Research on the Creation and Innovation of Graphic Design Driven by Artificial Intelligence

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Abstract: The development and progress of human beings is a process of constantly developing new tools and products. Now graphic design has developed into an essential and basic art form. This paper points out the role of Artificial Intelligence (AI) in graphic design, and considers it from three aspects: changing design methods and thinking, broadening new design fields, and artificial intelligence and design to create a new life. For the development trend of graphic design, the strategies of strengthening the diversification of professional knowledge, integrating science and technology and developing innovative consciousness are given. In the design creativity evaluation experiment, experts grade the entries of the contestants and evaluate their creativity. The score can be determined according to the uniqueness, foresight and creativity of the design. Among the creative scores, the highest score is 95, and the lowest score is 65. This paper is helpful to promote the innovative development of graphic design creation.

Keywords: graphic design, artistic intelligence, creativity and innovation, diversified professional knowledge, cross-border technology

1. Introduction

With the continuous development of human science and technology, artificial intelligence has gradually penetrated into all fields of people's lives. As far as graphic design is concerned, although artificial intelligence cannot completely replace human creativity, because design is based on "people", it is based on understanding people and observing human feelings, and its fundamental purpose is to deal with the relationship between people and people and the outside world. However, artificial intelligence will also bring great impact to the design industry, from the segmentation of the intelligent market to the portrait of users to the production of products, there will be the shadow of artificial intelligence. Then, in the new era, new technologies and artificial intelligence can further drive the innovative development of graphic design and further emancipate the original design methods and ideas.

This paper first gives the background of graphic design creation and innovation driven by artificial intelligence, and points out the application level of graphic design creation. Then it points out the role of artificial intelligence in graphic design from three aspects: changing design methods and thinking, broadening new design fields, and artificial intelligence and design to create a new life. Finally, it uses artificial intelligence technology to organically integrate it with traditional design methods, and designs a series of products to meet the practical needs on this basis. The differences between them are analyzed from two aspects: product quality and innovation.

2. Related work

Graphic design is to effectively combine the basic elements such as words, colors, images and signs on the plane, thus forming a whole graphic design. The application of artificial intelligence can make graphic design more accurate in visual transmission, and can also satisfy the visual psychology of designers and audiences. Ge Mingcui thinks that with the development and application of graphic design software, its technical level is getting higher and higher, which is of great significance to promote the development of graphic design [1]. Gong Ximeng studied an image enhancement and optimization method of graphic design based on laser vision. On this basis, he proposed a new two-dimensional graphic design image model based on wavelet decomposition, which can effectively

improve the visual effect of graphic design graphics and improve people's ability to distinguish graphic information [2]. Liu Anlei studied and analyzed the decorative elements of Shanxi residential brick carving, and discussed its artistic effect in graphic design from many aspects [3]. Chen Fuzhen believes that the color of paper-cut can vividly express the beauty of graphic design art, so as to spread Chinese traditional culture, and to conduct in-depth research on the color of folk paper-cut can make Chinese traditional culture have a strong national cultural atmosphere [4]. Zhang Yuanyuan thinks that calligraphy and seal cutting in China traditional culture are extremely valuable art forms, and their application in graphic design has become a new design trend [5]. But their research lacks the combination of artificial intelligence and graphic design.

Graphic design can bring more convenience to enterprises, such as daily work, and at the same time let design enterprises get rid of the traditional work mode that used to consume a lot of manpower to maintain low creativity, and turn to periodic maintenance for artificial intelligence with low creativity. At the same time, the work standards of employees will be improved in an all-round way, so that the company's talents can focus on cutting-edge design work with high standards, high creativity and high added value. It can not only save a lot of manpower, but also maximize the benefits and value of your creativity. The influence of artificial intelligence on traditional graphic design industry is the general trend [6-7]. Because intelligence and convenience are the inevitable laws of the development of human society. In this case, the best way to achieve harmonious development is to improve your own ability. Artificial intelligence is derived from people.

3. Innovative inquiry methods of graphic design

3.1 The role of artificial intelligence in graphic design

The function of artificial intelligence technology in graphic design is the result of the alternating influence of economy, technology and human environment. It changes and adapts these factors through the functions of data, algorithm, intelligence and design [8].

(1) Change design methods and thinking.

In this "crisis", no matter what kind of work, it is possible to be replaced by machines. Intelligent technology can improve the efficiency of the machine and reduce the design cost. The improvement of computer computing power provides more room for the generation of human brain, thus promoting the evolution of human brain. The emergence of artificial intelligence will change the way and thought of graphic design [9-10]. With the continuous development of artificial intelligence technology, people have stepped out of simple manual drawing and started to apply three kinds of drawing systems reasonably. The first is "performance type". That is, designers use drawing software to help express ideas, which can not only improve efficiency, but also enhance performance. Machinery is the design subject of designers. The second is decision-making support, which is an expert system for concept generation and scheme evaluation based on knowledge and genetic algorithm. This system helps designers to obtain modeling or color selection from the limitations and internal influence of experience. Designers here began to work with artificial intelligence. The third is the category of independent design. The competition between designers and artificial intelligence is increasingly fierce, which requires designers to have keen observation and thinking ability in order to create. Artificial intelligence endows the machine with continuous and powerful capabilities, so that it cannot only easily acquire design capabilities, but also realize more and more "accurate" products.

The application of artificial intelligence in graphic design involves many fields, including machine learning, deep learning and computer vision [11]. Convolutional neural network is a deep learning model, which is often used in image recognition and computer vision tasks. In graphic design, it can be used for image classification, object detection and style transfer [12-13]. Formula:

$$yi = f(zi) + wij + xj + bi$$
 (1)

Wij represents the weight, xj represents the input feature map, bi represents the offset term, and f(zi) represents the activation function.

Generated countermeasure network is a deep learning model, which consists of two networks: generator and discriminator. The formula is:

$$L(G, D) = pz(z)[log(1 - D(G(z)))]$$
(2)

Where G represents the generator, D represents the discriminator, and pz(z) represents the probability that the discriminator wrongly classifies the false data generated by the generator.

(2) Broaden new design fields.

Using internet plus's big data, Internet of Things and other advanced technologies, artificial intelligence is extended to the designer's vision in the field of design. On the one hand, the appearance of human-computer interaction graphic design has brought a promising network work opportunity to practitioners [14]. On the other hand, more and more high-end products are favored by consumers and begin to enter the market. At the same time, the traditional physical goods are also caught in a dilemma. The customer's demand for products is not only limited to the appearance of products, but also the overall experience of services. Therefore, we should have ideological quality in design and innovative ability in service, which is the secret of development. In the outbreak of COVID-19, innovative design and online service have widened the distance between designers. Only by highly empowering data, networks and algorithms can we truly achieve the goals of "accuracy" and "thousands of people".

(3) Artificial intelligence and design to create a new life

At present, the design dominated by artificial intelligence has become an urgent need for designers, and the innovative thinking of artificial intelligence and design has continuously brought people new survival modes. The intelligent vacuum cleaner robot of enterprises, the express sorting system of campus, the intelligent interconnected family of families and the intelligent management of smart cities all show the convenience of the intelligent era. Facing novel coronavirus, we should take artificial intelligence as the guidance, explore the prevention and control objectives, methods and concepts of infectious diseases, and put forward effective design ideas. If the virus mutates, the immune system of influenza will change constantly, even if the virus does not change, the design will change constantly. Through the integration of biological computers and other means, artificial intelligence in the true sense will contribute to the progress of mankind like other disciplines.

3.2 Technological innovation as the forerunner of design form innovation

In the past design process, the main reasons that affect designers' performance are: poor design experience. When sketching, you can't directly see the finished design results, and it's not convenient to use. In the past, we needed external devices, such as keyboard and mouse, but now, with the development of science and technology, new virtual devices are usually realized by gestures or grabbing actions. With the rapid development of modern audio-visual technology, designers can be helped to complete their works, and better design results can be obtained. For today's graphic designers, creation is much easier than before: design tools are becoming more and more perfect and intelligent. In the past, we often had a headache to dig out the details of the image when designing, but now, as long as we choose an area, the software will automatically handle it for us [15]; Before that, it was very time-consuming and energy-consuming to use channels or masks to reduce details like hair. Now, all the details can be displayed by quickly selecting tools, which not only saves time, but also improves the drawing accuracy. In the past, designers always racked their brains to find matching colors, but with intelligent filling and color matching tools, we can easily solve this problem. Advances in design tools have blurred the boundary between two-dimensional and three-dimensional. In the past, graphic designers often felt powerless to build three-dimensional space, and many ideas were just on paper. Because traditional graphic design tools did not have powerful three-dimensional modeling functions, people had the illusion that "graphic designers are just graphic designers". Nowadays, with the innovation of tools, graphic designers have more choices, and many ideas that were just on paper can be realized. For example, if you want to do three-dimensional special effects in retouching software, you must use multi-layer superposition, which is cumbersome and error-prone. Now, as long as you use 3D software, you can easily generate 3D models and make 3D rotation and scaling effects.

3.3 Development trend of traditional graphic design under artificial intelligence environment

In the face of powerful artificial intelligence, traditional graphic design takes human knowledge as the main component, which integrates past experience and knowledge in the brain to achieve high-quality design. However, when the era of artificial intelligence comes, designers need to use the big data analysis ability of artificial intelligence to create.

(1) Strengthen the diversification of professional knowledge.

The advent of artificial intelligence is an era of testing experience, experience and knowledge.

Because of the development of artificial intelligence, there must be defects in design. It can copy any design method, but the same products and similar products will have similarities. This requires graphic designers to compete with computers, which are "machines" of programs, which requires graphic designers to constantly enhance their professional quality. We should not only be proficient in the theory and software of graphic design, but also have a certain understanding of animation and three-dimensional direction.

(2) Cross-border integration of science and technology

In the past, graphic designers thought that they had high aesthetic accomplishment, excellent visual communication design theory knowledge and rich design experience to complete most designs. Moreover, due to the diversification of graphic design, many similar designs can be realized by crossing. For example, FAW Company can print a photo on a stamp in a sports meeting, which is not difficult. It only needs to add a serial number and a photo with a fixed size. If it is only done by hand, it looks very fast. However, if more than 10,000 photos are made in a day, it will be difficult to do so. The Excel spreadsheet system itself has a programming language to write Excel forms into programs. Combined with the executive function in Photoshop, tens of thousands of files can be replaced every day, which requires graphic designers to master some basic programming languages to improve the design level.

(3) Develop innovative consciousness

Now is the era of cloud computing, and the repetitive operation has been digitized and computerized, which requires our designers to have a typical sense of innovation, apply the sense of innovation in design, use the idea of brand design, and skillfully combine two different things through design aesthetics, so that the new design content is more than the original. To cultivate creativity, this requires that every designer should constantly learn new knowledge, constantly broaden his horizons, and constantly seek various independent and beautiful things in nature.

4. Graphic design creation and innovation exploration results and discussion

4.1 Design creativity evaluation test

Experts grade the entries of the contestants and evaluate their innovation. The score can be determined according to the uniqueness, foresight and creativity of the design.

The scores of innovation, uniqueness, foresight and creativity are shown in Figure 1. Among the creative scores, the highest score is 95, and the lowest score is 65.



Figure 1. Score of innovation, uniqueness, foresight and creativity

4.2 The impact of AI-aided design decision on traditional design methods

This paper takes a designer as the research object, uses artificial intelligence technology, organically integrates it with traditional design methods, and designs a series of products to meet the practical needs on this basis. The differences between them are analyzed from two aspects: product quality and innovation.

The comparison between artificial intelligence aided design decision-making and traditional design methods is shown in Table 1. In Experiment No.1, the average time of artificial intelligence aided design decision-making is 20 hours, while the average time of traditional design method is 30 hours.

 Table 1. Comparison between artificial intelligence aided design decision and traditional design methods

Experiment number	Design methods	Number of design works	Innovation rating	Quality rating	User satisfaction rating	Average time spent (hours)
one	Artificial intelligence assisted design decision-making	15	92	95	90	20
	Traditional design methods	15	80	85	80	30
2	Artificial intelligence assisted design decision-making	15	98	97	95	18
	Traditional design methods	15	78	82	78	35
three	Artificial intelligence assisted design decision-making	15	95	96	92	22
	Traditional design methods	15	82	86	80	38

4.3 Accuracy and recall rate

On this basis, through a series of test data, the accuracy and recall rate of graphic design based on machine learning and deep learning are evaluated to test its accuracy in market demand, user behavior and design trend. The comparison between machine learning and deep learning is shown in Figure 2. The accuracy of market demand forecast of machine learning model is 90%, and that of deep learning model is 95%. The prediction accuracy of machine learning model design trend is 75%, and the prediction accuracy of deep learning model design trend is 85%.



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Figure 2. Comparison between machine learning and deep learning

5. Conclusion

Traditional graphic design has reached a very important stage, but with the development of artificial intelligence, all graphic designers must face the influence of artificial intelligence, so that each design has its own unique side. Only by constantly enriching their knowledge and experience can they create their own unique graphics. In this paper, the accuracy and recall of artificial intelligence aided graphic design are very high. Using the advantages of artificial intelligence in data statistics, combined with the creative thinking of designers and interdisciplinary knowledge application, will become the main trend of graphic design development in the future.

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