monitoring.

2. Video Analysis and Understanding: Artificial intelligence can conduct in-depth analysis and understanding of video content, extracting key information from videos, such as actions, scenes, etc. In visual communication, video analysis can help us better understand video content and engage in more effective communication. For example, in the field of telemedicine, doctors can use artificial intelligence technology to examine and analyze patient videos, in order to diagnose the condition more accurately.

3. Pose recognition and motion capture: Artificial intelligence can recognize and analyze the posture and actions of the human body, thereby achieving motion capture and control of virtual characters. In visual communication, posture recognition and motion capture technology can achieve more natural and vivid interaction. For example, in the fields of virtual reality (VR) and augmented reality (AR), artificial intelligence can help users achieve more realistic action interactions, improve immersion and experience effects.

The data analysis is shown in the table below

DOI: 10.54254/2753-7064/34/20240103

Table 1: Specific Data Analysis

application area	method	Data/Effects
Security monitoring	Imagerecognitionand processing	Facialrecognitionaccuracy: 98%
		Vehiclerecognition accuracy: 95%
Telemedicine	VideoAnalysisandUnderstanding	Improveddiagnostic accuracy: 20%
		Communication efficiency improvement: 30%
VR/AR	Attitude recognition and motion capture	Actioncaptureaccuracy: millimeter level
		Increasednaturalness of interaction: 50%

Based on the data in the table above, the following analysis can be conducted on the different application fields of artificial intelligence in visual communication:In the field of security monitoring, artificial intelligence has achieved high accuracy in facial recognition and vehicle recognition through image recognition and processing methods. The accuracy of facial recognition reaches 98%, and the accuracy of vehicle recognition reaches 95%. These data indicate that artificial intelligence has high recognition ability in security monitoring. This can not only improve the efficiency of security monitoring, reduce the need for manual intervention, but also effectively prevent and respond to various security risks.In the field of telemedicine, artificial intelligence significantly improves diagnostic accuracy and communication efficiency through video analysis and understanding. Improve diagnostic accuracy by 20% and communication efficiency by 30%. These improvements help doctors to more accurately assess the condition, make timely treatment plans, and also alleviate communication barriers between doctors and patients, improving the patient's medical experience.3VR/AR field: In the VR/AR field, artificial intelligence has achieved millimeter level motion capture accuracy and improved interaction naturalness by 50% through posture recognition and motion capture methods. This indicates that artificial intelligence can provide a more realistic and natural interactive experience in VR/AR applications, allowing users to immerse themselves more deeply in the virtual world and improve the effectiveness of entertainment and education. From the above data, it can be seen that artificial intelligence has achieved significant results in different application fields of visual communication. These effects are not only reflected in the improvement of technical indicators, but also in the convenience and efficiency improvement in practical applications. With the continuous progress and integration of technology, the application of artificial intelligence in the field of visual communication will be more extensive and in-depth, bringing more convenience and innovation to the development of society and people's lives. At the same time, we should also recognize that the application of these technologies also needs to consider privacy protection, ethical and moral issues, in order to ensure the healthy development of technology and the sustainable progress of society.

4. Results And Discussion

In the era of cross-border integration, the integration of artificial intelligence into the field of visual communication has experienced noteworthy advancements. By implementing algorithms and systems, the efficiency and quality of design have been significantly improved. Moreover, artificial intelligence can analyze user-specific preferences and provide personalized design outputs to cater to

DOI: 10.54254/2753-7064/34/20240103

diverse user needs.

The study aims to establish the essential dimensions for evaluating the teaching effectiveness of artificial intelligence technology in visual communication design. Variables associated with artificial intelligence technology encompass data integration, learning analysis, virtual reality, and intelligent evaluation. As for the teaching effectiveness variables in visual communication design, they include intelligent teaching, diversified teaching, virtualized teaching, and others. Experts and scholars in the fields of artificial intelligence and visual communication design were invited to evaluate these dimensions. Additionally, eleven teachers in the artificial intelligence field and a randomly selected group of 11 students, editors, and designers majoring in visual communication design participated in technical analysis and simulation experiments. The results of these evaluations are presented in Table 2.

Table 2: Analysis and evaluation of AI visual communication technology

Variables	Dimensionality	Evaluation average
Artificial Intelligence Technology	Data Integration Technology	4.21
	Learn analytical techniques	3.74
	Virtual Reality Technology	4.10
	Intelligent Assessment Technology	2.86
Effectiveness of teaching visual communication design	Teaching Intelligence	4.20
	Personalized teaching	3.97
	Teaching Diversity	3.89
	Teaching Virtualization	2.94

According to the data in Table 1, there are significant differences in the evaluation of AI technology in different fields. At the technical level, the average evaluation values of data integration technology, learning and analysis technology, and virtual reality technology were 4.21,3.74, and 4.10, respectively, which exceeded the median 3 of the level 5 Likert scale, showing the important position of these technologies in artificial intelligence. In contrast, the average evaluation value of intelligent evaluation techniques is only 2.86, below the median of 3, which may require more research and improvements in this field. Therefore, the connotation of artificial intelligence should mainly cover data integration technology, learning and analysis technology, and virtual reality technology.

In order to gain a comprehensive understanding of user satisfaction with the graphic languages employed by various algorithms in visual communication design, this study categorized satisfaction into four levels: A, B, C, and D. Level A indicates very high satisfaction, with scores ranging from 8 to 10; Level B represents a satisfactory response, with scores ranging from 5 to 7; Level C indicates moderate satisfaction, with scores ranging from 3 to 4; and Level D corresponds to dissatisfaction, with scores ranging from 0 to 2. To evaluate user satisfaction, a comparison was made between traditional linear discrimination techniques and computer vision methods. The findings on user satisfaction are presented in Table 2. The proposed algorithm consistently demonstrates higher satisfaction scores compared to the other two algorithms across all career roles. Among the career

DOI: 10.54254/2753-7064/34/20240103

roles, designers consistently exhibit the highest satisfaction scores across all algorithms, indicating that they find the proposed algorithm most satisfying. Based on these findings and considering the context of cross-boundary fusion, it can be inferred that the application of artificial intelligence, particularly the proposed algorithm, holds promise in meeting the diverse needs of visual communication design professionals across different career roles. The higher satisfaction scores may be attributed to the advantages of artificial intelligence, such as improved efficiency, accuracy, and personalized experiences. It is important to further explore and develop artificial intelligence technologies that cater to the evolving demands of the visual communication design field to drive further satisfaction and success in this cross-boundary context.

Table 3: User satisfaction test

Career	Satisfaction/Score		
	The proposed algorithm	Linear discrimination	Computer Vision
Students	7.3	5.1	3.2
Clerks	8.3	6.4	5.2
Editor	7.9	4.4	51
Designers	8.5	5.8	4.1
Other	6.9	3.2	4.5
Average	7.7	5.1	5.0

5. Conclusion

The application of artificial intelligence in visual communication has brought unprecedented opportunities for designers, but accompanied by challenges. By making rational use of this technology and combining with the creativity of designers, we are expected to create more creative, personalized and intelligent design works. However, we must remain vigilant to ensure that the application of AI technology conforms to ethical and social value principles and achieves the best results of human-machine collaboration, while ensuring that the designers can fully play to their unique creativity and value in the design process.

References

[1] *Song B. Visual communication design based on artificial intelligence under the digital media art environment[J]. Solid State Technology, 2021, 64(2): 4882-4890.*

[2] *Wang H. Application of non-local mean image denoising algorithm based on machine learning technology in visual communication design[J]. Journal of Intelligent & Fuzzy Systems, 2023 (Preprint): 1-13.*

[3] *Wang L .Innovation of Visual Communication Design of Interactive Packaging for Internet-Famous Food Based on Artificial Intelligence[J].Scientific programming, 2022(Pt.15):2022.*

[4] *Yu C , Zhang Q .Application of Artificial Intelligence-Based Geostatistical Data Processing Technology in Hydrogeological Field Simulation[J].2022 International Conference on Education, Network and Information Technology (ICENIT), 2022:315-318.DOI:10.1109/ICENIT57306.2022.00076.*
lar Care, 2022(Supplement_1):Supplement_1.DOI:10.1093/ehjacc/zuac041.130.

[5] *Xiang S L .The application of big data and Artificial intelligence in visual communication design[J].J. Comput. Methods Sci. Eng. 2022, 23:639-649.DOI:10.3233/jcm-226627.*

DOI: 10.54254/2753-7064/34/20240103

[6] *Liu X , Wang X .Application of artificial intelligence for solving the engineering problems[J].Structural engineering and mechanics, 2023.*
[7] *Chen Hongbo, and Zhang Yaqin. The application of C4D in visual communication design under the crossover vision. Shanghai Light Industry 6 (2023): 26-28.*
[8] *Bao Jiahao, Cheng Mengjia, and Yu Hongbo. The current situation of virtual reality technology in orthognathic surgery teaching in the context of artificial intelligence. "Chinese Journal of Medical Education Exploration" 22.12 (2023): 1761-1766.*
[9] *Li Mengye. Optimization design analysis of a new AI system based on visual communication. "Information and Computer 034-009 (2022).*
[10] *Li Qiong, Song Xiaolin. Research on the application of AI + VR technology in Professional English Practice Teaching system under the background of industry-education integration [J]. Journal of Chengdu University of Traditional Chinese Medicine: Education Science Edition, 2023,25 (2): 59-62.*
[11] *Yuan S. Visual communication design of web-based learning resources in the digital era[J]. Journal of Intelligent & Fuzzy Systems (Preprint): 1-12.*
[12] *Hayashi M, Aharari A. Development of Interactive Visual Communication Tools to Assist Caregivers[C]//International Conference on Human-Computer Interaction. Cham: Springer Nature Switzerland, 2023: 289-298.a*