Analysis of Emotional Intelligent Design Features and Their Influences in Interactive Devices

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Abstract. The development of emotionally intelligent design promotes the improvement of emotional design efficiency, design quality, and attention to user emotions in the design of interactive devices. This paper sorts out and analyzes the research status of the emotional intelligent design of interactive devices. The characteristics of the emotional intelligent design of interactive devices are analyzed from four aspects: interactivity, personalization, intelligence, and emotion, and the impact of the emotional intelligent design of interactive devices on people's lives is explained. I was thinking about the emotionalization of future interactive installation art in the field of artificial intelligence Design research and application prospects.

Keywords: Multimedia interaction; installation art; emotionalization; artificial intelligence

1   Introduction

With the rapid development of new media technology, artistic creation enhances audience participation using richer methods while retaining traditions. AI technology is integrated into art creation, enabling emotional resonance and diverse interactive installations. The meaning generation and context of interactive works are multidimensional. Every interaction triggered by different touch points has its meaning [1]. Using interactive installation art to spread emotional design can expand design space, convey social-emotional values via multimedia, evoke social resonance, and reconsider the relationship paradigm among technology, audience, artist, and artwork.

2   Research Background and Current Status

2.1   Research on the Emotionalization of Interactive Devices

Emotional interactive design requires a deep understanding of the emotional needs of users. Designers can understand the emotional characteristics and needs of the target user group through methods such as user research and sentiment analysis[2]. Zhou

Xiaorui et al. [3] studied the theory and methods of interactive installations in cultivating social emotions; Wen Wenlong et al. [4] started from the interactive behavior itself and explored the impact of interactive rituals on the participant's experience and the psychological mechanism of positive resonance in the context of interaction between people and art installations from the theoretical perspective of the interactive ritual chain.

2.2   Research on Intelligent Design of Interactive Devices

Deng Bo [5] proposed that interactive installation art has the characteristics of interactivity, multimedia and virtuality; Yang Hongmin [6] discussed the design principles and technical applications of interactive display design; Bo Yun [7] proposed that new media and materials make the form and concept of installation art more diverse and open, thus giving rise to interactive installation art; Xiao Wenlei [8] analyzed the feasibility and value of generative artificial intelligence intervention in the creation of interactive installations. It can be seen that the new interactive attributes brought to installation art by new media technology is a consensus reached by existing research.

2.3   Research on Emotional Intelligent Design

AI technology empowers emotional design. With the help of advanced technologies such as neural networks and natural language processing, emotional design has made significant progress in intelligence [9]. As early as 1997, the MIT Media Lab proposed the concept of affective computing [10], which aims to enhance the intelligence of computers by giving them the ability to recognize, understand, and express human emotions. This is the embodiment of the concept of emotional design in AI product development.

3   Characteristics of Emotional Intelligent Design of Interactive Devices

3.1   Interactivity

Interactive installation art, which integrates art, emotion, and technology, is the development trend of future art. It has certain open characteristics and its interactivity turns the original three-dimensional space in the World Expo exhibition hall into a four-dimensional space. Countless fragmented individual consciousnesses aggregate into a virtual spiritual community, making the interactive space a real place for emotional exchange and collision of ideas [11]. Open and interactive interactive installation artworks make the audience, works, and environment harmonious and unified. In the process of interaction, the value of the works is truly reflected, and the dialogue between people and machines is realized, which injects fresh blood into multimedia interactive design. " YANTO- Yaw but not overturned" (2022) is an interactive installation work with a mobile phone application as the interface, as shown in Figure 1. The picture and

sound will change with the audience's actions: turn the device, the virtual environment rotates; the device moves up to see the sky; and the device tilts down to show the floor. Through the perspective of the artificial intelligence simulator, the audience is invited to transform species and create new simulation experiments to observe the changes in the ecosystem.

3.2   Personalization

The multimedia interactive installation under the fusion of art and technology realizes two-way communication with the audience. It is an art form of human-machine inter-action based on a certain hardware platform. While the audience communicates with the machine, their emotional expression is integrated into the work, becoming a unique component of the work, making the work unreplicable. The work "Sealing the Bi-Mo Chi Ji" collects calligraphy data of famous calligraphers from various ancient dynas-ties, including Wang Xizhi, Dong Qichang, Rao Jie, Su Shi, Huang Shangu, Wang Shouren, and others, as shown in Figure 2, using artificial intelligence Generative Ad-versarial Networks (GANs) to conduct Deep learning combines the ink and style of famous artists in "Ink Pond" and reappears in the world; "Sealed Pen" also provides an electronic writing platform, randomly selecting words for participants to write im-promptu, and recording their handwriting. Through the process of image learning and data comparison to outline the text form, in the end, the article will slowly disappear into the black water.

**Fig. 1.** YANTO - Yaw but not overturned

Fig. 2. Sealing the Bi-Mo Chi Ji

3.3   Intelligent

In the design process, the knowledge of human experts is modeled and processed auto-matically using intelligent technology to achieve automation of the design process [12]. With the help of intelligent design, designers can be assisted in the digital modeling and automated control of artworks. Based on optimization algorithms, material selec-tion, and automated testing, the artworks can be assisted in digital manufacturing, au-tomated production, and intelligent management, thereby optimizing and improving the artworks in all aspects. Abiotic Origins (2022) is an interactive computer installation with generative graphics and sounds. As shown in Figure 3, the visible elements in the work design are composed of 32 internal element groups composed of preset compo-nents, which symbolically constitute a " gene library ". In addition to the mathematical

description of shape, surface texture, and color information, each component contains information about cyclic and random parameter changes.
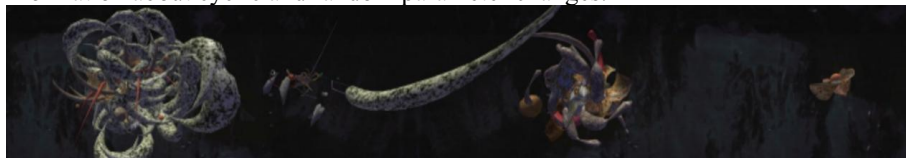
Fig. 3. Abiotic Origins

3.4 Emotional

From the audience's perspective, static structure art can no longer meet the audience's needs, and experiential and interactive works are more popular with the audience. The development of humanism pays more attention to people's feelings. When designing installation works, artists fully consider the psychological and emotional needs of the audience and use new art forms of interactive installations to reflect the humanistic care for the audience. "Liuhe" (2023) is an interactive video installation created by the artist based on his understanding of ancient totems and spiritual culture. The work takes Liuhe as the core concept and selects the auspicious totem " Deer and Crane in Spring " to express the prosperity of all things. The multi-dimensional interactive techniques and visual transformation of multimedia art give traditional images a new perceptual dimension. The work gives the viewer a strong audio-visual experience and leads the audience into the world of Liuhe in a state of focused gaze.

4 The Impact of Emotional Intelligent Design on Interactive Devices

4.1 Cross-border Integration

Interactive installation art is a new art form born in the digital age. It advocates the integration and innovation of art, culture, and technology, and focuses on the artist's subjective situational experience and the extension of imagination. In the era of artificial intelligence, interactive installation art creation integrates multiple disciplines, including physics, biology, optics, acoustics, psychology, information communication, and aesthetics, and involves computer programming and animation production to provide real-time dynamic feedback on human behavior, guiding people to actively engage in dialogue and interaction with inanimate objects. The emotionally intelligent design of interactive installations has achieved multidisciplinary cross-integration, and its diversified artistic characteristics are also loved by the public. By understanding the user's emotions, cognition, and behavior, designers can choose appropriate design elements such as colors, shapes, and patterns to trigger specific emotional responses. Designers need to consider the impact of social and cultural background on user emotions and realize the localization or globalization of design. Cross-cultural communication skills and sensitivity are also becoming more and more important for designers.

4.2   Problem Awareness

The development of artificial intelligence technology has changed the form of expression of interactive installation artworks. Interactive and experiential multimedia interactive installation artworks allow the audience to integrate into the works. The audience is no longer just a bystander, but a participant. In addition to meeting the audience's functional and aesthetic needs, the emotionally intelligent design of interactive installation art under the fusion of art and technology, is people moving towards digitalization. It triggers thinking about the relationship between people and the world. Do the high-tech elements in the work make the work lose its meaning? While the development of interactive installation art relies on the support of intelligent technology, can it grasp the degree of emotional design integration? For an artwork, what is important is the cultural connotation it wants to express. Over-emphasizing the cool technical presentation will make people lose themselves and fall into misunderstandings.

5   Future Development Trends

5.1   Output of Emotional Intelligent Design Solutions Throughout the Entire Process

Future interactive installation art will use data analysis to create precise emotional profiles by collecting historical and real-time data, including browsing history, purchase records, and social media activity. This analysis will help designers understand users' emotional states and needs, enabling more personalized designs. For example, music platforms can recommend playlists based on listening habits and mood, e-commerce sites can tailor product images and ads to shopping preferences, and social networks can adjust interfaces and interactions based on emotional expressions. Currently, emotional intelligence design research focuses on single aspects of the process. To enhance design efficiency, AIGC, and deep learning can support a full-process emotional design system, constructing strategies for emotional experience design and identifying key elements that impact user emotional engagement.

5.2   Multimodal Scenario Generation based on AIGC

Multimodal large models enable AIGC to have a wider range of application scenarios, and AI is no longer just in a supporting position [13]. The human-machine co-creation form of AIGC has put forward more radical changes to the original concepts and models of traditional knowledge production. Based on the production method of data fusion and multimodal models, AIGC has also been widely used in image recognition, image segmentation, target detection, image generation, and other fields, and can assist in completing computer vision technologies such as character modeling, scene reconstruction, and simulation of physical effects [14]. With the accelerated development of artificial intelligence algorithms, computing power, and data [15], AI-generated content (AIGC), represented by AI art creation (AI-generated art), is becoming an important trend in the development of network information resources in the digital intelligence

environment [16]. Multimodal large models are based on deep learning platforms such as computing power and data to achieve the cross-modal multi-directional generation of "text-sound ", " text - image " and "image-image" [17]. With the evolution of AIGC, multimodal production methods are emblematic of data fusion technology. Currently, interactive devices engage users primarily through visual and auditory channels, with tactile feedback limited to specific devices. However, future advancements could incorporate touch and smell into emotional interactions. For example, tactile technology could sense user pressure, and scent control could modify the user's emotional state. Multimodal design, using multiple sensors, offers a comprehensive approach to perceiving, identifying, and regulating emotions. It allows for cross-verification of information and supports personalization, giving designers more tools to meet individual emotional needs and preferences.

5.3   AI Emotional Interactive Dialogue and Action Generation

AIGC is a digital content generation method that involves human-machine collaboration, breaking the boundaries between humans, machines, and information resources, and reshaping the paradigm of information resource generation and use. Jiang Tingting et al. proposed a human-intelligence interaction research framework for human-centered artificial intelligence [18]. AIGC applications liberate artistic creation from the individual author model, fostering a human-AI collaboration (HAI-C) model. Anthropomorphic design in human-machine systems, which gives robots a human-like appearance or voice, influences user psychology and behavior. For instance, XiaoIce's "original" works facilitate multi-field interactions including text, visual, and sound creation. As AI advances, the anthropomorphism of interactive installations will grow, altering their role in human-machine interactions. Maintaining a stable, efficient cooperative relationship between the system and the user relies on emotional design, necessitating its evolution. Emotionally intelligent design involves collaboration among computers, designers, and users. Key areas to explore include real-time interaction, experience optimization, and enhancing human-computer interaction and collaboration efficiency.

6   Conclusion

The emergence of artificial intelligence technology has brought an unprecedented trend of diversification to the development of interactive installations. The continuous updating of new technologies and the continuous experimentation with new forms have given the future of interactive installation art more unpredictable spaces and possibilities. As artificial intelligence technology continues to develop to a higher level, in an era that increasingly focuses on human spiritual and emotional needs, it still requires in-depth exploration to continuously optimize intelligent design methods, technologies, steps, and processes, improve design efficiency, and meet user needs.

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