Research on Design of Cultural and Creative Products Based on Artificial Intelligence-Assisted Design

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Abstract. Throughout the entire cultural and creative product design industry, cultural and creative product design tends to be homogeneous, with single product categories, simple elements, slow design innovation and update, and a mixed market. In view of this phenomenon, the author thinks about using the popular artificial intelligence-assisted design to solve the problem of homogenization of cultural and creative products. This paper first discusses the specific problems of the existing homogenization, and then analyzes the feasibility of solving the homogenization problem according to the existing artificial intelligence technology, and does a brief design practice, and finally further discusses the new trend of multi-modal design driven cultural and creative product design.

Keywords: Cultural and creative products · homogenization · AI-assisted design · innovation

1 Research Status and Analysis

1.1 Homogenization of Cultural and Creative Products

With the rapid development of social economy, the development trend of cultural and creative products in recent years is particularly good. The main reason is that the combination of cultural connotation and product aesthetic and functional uniqueness of cultural and creative products accords with people at all levels, thus greatly promoting the expansion of the hotbed of cultural and creative products design [1].

However, with the rapid development of the cultural and creative industry, the problems of cultural and creative products have also become increasingly apparent. In addition to the single product and insufficient connotation, the most important problem is the phenomenon of homogenization. "Homogenization" refers to the lack of competition between products in visual image, cultural connotation and marketing methods [2]. This requires us to think about where the differentiation of cultural and creative products lies, and how to eliminate the homogenization problem of cultural and creative products by combining artificial intelligence-assisted design with the rapid development of artificial intelligence. Through investigation, we have learned the reasons for the current homogenization problem as follows:

1. The design and development objectives are vague and the innovation speed is slow
2. Design and development procedures are not perfect, cultural lack
3. Lack of design feedback, Design tends to be conservative

1.2 Current Development of Artificial Intelligence Design

At present, the development of artificial intelligence technology has entered a new stage and become the focus of attention. In the field of design, the participation of artificial intelligence has redefined the paradigm of design, from assisted design to deep integration, from semi-artificial intelligence involvement to man-machine deep collaborative development in the design process. More and more design practitioners and artificial intelligence beneficiaries have begun to think about new intelligent design requirements, thus leading to a series of design thinking and method changes.

From the perspective of AI-assisted design technology, the international academia mainly focuses on the research of underlying applications and multicultural integration, with more subdivisions, mainly on the design of survival algorithms and experimental survival art. However, domestic academic circles started relatively late in this field, and in recent years, they have witnessed rapid growth in the field of art design and computer, which is manifested by bottom-up use and top-down reform. Specifically, some leading figures in the design industry lead more designers and users with common needs to carry out small-scale learning and trial and error. Until Internet companies launch AI algorithms like Wenxin Grand Model to benefit the public [3]. Therefore, it is more meaningful to study the application of artificial intelligence in Puhui art design at present. By analogy, this paper also considers and studies the feasibility of AI-assisted cultural and creative products to solve the homogenization problem.

2 Artificial Intelligence and Cultural and Creative Product Design

Artificial intelligence design and artificial intelligence assisted design are two completely different concepts, which have been discussed a lot since the art of artificial intelligence was put forward. Now we mainly discuss the aspect of artificial intelligence assisted design, which belongs to man-machine collaborative design, in which designers grasp the design as a whole, and artificial intelligence is involved in workflow assisted design as a tool.

In the early 21st century, artificial intelligence developed in neural network and deep learning technology, and a new round of artificial intelligence made a breakthrough in imitating human creation. GAN program (generating Adversarial network) emerged, which simulates and generates similar works by making computers learn and imitate classic works in art history. Let's briefly summarize the implementation principles and mechanisms [4]. First, we need an open source computer algorithm and program that can carry out deep learning of artificial neural nets. Secondly, designers can obtain the pre-set goal scheme they want in two ways. First, they can self-build professional data set and complete the pre-training of basic information through a large number of collection and induction, so that the algorithm can complete the "text to image" through training. The second is not to build pre-set data set, using artificial intelligence random noise generation, the program will learn through big data to an initial value, and then

constantly evolve to design the pre-set design scheme. Finally, it is redesigned according to the pre-design scheme [5].

3   Artificial Intelligence Aided Design Element Analysis

Due to the explosive development of AI-assisted design-related applications in 2020, people have gradually shifted from focusing on core underlying technology breakthroughs to assisting creative design guidance, which is oriented towards empowering creative practitioners. Focus on stability, experience, and human-machine collaboration of AI-assisted design. From the index of technical diversity to the index of applicability [6].

1. Creative mining and innovation guidance.

The design industry involves different processes of design tools in different fields. The development status of auxiliary tools in the design industry is reviewed, and the way of digital artificial intelligence-assisted design to intervene in creative activities is clarified. Aiming at the research on the creative guidance of different user portraits in different design fields, a large number of experiments were carried out to get the proportion allocation and contribution degree of human and artificial intelligence in creative design activities, so as to achieve quantifiable human-computer collaborative creative proportion and build a new path for optimal design.

2. Design proposal generation and feedback.

By collecting user requirements and grasping design orientation, designers combine information deep learning to make comprehensive quantitative and qualitative analysis of design framework, so as to achieve more efficient and accurate quantified design requirements. The use of multimedia creative integration, creative information integration and series. Based on the neural network prediction model and group-intelligence collaboration method, the design problem is dynamically reconstructed, and the representation of design problems is combined to realize the transformation of design requirements to design direction, and the product conceptual design strategy supporting creative thinking is generated.

3. Design, development and application of man-machine collaborative system.

The application and development of man-machine collaboration system are carried out in depth. Based on the combination of industry needs, the artificial intelligence-based man-machine data management platform and cloud creative generation design engine are built, and the integrated and efficient design process of "creative definition - concept generation - evaluation feedback - design iteration" is realized to achieve a high proportion of man-machine collaboration.
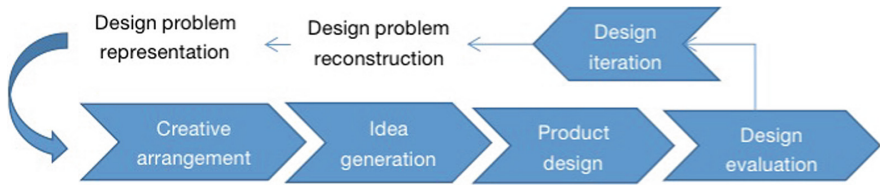
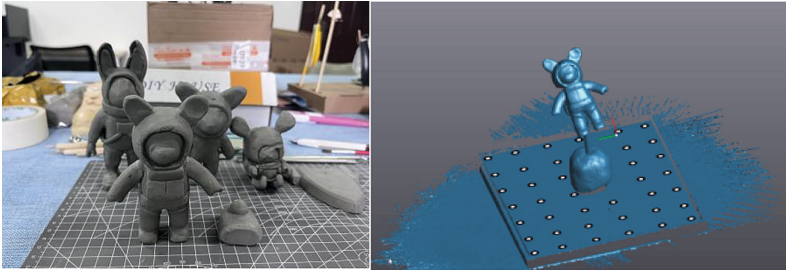**Fig. 1.** Design flow chart (author's own drawing)

Fig. 2. Backward model generation (author's own drawing)

4 Design Practice of Cultural and Creative Products Based on Artificial Intelligence Aided Design

4.1 Design Process

Based on the above analysis, we try a man-machine aided creative design method for cultural and creative products, which mainly applies artificial intelligence to creative mining and design scheme generation and feedback (Fig. 1). The specific process is shown in the figure as follows: First of all, we search the creative design knowledge resource database to obtain the common design requirement set, which will pave the way for the subsequent design assistance. New design concepts will be added to the overall design to achieve diversified integration, and the resulting design products will be evaluated, iteratively generated if there are any problems, and finally the design scheme will be obtained.

4.2 Establishment of Basic Data Model

The IP images of Wen Chuang are generally simple and clear cartoon images. Therefore, according to the course work related to astronaut theme of the model making course, we will make the model for reverse data generation (Fig. 2) to get a basic model.

Using AI generation of the model base data with the existing DALL·Emini model, we got this related set of design images, prompt statement being "cute astronaut" (Fig. 3).

4.3 Stylize the Data Set

We can find that the images generated by the DALL·Emini model are missing a lot in the creative style, so we conduct a controlled experiment for the design style, and here
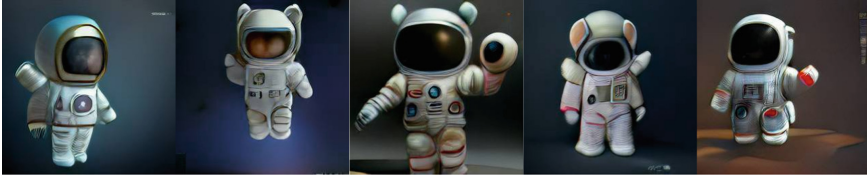
Fig. 3. Partial foundation molding (author's own drawing)

Fig. 4. Google cloab notebook program (author's own drawing)

we start using Google cloab notebook to configure the relevant GAN to generate the network environment (Fig. 4).

The main data models are disco diffusion and stable diffusion [7]. According to different statements, we can get relevant pictures of different design styles (Table 1).

4.4 Design Programmatic Iterative Generation

During the design process, we found that when the data set was too fine, it was not conducive to the stylized generation, and even more inclined to artificial intelligence design rather than artificial intelligence assisted design. Therefore, we still used the random generation of noise for most design ideas [8].

After the style and creativity is almost determined, the design will be refined and detailed, we through the generation of 2–3 design lines, prompt statement complementary and learning, finally get the general design model picture we want, the specific evolutionary path we select one to show (Fig. 5).

Table 1. Different design styles

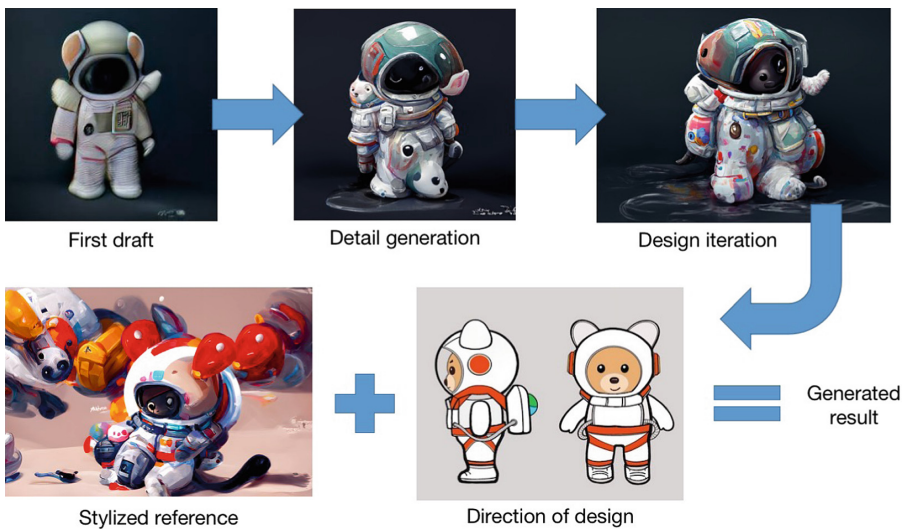| prompt1: A beautiful picture of an animal astronaut standing on the planet, unity |
|---|
| |
| prompt2: A beautiful painting of a cute animal astronaut toy popular on artstation, unity |
| |
| prompt3: animal astronaut toy isolated on white background, unreal engine,cute |
| |

Fig. 5. IP image generation process (author's own drawing)

Fig. 6. Aerospace Bear IP creative image (author's own drawing)

Due to the problems in the details, we still need to optimize and iterate on the details for many times. We will put it into the midjourney model for further generation. With the post-processing and modeling of the design, we can finally get a new IP image of Aerospace bear (Fig. 6), and apply it to various cultural and creative products with good results.

Through such a simple design process, we can see that there is a lot of space for the design of artificial intelligence-assisted creative products. The design is not completely controlled by artificial intelligence. The designer still occupies a dominant position in the creative generation part, but the process of creative generation becomes more integrated and convenient.

5   Thesis Conclusion

This article creates the product IP design case, the successful combination of AI-assisted design and cultural and creative product design, and we can find that the AI-assisted design into the design process to better avoid product homogenization. Idea generation is more efficient and fun.

The first trend Accenture mentioned in its 2017 Technology Vision Is that "AI Is the New UI." Ai has moved from developing low-level applications to becoming an operational service tool that AIDS design. Man-machine collaborative design will certainly be the way to achieve comprehensive artificial intelligence design in the future.

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