

Impact of Artificial Intelligence on Creative Digital Content Production

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Abstract

In the digital media era, with developed communication technologies, the changes of creative digital content production have become a focus of designers. At the same time, the development of artificial intelligence technology has had an impact on various industries in society. This paper aims to analyse the impact of artificial intelligence on the production of creative digital content represented by online poster design and video design. Starting from the concept and scope of creative digital content, this research examines the history of artificial intelligence and design development and teases out the development context of intellectualized design. This paper will explore the impact of artificial intelligence on design thinking, digital content creation and designers. Through the case analysis of artificial intellectualized tools such as Luban and Alibaba Wood, the principle and application of poster and video intellectualized design are studied. Artificial intelligence has changed the traditional digital content creation process. In the era of intellectualized design, designers need to reshape design thinking, change the traditional role positioning, and rationally apply intellectualized design tools for design and creation. The fuse of artificial intelligence and design will inject new vitality into the broader research field of design.

Keyword : intellectualized design, artificial intelligence, creative digital content, digital content production

1. Introduction

In recent years, AI(Artificial Intelligence) technology has entered a stage of rapid development and has begun to fuse deeply with different industries. The application such as computer graphics, computer-aided design, agile design and other technologies has gradually deepened, and there is a qualitative leap in theories and methods of modern content creation. Creative digital content is a form of content expression produced by the gradual fusion of modern information technology and cultural creative content, which uses modern digital technologies such as CG (Computer Graphics). It depends on teams or individuals, and is shown in the way such as developing digital content, designing and planning vision, creative service through technology, creativity and industrialization. Currently, creative

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digital content mainly deals with design and development of things in fields such as exhibitions, virtual reality, and product visualization. Due to the development of various technologies such as hardware and software, the ability of data processing and computing is greatly enhanced, which also provides a solid foundation for the application of AI-based design creativity in the field of creative digital content production. Applying artificial intelligence technology in the content creative field has become an inevitable trend in the development of creative digital content.

2. The development of intellectualized design

The first industrial revolution completed the transition from traditional craftsmanship to modern design, which made the design industry begin to separate from traditional handcrafting. The simultaneous advancement of technology and machinery contributed greatly to the development of productivity at that time. With the advent of the Art Nouveau movement, design also accomplished a transition from decoration to utility. Represented by the application of electronic information technology, the third industrial revolution became a major change in the field of science and technology after World War II. In 1955, McCarthy first put forward the concept of "artificial intelligence" at the Dartmouth College conference. In the 1950s, artificial intelligence ushered in its first upswing, and developed rapidly. A series of theories and methods were proposed at the time. However, due to the limitation of computing capability and the lack of intellectualized realization, most artificial intelligence projects were shut down in the 1960s and 1970s, and artificial intelligence research entered a recession. But in the 1980s, artificial intelligence ushered its second development boom. The emergence of expert system theory broke through the ability to solve problems when using artificial intelligence, while the emergence of machine learning algorithms enhanced greatly the ability of neural networks, and completed the rebirth of artificial neural networks in theory and application. After that, with the improvement of infrastructure, data processing capabilities and computing levels are gradually increasing, and most of the algorithms in the field of artificial intelligence also improved and fused. The origin of intelligent design can be dated back to the application of AI in industries such as architecture and product design in the 1970s. With the rapid development of microcomputers in the 1980s, the process when designers draw by hands transformed into one of ordering the computers to draw, and 2D drawing was changed into 3D modeling, by ways of simulating material and lighting effects. With the increase of computing capability, designers are gradually freed from some simple and repetitive operations, and are able to implement real-time correlation results through algorithms. In the 1990s, DeepBule defeated chess champion Gary

Kasparov. It was the first time that artificial intelligence application was brought into public view successfully. Since the beginning of the 21st century, the development of artificial intelligence has entering a third upsurge. Artificial intelligence technologies such as machine learning and deep learning begun to be widely used. In 2016, the invention of AlphaGo arose a great attention to AI and opened a new era. In the same year, the United States published "Preparing for the Future of Artificial Intelligence" and "National Artificial Intelligence Research and Development Plan. Google's strategy was shifted from Mobile First to AI First [1]. The development of artificial intelligence and the maturity of computer hardware technology have provided designers with more modern means and methods to make the production of creative digital content move towards intellectualized development.

3. The impact of intellectualized design on creative thinking

Artificial intelligence simulates the thinking and methods of creative members through algorithms. And the creative thinking of digital content is called design thinking. The evolution from digital content creation to design thinking actually evolved from the creation of digital content products to the analysis of the relationship between human beings and digital content products, and then to analyze the relationship between people [2]. Design consulting firm IDEO defines design thinking as "the rules of the human needs that can be translated into customer values and market opportunities and feasible in both technical and business strategies which are satisfied by designer's perceptions and methods." Therefore, design thinking can be seen as a new way and method to achieve innovation [3].

Among many descriptions of design thinking, the most common features of them include user-centered design, working repetitively, prototyping, and enjoyment process and learning in failure [4]. SIMON defines design thinking as a process of finding better solutions under the existing condition. That is to say, we should use designer thinking and methods to generate ideas or alternatives for consumers' needs, involving three specific aspects which are cognition, emotional expression and interpersonal activities [5]. Therefore, unlike traditional thinking, design thinking is a people-oriented design attitude and method, and is a process of concept generation, construction and implementation. In this process, not only human needs and behavior but technical and commercial feasibility should be taken into consideration [6]. As a process of thinking, design thinking emphasizes the balance between image and abstraction, divergence and convergence, analysis and synthesis, logic and intuition. The design process of creative digital content is a comprehensive process with image thinking and abstract thinking, which involves thinking processes such as association and intuition. It is hard to perform computer simulation

especially by intuition, which is often required in the creative design process [7].

There are three features in design thinking. Firstly, design thinking is the procedure of cross-media knowledge processing. Designers will search for inspiration by sketching, searching for cases, and so on. It will be inspired by a certain sensory stimulus as well, such as a novel sense of smell, etc. For computers, this multi-channel knowledge search and processing is a typical procedure of cross-media knowledge processing. Next, design thinking is a process with both problem and program). The designer has proposed a solution, but this does not mean the end. That's because the designer might come up with new problems according to this program. Circulating From problem to solution repeatedly, problems and solution spaces caused by these cyclical links are changing all the time. Finally, the entire design process goes on with both divergent and convergent at the same time. The design ultimately needs to converge into a result. But before this result appears, the design sometimes diverge, sometimes converges, and generally exhibits the character of convergence ahead and divergence rearwards.

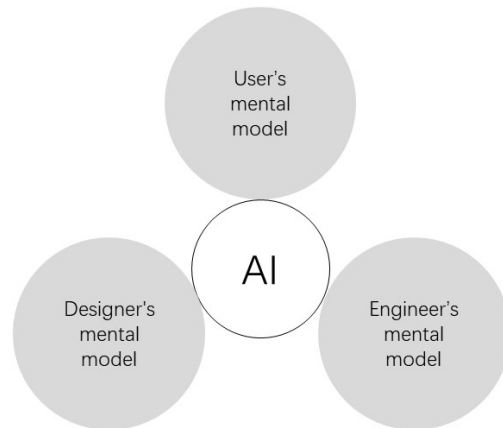
Traditional artificial intelligence is best at solving problems such as reasoning, classification, proof, and clustering which have clear goals and clear rules. But creative design is a vague problem from the beginning to the end. Because of its unclear definition of the problem, the uncertainty of the solution path, and the undefined evaluation criteria. For example, a computer problem often has very defined input and output, focusing on the process of solving. But design problems are often very vague in definition. Designers need to take a very long time to discover and define specific problems, and to continually diverge and converge to solidify the problem. There are often no specific rules in this process. The design has the characteristics of capability of predicting future, and poor structure, which are precisely what the computer is not good at solving. Thus, intellectualized design still faces many challenges in the process of content creative producing.

4. The principle of applying artificial intelligence to content production

In the process of content creating, designers need to carry out analytical reasoning, operational decision-making and comprehensive evaluation. As shown in [Fig. 1], artificial intelligence is able to connect the mental model of engineers, designers and users, which flexibly adjust the matching force and influence in various relationships, and reasonably distribute rights and obligations, and also promote the development of new human-machine relationship and manufacturing mode [8].

At present, the basic idea of AI technology is to convert the problem into a correct data set and to build a model for calculation. Based on the neural network, the basic structure of the deep learning

algorithm and a large number of labeled images, the AI compares the data, finds the relevance and pattern of each type of object, and uses the information to mark the objects in new images in the process of image recognition. Speech interaction technology which is based on speech recognition also applies a neural network to find a common mode of sound and confirms a certain recording of one object through an audio sample corpus.



[Fig. 1] The Connection between Mental Models and AI

Expert systems, knowledge maps and natural language processing are main AI technologies, which are used in creative activity. The ways of designing goals are not the same at different stages. An expert system is an intelligent program system that contains a large amount of knowledge and experience at the expert level of a certain field. It can use knowledge and problem-solving methods of human experts to deal with problems in specific fields [9]. Things like semantic networks, production rule systems, predicate logic, framework systems are all methods for AI to represent knowledge. Expert systems enable intelligent assistance in all phases of product design. For example, in the conceptual design phase, production planning and reasoning planning can be applied, while in the detailed design phase, the framework system applied [10]. Knowledge map is a method for describing the relationship between ontology and other things through the study of text or images [11]. Based on the construction of knowledge maps through the Internet, it might be possible to establish a knowledge map of design AI via deep learning in the future. The emotional calculation of text content which is based on natural language processing mainly focuses on the analysis of semantic features [12]. Mainly, there are two ways to calculate emotional understanding of text sentence grammar and semantic structure analysis, which includes emotional bag of words such as emotional dictionary, lexicon and relationship for rule

matching [13] and statistical-based machine learning method. We constructed a big data sentiment corpus through the content of comment text from Internet users, and searches for the design elements that impact on consumers positively according to the traditional costume design, and provides a reference method to construct the design model that satisfies the user's emotional needs [14].

5. Intellectualized design application

More and more design platforms or tools are using artificial intelligence to assist or replace designers to complete tasks. The current intellectualized design system follows a certain technical framework and production process. Firstly, the system requires a structured understanding of visual content, such as classification, quantification, and characterization. Secondly, by a series of learning and decision-making, structured information is builded that satisfies the needs of users, which is data. Finally, the data is transformed into creative digital content such as visual images or videos. This technical framework relies on a large amount of existing data.

5.1 Intellectualized design of poster

Alibaba, China's e-commerce company, has a million-level advertising distribution and delivery requirements every day. It needs to deliver different content and sizes in different locations such as T-mall, Taobao, Baidu, Google, and on the homepage of the website, mobile application homepage, sidebar. Alibaba hopes that the system can push different products and deliver different digital ads according to the user's preferences and history, when each user opens the app. As a result, digital creative advertising design got a huge amount of scale. Not only should design need to be applied to different products, sizes and scenarios, but also should the advertisements of the same product provide various design solutions to meet the needs of different customer. While for general poster ads design, there is no need for designers to have master or artist-level design capabilities. At the same time, the life cycle of such print ads are very short, often only a few days or even a few hours, which belongs to a design scenario with a large amount of low value and high consumption. If the traditional model is followed, you need to set up a huge visual design team. But with the continuous advancement of AI, it has become possible to solve the problem of creative content of such digital advertising content through intelligent design methods.

During the 2016 Double Eleven, Luban, Alibaba's artificial intelligence design system, produced 170 million advertising banners, and the click-through rate increased by 100% comparing with that of last

year. On Double Eleven in 2017, it designed 400 million posters. Luban can complete 8,000 poster in one every second and can make 40 million posters a day. The emergence of the Luban system solved the serious imbalance between the supply and demand of posters during the period of Alibaba Double Eleve Shopping Carnival.

The Luban system is a set of artificial intelligence systems that can achieve design cognition via self-learning. It simulates the process of human learning design. The developer designed a closed-loop system that can quickly learn the design style and continuously grow, including three core modules: style learning, actor and evaluation network. After the system learns the design style from a large number of design files, the actor generates the design results according to the design requirements. And then generated design results are fed back by the evaluation network.

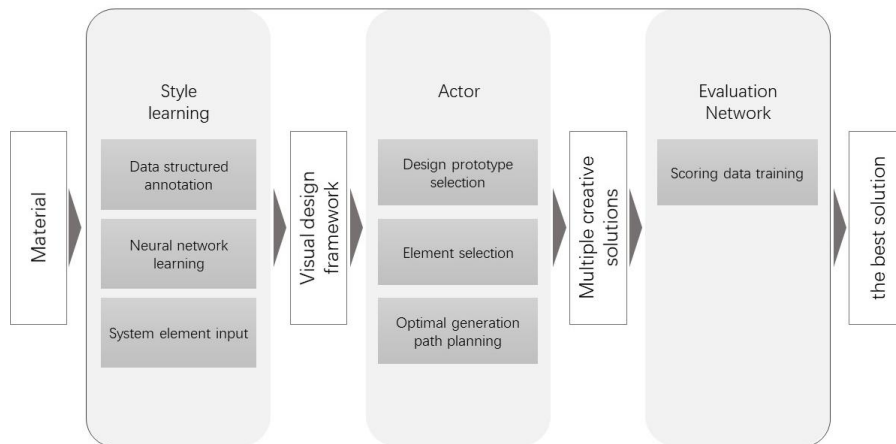
Luban structured the design data of a large number of design materials at first, and then after a series of neural network learning, output the design framework of space and vision. In framework design, the first thing to do is to let the machine understand what elements of the design are composed, such as its product body and background by means of manual labeling. At the same time, design expert knowledge is applied to define some design and styles. Then, prepare the original files of the design, such as a series of objects, and input them into the deep learning network. The network has a memory function that can remembers complex processes of the design process. After learning this layer of neural networks, you will get a design framework. Technically, it is a model of some spatial and visual features. From the designer's view point, it is equivalent to the impression that the designer had before he made a set of designs.

While designing the frame, elements are input in element center, such as background, product body map, decoration elements, and so on. And then element classifier runs learning and classification process based on visual features and types.

The main function of the actor is to select the design prototype from the style learning module according to the requirements, and select elements from the element center which can help to plan multiple optimal generation paths and complete the picture design. This is very similar to the actual working process of the designer. If the designer wants to design a product poster, he will constantly adjust each position in the software and choose different colors. Meanwhile, the whole process is a process of intensive learning as well, and the actors will be smarter and more intelligent in the trial and error. Once this process is completed, multiple creative scenarios will be output and ultimately be assigned to the Evaluation Network to score the output production.

The principle of evaluation network is to train data after inputting a large number of design images

and scoring data, and finally to let the machine learn the judgment of the design scheme. The basis of Luban is template and element material by the designers. Therefore, there are two characters of designer to train Luban every day. One is responsible for helping Luban complete the latest style learning, which makes to continue evolving. The other plays a role of evaluating the results of its design and telling which design is the best. The working principle of Luban is shown in [Fig. 2].



[Fig. 2] Luban Working Principle

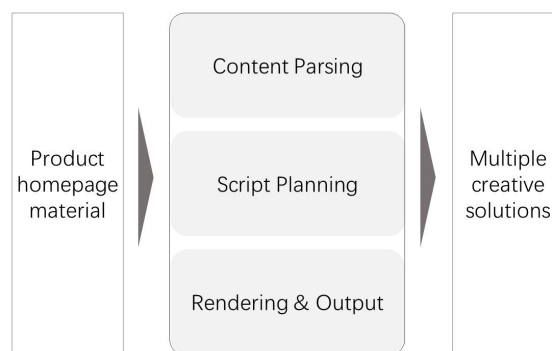
At present, Luban has learned a million-level design drafts and has developed millions of poster designs capably. In May 2018, Luban opened its core functions to the public, including one-click posters, smart layout, design development, and intelligent creation.

5.2 Intellectualized design of video advertising

Video design is the addition of time dimensions to graphic design. Videos, especially short videos, have greatly attracted the interest of young users. In recent years, the popularity of apps such as Tik Tok and Kwai in Chinese market has also confirmed this view. The way of applying video is widely used on product introduction. Alibaba's data indicates that video ads have a much higher conversion rate than that of print ads. At present, however, in each platform, the proportion of video advertisements of products is still relatively low, and the cost of video advertisement production of merchants is high. Turning your store listing into high-quality short videos is the current issue to be solved. Alibaba developed a short video intelligent design system, which is called Alibaba Wood. Related to Ali's data feedback, Alibaba Wood can increase the revenue of stores quickly and effectively, and the total store

turnover increased by 22%.

Alibaba Wood uses AI to design e-commerce videos, which is able to acquire and analyze the product details of existing Taobao and T-mall automatically, and combine with short video narrative shots based on product styles and selling points to sort out the main storyline, which working process is shown in [Fig. 3]. In addition, it also can analyze complex product information, evaluations and other data in a visual way. It is able to analyze music styles based on musical emotions and rhythms to recommend or generate pieces of background music what match the style of the product and match the copyright. By analyzing and understanding the background music, the music rhythm is matched with transitions. In this way, the sound and the picture synesthesia of short video is presented in a unified experience of vision and audio.



[Fig. 3] Alibaba Wood Working Principle

6. Transformation of designer's role

Since the improvement of AI and the expansion of application boundaries, worries about AI are constantly emerging. Some of the work has been or will soon be replaced by AI, including some design work as well. In "Design in Tech Report 2019", John Maeda pointed out that most designers believe that visual designers will begin to be replaced by artificial intelligence within five years. Many designers also begin to worry and redefine their value [15].

If we apply AI to train the creative thinking of non-design institutions such as medical schools and business schools and professional groups, in that way everyone will be a designer in the future. Nevertheless, professional designers need to be interdisciplinary composite talents to maintain their competitiveness, so that to complete the role transition from creators to leaders and managers [16].

Design is an innovative behavior. At present, however, AI is mainly in the phase of relying on big data, computing power and algorithm operation, which belongs to the category of weak artificial intelligence. AI can help designers to recognize design tasks quickly and accurately in a given direction, solve problems such as data acquisition, efficient feedback, scientific decision-making and efficiency improvement, and predict the possibility on this basis. But it is not innovative, and is unable to think independently. Designer's labor can be divided into two categories, which include creative and procedural ones. Based on big data, AI can assist designers in design research, creativity and practice from various dimensions. Intellectualized design will reduce the procedural labor of designers, so designers will have more time to think and innovate. Therefore, designers should fully understand possibilities brought by AI.

Designs now something needs to search and pick the best solution from a range of possible options, rather than a creation of new project by designers with their design talent. Designers are more often evaluating [17]. Designers' design ideas needs to have clear values and ethical orientations, while AI, as a tool, cannot judge the value of the optimal solution and is not ethical. Therefore, while actively adapting and learning AI, designers need to pay more attention to the cultivation of their own artistic accomplishments and correct values.

7. Conclusion

The traditional design and creative process aims to find some typical users and build a persona through user research, and then to design the function and form according to the user's needs, and finally to deliver the completed design to the production or development. But now, with the ability of AI which enables to do experience computing, perception enhancement and design intelligence, the entire design and creative process has undergone tremendous changes. It is no longer for designer to find the demand and to give a solution through user sampling, but they are involved in the entire production life cycle of the product, and constantly redesign and re-optimize in the user's actual experience. Therefore, Intellectualized design provides a new vision for the production of creative digital content. Facing with such a new creative content development model, design is no longer a node in the production chain, but an important part of the design cycle of user-centered and AI empowerment throughout the product life cycle. Such changes pose new challenges to design education, design research, and design practices.

The production of creative digital content is practicing this new paradigm of design. Designers should improve their professional constantly skills, master intelligent design thinking and design methods, and

find new possibilities for the creation of creative content. This new design paradigm will also gradually affect the field of physical product design, and even extend to the broader field of creative design.

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