

A Brief Discussion on the Impact of Generative Artificial Intelligence on the Development of Design Aesthetics

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Abstract:

Examining the links between generative artificial intelligence and design aesthetics, and investigating the applications of AI technology in the design domain, serves to enhance our understanding of the current evolution of design aesthetics—providing theoretical support and practical cues for technology-driven design practices. By delving into the aesthetic expressions of design across the industrial and AI eras, this article probes the impacts of emerging technologies and tools on the advancement of design aesthetics. After the intervention of artificial intelligence in the field of design, the creative generation rules, workflow, and the role of designers have undergone a transformation. Summarize the positive changes and a series of problems brought by generative artificial intelligence to design, and point out the principles that artificial intelligence should follow and the responsibilities that designers should shoulder in this context. With the widespread application of AIGC generative design and the establishment of discourse power, its aesthetic paradigm is gradually evolving from imitating existing designs to creating unique language rules and principles. This transformation is gradually permeating and reshaping the aesthetic concepts in the field of design. We need to analyze it in a timely manner and adhere to the original intention of designing and beautifying life, adopting proactive strategies to adapt to this change.

Keywords:

Generative Artificial Intelligence, AI Era, Design Aesthetics

1. Design Aesthetics in Modern Design

Aesthetics is generally regarded as the subject's active aesthetic perception consciousness activity. Aesthetic consciousness is the key decision-making consciousness behavior bridging the tangible material world and the intangible spiritual activities of humans. Modern design aesthetics is a design concept. In the industrial era, design aesthetics emphasized "form follows function," characterized by simplicity, practicality, and standardization, reflecting the influence of mass production and mechanization [1]. Over time, design gradually incorporated more

humanistic care and personalized elements, beginning to focus on user experience and emotional connection [2]. In the AI era, design aesthetics has further evolved, emphasizing the integration of technology and intelligent application. Designers utilize new technologies and tools to create more intelligent, efficient design works while focusing on user participation and personalized experiences to meet the complex demands of modern society.

1.1. Mechanical Aesthetics of the Industrial Era

The First Industrial Revolution ended the handicraft era. The invention of the spinning jenny and Watt's technological innovations to the steam engine significantly reduced human labor intensity [3]. Tools acted as media accelerating goal achievement in industrial production. In the early mechanical era, people believed machine-produced goods were soulless and would cause humans to lose their souls [4]. As the era progressed, the emphasis on science and the promotion of rationality prompted design to abandon the decorative styles of the handicraft era, instead pursuing a sense of order and precision based on mathematics. The rise in living standards brought by mechanical production, and machine aesthetics influenced the public's aesthetic experience. People gradually accepted the forms of machines and machine-produced design products, beginning to appreciate and praise machine beauty. The essence of this machine "beauty" undoubtedly has a deep intrinsic connection with the historical context of technological progress, the Industrial Revolution, and the significant development of capitalist commercial civilization [5].

However, the principles of mechanical aesthetics did not inherently carry legitimacy [2]. According to communication scholar McLuhan's analysis, when printing technology first emerged, its font styles imitated handwriting. As printing machinery became widely disseminated, specialized printing fonts gradually established their dominance in written expression. The public's acceptance of the mechanical design aesthetics born from the industrial era underwent a similar aesthetic evolution process. In this context, mechanized mass production, leveraging its dominant discursive power, shaped the aesthetic characteristics of the new era. By the International Style period, this mechanical aesthetic style rapidly globalized, forming a monopolistic world aesthetic standard. Consequently, even as design progressed through Modernism and Postmodernism, it did not break through the machine aesthetic principles of the Industrial Revolution era.

1.2. Intelligent Aesthetics of the AI Era

Since entering the AI era, design aesthetic activities have shifted from a "unidirectional" mode of passive product appreciation to a "multidirectional" mode involving mutual connection and influence between subject and object [6]. With the development of AI technology, human interaction systems with intelligent products (including various procedural design and creative platforms) have rapidly evolved from passive interaction and forced active interaction towards proactive interaction. Proactive interaction systems enhance human willingness to communicate and trust in the experience [7]. The popularity and proliferation of interaction design have brought about a comprehensive transformation in human-machine relationships. In traditional design concepts, designers played a central role. However, in the field of interaction design brought about by AI, this role has shifted, forming a collaborative relationship between designers and AI systems. Since the industrial era, the interaction between humans and machines has been a focal topic for many thinkers. This discussion has

evolved from early human-machine antagonism to today's human-machine collaboration, even looking forward to potential future human-machine integration. In this process, the role of machines is gradually strengthening, showing a more proactive side in human-machine interaction.

AI's intervention in design is not only a transformation of design methods but also a significant impact on the traditional anthropocentric mode of thinking [1]. In the AI era, with continuous technological advancement and proliferation, design and creative work increasingly incorporate intelligent elements. This emerging aesthetics is reflected not only in the function and form of intelligent products but also throughout the entire design process, including user interaction, experience optimization, and customized services. Intelligent aesthetics emphasizes the fusion of machine intelligence and human aesthetics, aiming to create more personalized, efficient, and optimized aesthetic experiences through AI. It advocates a data-driven, algorithm-optimized design paradigm where AI is not just a production tool but also a partner in innovative thinking and aesthetic creation. For example, in product design, AI can automatically generate personalized design schemes based on user behavior and preference data; in artistic creation, AI can imitate and learn artists' styles to create new artworks; in user experience, AI can respond to user needs in real-time, providing tailored interfaces and services.

2. The Transformation of Design Aesthetics in the AI Era

The advent of the AI era reflects the influence of technological innovation and social progress on design concepts. With the continuous development of AI technology and the comprehensive application of AIGC in the design field, designers can explore new design possibilities. Simultaneously, designers utilize new technologies and tools to constantly experiment with new design methods and concepts, driving progress and development in the design field. The transformation of design aesthetics in the AI era has arrived, enriching both the connotation and extension of the design field, and providing new directions and momentum for future design development.

2.1. Transformation of Creative Generation Principles

Creativity has always been an important force driving design reform and innovation. From the Arts and Crafts Movement to the Modernist design movement, every major design change has been accompanied by significant breakthroughs in ideas and creativity. Creativity not only drives changes in design style but also promotes the advancement of design methods and practices. However, creativity is the result of the intertwining of various factors such as knowledge, experience, intuition, environment, and personal psychological state. This complexity makes it difficult to have a unified standard or formula to measure and explain the generation of creativity.

Today, design workflows and teaching models centered on human brain creativity are being replaced by new tools and methods driven by AI technology. This change is not merely a tool upgrade but a redefinition of the entire creative generation process. On one hand, the focus of design education has shifted from traditional creative production principles, such as the "Five Steps of Creative Generation" and brainstorming, to teaching how to use procedural creative generation platforms. The use of AIGC platforms like Midjourney and Stable Diffusion is gradually becoming an essential skill for design students. Design education is adapting to technological

development, shifting its focus from human brain creativity to technological application. On the other hand, AIGC technology not only changes the specific execution process of design but also raises new questions about the essence and value of design. Traditionally, design has been viewed as a form of human creative expression, relying on the designer's personal experience, emotion, and intuition. However, with the application of AIGC, the "creative spark" in the design process no longer solely originates from a flash of human inspiration; it can be generated by algorithms analyzing vast amounts of data and learning existing design patterns. This AI-driven creative approach, to some extent, deconstructs the mystique of design, making it more efficient and predictable, even surpassing the creative limitations of individual designers in certain cases.

Currently, the design field is undergoing a profound transformation that not only improves design efficiency but also redefines the creative generation process. However, in this process, we should not overlook the innovative pleasure brought by traditional design thinking and its profound impact on human thought patterns. Future design education and practice need to find a balance between technological application and preserving the value of traditional creativity, ensuring that design works are both creative and imbued with humanistic care.

2.2. Transformation of Design Workflow

In the current design field, generative AI has transcended its role as an auxiliary tool to become a co-participant in the design innovation process. AI's impact on the design process lies not only in efficiency enhancement but also in expanding designers' thinking methods and innovation capabilities.

In the initial design phase, traditional methods required designers to conduct comprehensive and in-depth market and user research to accurately capture and understand specific user needs, behavioral patterns, and market dynamics. This meant designers spent considerable time collecting and analyzing primary data, such as user interviews and observations, combined with secondary research for comprehensive evaluation [5]. Now, AIGC significantly improves designers' efficiency during the information gathering and acquisition stage.

In the design definition phase, AIGC, through its powerful information processing capabilities, promotes more personalized design definitions. AI can provide customized design solutions and suggestions based on different design contexts and target requirements, achieving a data-driven design approach. For example, data from clients or companies can directly influence design definition, and AI can automatically generate specific solutions for each user without manual intervention. This capability not only ensures a tight fit between design and real-world application scenarios but also provides users with a more personalized design experience [8]. With the further development of generative AI, the design output process will become increasingly automated and extend to more design domains.

The rise of AIGC technology has, to some extent, subverted long-standing human aesthetic habits, introducing elements that do not conform to modernist logic and gradually gaining acceptance for them. AIGC based on procedural creative platforms shifts the core of design from traditional composition and form to data and algorithms, thereby transforming the principle of "form first" to "algorithm first." This shift will inevitably influence human habits and perceptions of modernist aesthetics over time.

2.3. Transformation of the Designer's Role

In the AI era, designers' work is no longer confined to visual creation but involves every aspect of the entire design process, thus playing a more critical and multifaceted role. The rise of AIGC technology has transformed the designer's role from a traditional design executor to a strategic planner, collaborator, learner, user experience advocate, and innovation driver.

From Executor to Strategic Planner. The traditional designer role focused more on idea generation and design execution. However, with the application of AIGC technology, many repetitive and technical design tasks can be completed quickly by AI. This liberates designers from tedious execution work, allowing them to focus on more macro and core issues such as design strategy, user experience, design thinking, and aesthetic expression [9]. Designers need to increasingly consider how to leverage AI tools to enhance design quality and efficiency, and how to integrate new technologies and trends into design.

Partner in Creative Collaboration. AIGC technology can provide a large number of design schemes and options. Designers are no longer solitary generators of creativity but have become collaborators working with AI. Designers need the ability to select, adjust, and optimize AI-generated designs, while also being able to guide the AI's learning process to better align with design goals and user needs. This collaborative model requires designers not only to have solid design expertise but also to understand the working principles and limitations of AI.

Continuous Learning and Adaptation. The rapid changes in design tools and technologies require designers to possess the ability for continuous learning. Designers need to constantly update their skill sets to adapt to new design technologies and tools, while also understanding and mastering the principles and possibilities behind AIGC technology. This adaptability extends beyond the technical level to include keen insight into market trends, user needs, and societal impacts.

Advocate for User Experience. In the AI era, designers need to pay greater attention to the details of user experience, as AI-generated designs may lack the human warmth and depth provided by human designers [10]. Designers need to ensure that designs are not only visually appealing but also functionally meet user needs and expectations, creating meaningful and valuable user experiences.

Driver of Innovation. Although AIGC technology can generate innovative design schemes, true innovation often stems from a profound understanding of human needs and desires [11]. Designers need to leverage their creativity and insight into human psychology to drive design innovation, ensuring designs not only meet functional requirements but also resonate emotionally.

While AIGC profoundly impacts the design process and designers themselves, discussions about whether designers' work will be replaced by AI are intensifying. In fact, although current AIGC is already very powerful, designers remain the most crucial role. The irreplaceability of designers is primarily manifested in aesthetic judgment, cultural sensitivity, and creative thinking. Although human-AI alignment research has gained attention and development, previous studies have mainly focused on alignment in ethics and morality. Alignment in aesthetics, culture, and thinking patterns requires further strengthening. Firstly, designers can perform nuanced aesthetic judgments based on long-term artistic training and a deep understanding of human culture, an area where AI remains limited. Secondly, designers can understand

and embody the diversity of social cultures, which is often missing in generative AI designs. Finally, although AI can generate diverse design schemes, they lack innovative thinking and the ability for associative leaps, which are the core competencies of designers. While AI will fundamentally change the way design is produced, and fully autonomous, self-creating systems may be developed, many studies consistently agree that AI's greater impact should be to complement and enhance human creativity, not replace it [12]. It can be seen that the designer's role will shift towards greater emphasis on design guidance, aesthetic judgment, and final solution selection. Designers need the ability to effectively use AI tools to achieve design goals while maintaining dominance over the design process.

3. Principles for AI and the Responsibility of Designers

The development of AI technology has made the generation of images or text unprecedentedly easy, potentially calling into question the value and originality of designers' work. In this era of vigorous technological development, outright rejection and restriction of new technology is clearly inadvisable. For AI technology to truly serve designers well, it is necessary not only to clarify the intellectual contribution of designers but also to respect the human intellectual achievements that contributed data for AI training. This requires AI developers to follow the principles of "responsible AI" and designers to shoulder basic design ethical responsibilities, jointly promoting the development of AI technology applications.

For AI itself, due to the advancement of AI technology, it can do more and more things, and its influence is growing. AI possesses the capacity to bear responsibility. The Organisation for Economic Co-operation and Development (OECD), in its 2019 AI Principles, proposed that "Responsible AI" should include the following principles: (1) Inclusive growth, sustainable development, and well-being; (2) Human-centred values and fairness; (3) Transparency and explainability; (4) Robustness, security and safety; (5) Accountability. This requires AI to fairly represent the intellectual contributions of different participants in its outputs and to restrict or avoid content harmful to human society.

For designers, the transformation of design under AI's influence becomes a process centered on information as the core carrier, encompassing information communication, information production, and information judgment [13]. Emphasizing the irreplaceability of designers in aesthetic judgment, cultural sensitivity, and creative thinking helps enhance their value in the AI era. Designers need to maintain sensitivity to and critical awareness of socio-cultural changes, integrating these shifts into design production and evaluation to enhance the cultural value and social significance of design, creating human-centered designs. Designers should improve their innovation and aesthetic literacy, continuously exploring new design concepts and methods. When evaluating and selecting AI-generated design works, designers must not only consider the aesthetic value of the works but also assess the accuracy and potential biases of the AI-generated content. Current AIGC still faces issues with information accuracy and ethical standards, which not only affect the quality and credibility of designs but may also impact social ethics and public safety. When using AI tools, designers need to critically evaluate whether the AI has produced erroneous or false information, or exhibited biased or discriminatory content. In addition to the designer's own assessment, external calibration mechanisms must be introduced to enhance the verification process. This includes implementing error detection and correction mechanisms, using diverse and balanced training datasets, and developing

algorithms capable of effectively identifying and eliminating biases. These measures are crucial for ensuring the fairness and inclusivity of AI systems and contribute to improving the quality and credibility of design outcomes.

While AIGC brings efficient and convenient design experiences, it also entails certain risks: it can serve humans while subtly controlling them; it can generate countless novel design works, yet dissolve human imagination and creativity; it broadens people's horizons, allowing everyone to become a designer, yet potentially drowning out truly excellent human design works; it can "do good," improving human living standards, or "do evil," triggering social trust crises and structural unemployment in the design industry. These dilemmas depend on how humans utilize the technology and the direction of rational development. We need to accurately position AI's function—it should be an "assistant," not a "replacement."

4. Conclusions

AI technology provides designers with powerful tools and resources. These technologies not only offer new avenues for generating ideas but also accelerate the design process [14]. The participation of AI technology in design work has changed the original design methods. Designers can utilize AI to assist in completing tasks at various stages: the initial phase, the creative conception phase, the design definition phase, and the design implementation phase. Simultaneously, people need to face the fact that current AI technology is not yet fully mature. When applying AI technology, its social impact must be carefully weighed. Issues such as privacy protection, algorithmic fairness, and technological transparency need to be fully considered during the design process. The role of designers is crucial in this. Researchers are attempting to lower the barrier for designers to collaborate and interact with AI, building a collaborative system between designers and AI. It is foreseeable that AI will gradually participate in all stages of design in the future.

AIGC has already constructed a new form of art and design. This new form, whether viewed from the principles and steps of creative production or the generated aesthetic styles, represents a subversion compared to modernist design. As a technology and tool, AIGC can exert influence on art and design works, but it should not become the dominant force. Although different tools can create design works of different styles, the makers of tools cannot control the creators of design in reverse. The two have a relationship of primary vs. secondary: the "tool" is secondary, while "art" is primary [15]. Overall, AI technology has brought revolutionary changes to the design field, but its potential negative impacts must also be treated with caution. In the future, continuous attention to technological development, strengthened ethical standards, and the pursuit of innovative solutions are needed to ensure that the integration of AI and design can better serve human society.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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