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Retraction

Retracted: Dynamic Logo Design System of Network Media Art Based on Convolutional Neural Network

Mobile Information Systems

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Z. Yang, "Dynamic Logo Design System of Network Media Art Based on Convolutional Neural Network," *Mobile Information Systems*, vol. 2022, Article ID 3247229, 10 pages, 2022.

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Research Article

Dynamic Logo Design System of Network Media Art Based on Convolutional Neural Network

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Nowadays, we are in an era of rapid development of Internet technology and unlimited expansion of information dissemination. While the application of new media and digital multimedia has become more popular, it has also brought Earth shaking changes to our life. In order to solve the problem that the traditional static visual image has been difficult to meet people's needs, a network media art dynamic logo design system based on convolutional neural network is proposed. Firstly, the software and hardware platform related to accelerator development is introduced, the advanced integrated design and calculation IP core are determined as the FPGA hardware accelerator, and the design objectives and requirements of the accelerator system are analyzed. The overall architecture of the accelerator system is designed. 76% of designers believe that the dynamic logo has promoted the corporate image. Then, the function and architecture of IP core are designed based on advanced synthesis, the code structure is standardized, the function is divided, and the operation acceleration is further optimized by using the instruction set of HLS. Finally, the design is integrated by Vivado HLS and Vivado IDE software. The experiment shows that the accelerator system has low power consumption and high resource utilization.

1. Introduction

The wide application of digital technology, multimedia technology, network technology, and other technologies has not only changed the way of traditional logo design, but also broke the limitations of traditional newspapers. It has a profound impact on modern logo design in all aspects such as design concept, visual expression, and form structure, as shown in Figure 1 [1]. The multi-dimensional spatial effects such as three-dimensional, motion, gradual change, and superposition of logo graphics created through computer-aided design break through the traditional visual image expression methods such as geometric graphics and texture effects. The expression means and scope have been greatly expanded, and the form and style of logo design are also developing in a diversified direction. The support of media technology and design software provides designers with greater design space and solves the creative constraints caused by technical barriers or lack of appropriate media. The development of information technology has supported the emergence of a new "dynamic logo" design, which is why: (1) the pursuit of the audience's visual experience is constantly improving. When people ignore the information irrelevant to themselves, they will be more eager to obtain positive information that is beneficial to themselves and can get a pleasant feeling [2]. The emergence of new media makes designers find a better carrier to express the logo concept and design the logo image, which meets the growing spiritual and cultural needs of people to a certain extent. (2) With the increasingly fierce market competition, enterprises pay more and more attention to brand construction. The emergence of new media provides a rich carrier mode for the dissemination of logo image. When people began to talk about new media, interactive communication, and other new terms, business owners also began to consider better ways to spread positive energy and create and maintain brand image. (3) The successful case of dynamic logo design has aroused the consideration of logo designers. Dynamic forms should be added to the future logo design to enrich the brand content [3].

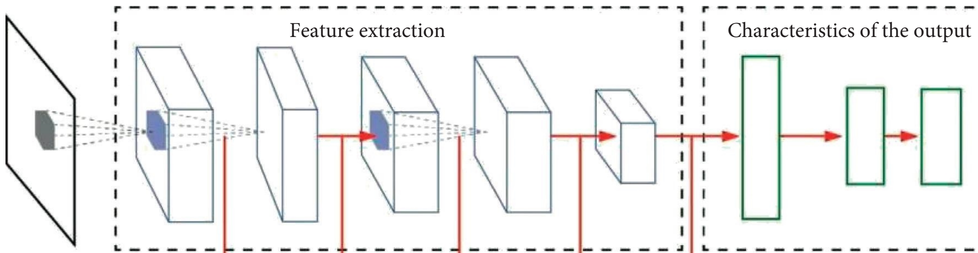


Figure 1: Structure of convolutional neural network.

2. Literature Review

With the advent of the new era, digital multimedia technology also develops at a high speed [4]. CEN and others found that on this basis, information dissemination has also accelerated the pace of updating. Its convenient and efficient characteristics make the amount of graphics and text information that people come into contact with in their daily life increase year by year [5]. Liang and others found that under the strong influence of visual stimulation, people's increasingly stringent aesthetic needs have led them to feel tired of a large number of repeated visual information, and the public's choices in receiving information have become more diversified. Extending to the field of logo design, only logo design with unique beauty and rich creative elements can be more liked by the public [6]. Kim and others found that in today's society, logo design is more and more needed by people, and its application market is also growing. Various factors constitute the emergence and development conditions of logo dynamics [7]. Da and others found that in recent years, in the renewal of brand logo, many well-known enterprise brand images choose to appear in a dynamic form. Different from the limitations of traditional media, the dynamic logo brings consumers more and different novel experiences through visual impression and rich association of products. At the same time, it also has good visual effect, meets the audience's requirements for product aesthetics, and caters to the modern fashion trend [8]. Yun and others found that dynamic logo will use its unique particularity and diversity to create higher economic benefits and rich social value in the future [9]. Qawaqneh and others found that under the background of the digital age, dynamic signs have unique visual appeal, transparent information transmission, multi-dimensional sensory experience, and flexible promotion methods, which make them gradually adapt to the needs of the market. Dynamic signs not only make people feel fresh and energetic, but also attract extensive attention [10]. Disabato and others think that nowadays, logo design conforms to the development of the times and gradually evolves from traditional static form to dynamic form, which has become a way of its development. However, at present, China's theoretical research specializing in this field is still in a relatively scarce state, and China's relevant dynamic logo practice is also in the initial stage of exploration [11]. Therefore, on the premise of constructing their basic theory, Meng and others continuously explored the practical feasibility through the specific methods required for dynamic logo design described in this paper [12]. First of all, from the research of dynamic logo design, it is not difficult to see that the design of dynamic logo design is different from logo design. It can not only attract the attention of the audience, but also broaden the channels for the public to receive information, so as to expand the dynamic demand of dynamic graphics in logo design. Secondly, Zhong and others gradually analyzed its principles, advantages, and disadvantages by combining many dynamic logo cases in China, and learned lessons from these classic cases. It can not only improve the design level of dynamic signs, but also lead the subsequent design development [13]. Finally, Hongshun and others stimulated the public's interest in dynamic signs by taking the dynamic design of signs as the main body, making full use of past design experience and in-depth analysis [14]. Through the analysis of a large number of excellent classic cases, it provides specific and accurate design direction and valuable theoretical reference for dynamic logo design. Through the combination of theory and practice, the feasibility of its design is verified, and it is hoped that this research can guide the creators to better practice the dynamic logo design to a certain extent.

On the basis of this research, this paper proposes a network media art dynamic logo design system based on convolutional neural network. From the analysis of the most basic new media technology and the concept of dynamic logo, combined with the development of new media technology and the organization of logo development process, the impact of new media technology on the development direction of logo design is summarized, and the reasons for this are sorted out and analyzed, to predict the future development of dynamic signs in the new media environment. The paper mainly uses the methods of literature induction, theoretical analysis, case analysis, etc., and strives to demonstrate in a step-by-step and simple-to-detail manner.

(1) Literature induction method: organize and analyze the content by searching for relevant theoretical books, journals, and papers. By searching for literature to collect and sort out the survey methods about the research object, its significance lies in that the reference data and reference information can be sorted and summarized accurately and effectively.

(2) Case analysis method: through the analysis of some classic cases, the corresponding design methods are summarized, which is to make them systematic, theoretical, and elevated to an empirical method. Its significance is to promote advanced experience to human beings, and it is one of the more effective methods that have been used for a long time in history.

(3) Theoretical analysis method: carry out analysis and research on relevant design theories, and use the research results to demonstrate the arguments in the paper.

3. Method

Traditional machine learning enables computers to learn from experience, that is, to continuously improve machine learning algorithms by training data [15]. However, the algorithm relies on human to set specific features. For the feature extraction of complex problems, it takes a lot of research time to design an effective feature set manually. The depth of deep learning is that compared with the machine learning algorithm of shallow network, the shallow learning algorithm has only a few feature extraction layers, such as support vector machine (SVM) and logistic regression (LR) [16, 17]. They map the original data to the feature space through the linear classification model. When the target task is complex, they cannot map the original data to the high-dimensional space or find the optimal classification hyperplane. Deep learning has a multi-layer network structure, which can solve problems through hierarchical feature sets [18]. Compared with the traditional manually set features such as Haar and LBP, more abstract feature representation can be extracted from the data. Each feature is defined by its relationship with some relatively simple features. According to the theory of hierarchical processing, the computer can build simpler features to learn complex features, that is, through the deep network structure, learn specific concepts in the target task from low to high, so as to strengthen the expression ability of the model, as shown in Figure 2 [19, 20].

Neurons are the basic units in neural networks. Each neuron can independently accept information input and produce output. The function in artificial neural networks is equivalent to defining the connection mode, and the adjustable parameters in the function define the intensity of the influence under this connection mode [21, 22].

x_i is the input vector, which is composed of multiple input signals, $(x_1, x_2, x_3, \ldots x_n)$, b is the input bias, w_k is the weight, where w_{ki} represents the connection strength between other i-th neuron and current neuron k, $\ell(\cdot)$ represents the activation function, performs the output transformation of the input obtained by the neuron, generates Y, and establishes the connection between input and output, and y_k represents neuron output. As shown in Figure 3, therefore, the calculation of the neuron model is expressed as

$$\begin{aligned} v &= \sum_{i=1}^{n} x_i w_{ki} + b, \\ Y &= \ell(v). \end{aligned} \tag{1}$$

The mathematical model shows that the processing process of artificial neural network is first make the inner product of input X and weight W, then input the activation function to the inner product result, and finally output the signal from the activation function. In order to simulate the activation effect of neurons on the input signal, it is necessary to define the transformation function of input to reflect the influence of input on output. If the linear transformation function is used, the network performance will be reduced. Even if the multi-layer neural network is used, it is equivalent to the simple linear transformation of input, so the nonlinear transformation is generally used. Early neural network algorithms mostly used piecewise linear functions or S-type functions as output transformation functions. These functions have saturation characteristics in small and large numerical intervals, which can effectively imitate the excitation or suppression (Figure 4) characteristics of input. The Figures 4(a)–4(d) are the curves of S-type transformation function and its derivatives [23, 24].

$$\begin{aligned} \sigma(x) &= \frac{1}{1 + e^{-x}}, \\ \tanh x &= \frac{e^{x} - e^{-x}}{e^{x} + e^{-x}}. \end{aligned} \tag{2}$$

Both tanh and SIGMOD functions are S-type transformation functions, which have nonlinear gain to the input signal and compress any input value to the range of (- 1,1) or (0,1). The smoothing characteristic of S-type function is the key factor of its activation function. The smoothing characteristic means that small changes in weight and bias ow and △ B will produce a small output change through neurons, which is equivalent to the smoothed version of step function [25, 26].

$$\Delta \text{output} \approx \sum_{j} \frac{\partial \text{output}}{\partial w_j} \Delta w_j + \frac{\partial \text{output}}{\partial b} \Delta b. \tag{3}$$

Convolutional neural network is a very important network structure in the field of deep learning. It has a picture recognition accuracy close to or even higher than the human level. Convolutional neural network is an artificial neural network with local connectivity and hierarchical organization. In the traditional neural network topology, all nodes in each layer are connected with each other, which is called fully connected neural network. Convolutional neural network is similar to it. It adopts feedforward network model structure and takes neurons as nodes to form hierarchical connection. However, the nodes between adjacent layers are connected by local area, and the connection weight between some neuron nodes in the same layer is shared.

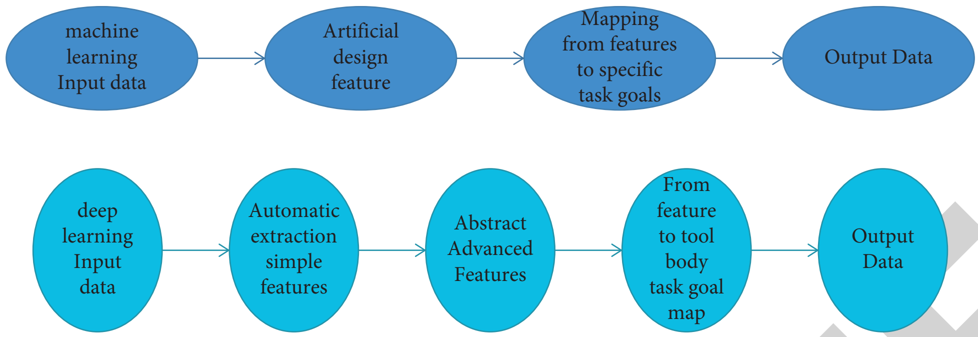


FIGURE 2: Feature extraction of machine learning and deep learning.

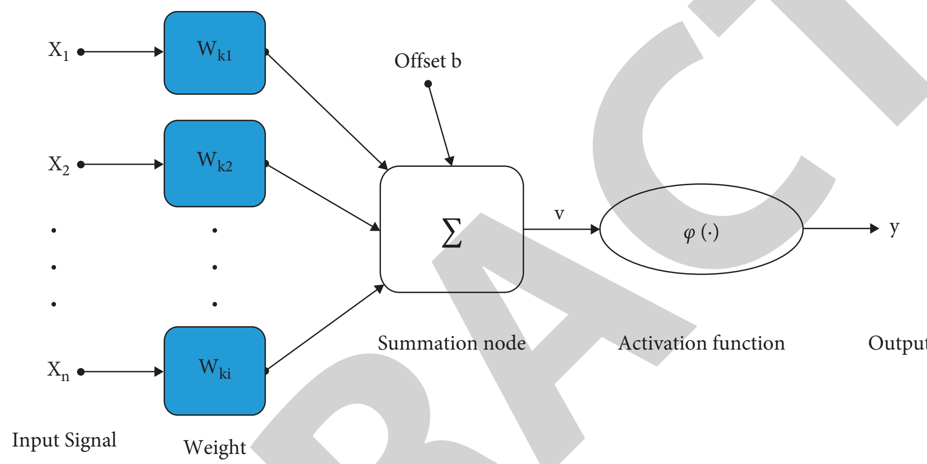
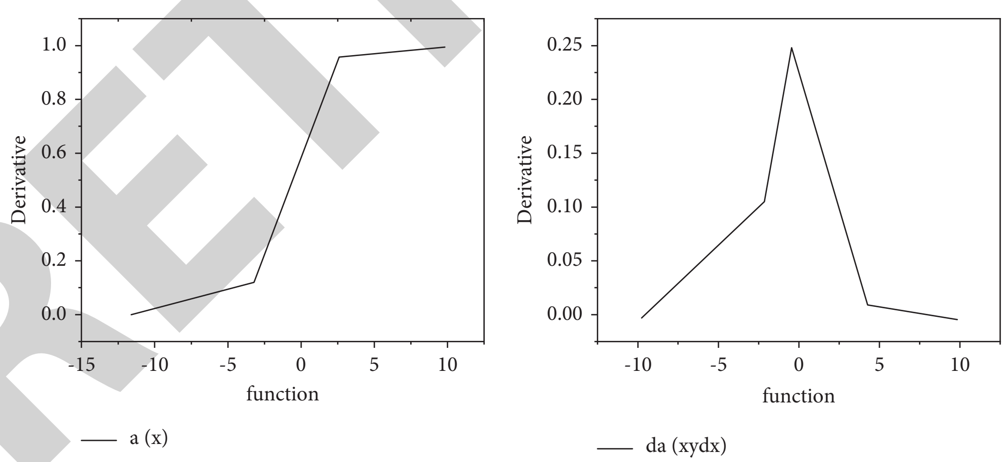


FIGURE 3: Neuron calculation model.



(a) (b)

FIGURE 4: Continued.

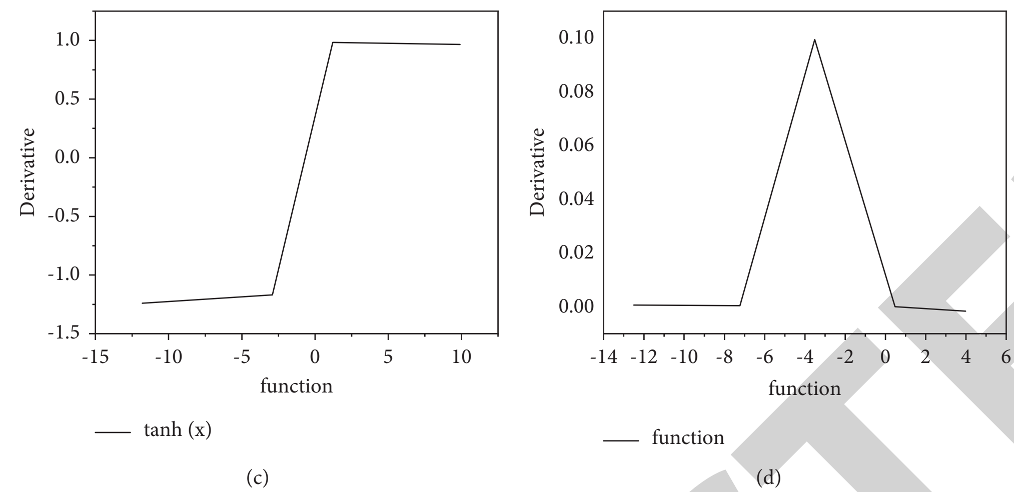


Figure 4: 3S-type transformation function and its derivative.

Convolutional neural network generally includes the following five hierarchical structures: convolutional layer, activation unit, downsampling layer, full connection layer, and output layer. Its basic structure is shown in the neural network topology in Figure 5 [27, 28].

The implicit layer in the whole network structure includes two layers of convolutional layer, two layers of downsampling layer, and two layers of full connection layer. The network starts to input the handwritten font image and finally outputs the probability value of the digital possibility of the corresponding image. In the processing process of convolutional neural network, firstly, the pixel data of the image are transmitted to the convolutional layer as the input. The convolutional layer performs convolution calculation on the input data through convolution check, so as to extract the image features. Then, the nonlinear transformation of the activation unit is carried out through the convolution calculated data to enhance the expression ability of the network. The set of calculation results obtained at this time is called the characteristic graph. In the next step, the data in the characteristic graph are processed in the downsampling layer. The downsampling layer is mainly to reduce the data dimension and reduce the data scale. The structure of convolutional layer + activation unit + downsampling layer constitutes the basic processing module. After passing through one or more such processing modules, a new convolutional layer or full connection layer can be input. Such a composite structure represents the image feature extraction process of convolutional neural network. The basic processing module can extract some features of the image. The subsequent processing module carries out further feature abstraction based on the feature extracted by the previous processing module, which is a hierarchical feature abstraction process, so that the reasoning process of convolutional neural network can complete the image recognition.

Next, we will briefly introduce the specific working principle of each structure:

The convolutional layer mainly performs convolution calculation on the image area, which is different from the one-dimensional convolution process of general digital signal processing. The convolutional layer mainly performs two-dimensional convolution operation on the image input; that is, the convolution kernel and the convoluted signal are in the plane. The operation of summing after multiplying the corresponding terms on one-dimensional convolution operation is

$$y(k) = h(k) * u(k) = \sum_{i=0}^{n} h(k-i)u(i). \quad (4)$$

Two-dimensional convolution operation is

$$y(p,q) = \sum_{i=0}^{m}\sum_{j=1}^{n} h(p-i,q-j)u(i,j). \quad (5)$$

The convolution input of convolutional layer is generally a three-dimensional image including channel, width, and height. Convolution is equivalent to filtering the image with a discrete two-dimensional filter, so this convolution kernel is also called filter. The image is decomposed into different subsets by filters. The sensing domain of each filter is smaller than the overall image, but the depth is consistent with the number of channels of input data. The two-dimensional filter moves along the width and height of the input, traverses all pixel data on the image, performs two-dimensional convolution with the pixel data of the corresponding area of the image, and generates a two-dimensional activation map of the filter. Different convolution kernels can extract different features, such as edge, linearity, and angle. As shown in Figure 6, in convolutional neural network, the network convolution kernel learns that it is activated when it sees some types of visual features.

After convolution calculation and adding bias, nonlinear (activation unit) will be added to enhance the fitting ability of the model. The traditional feedforward neural network will use the S-type transformation function as the activation

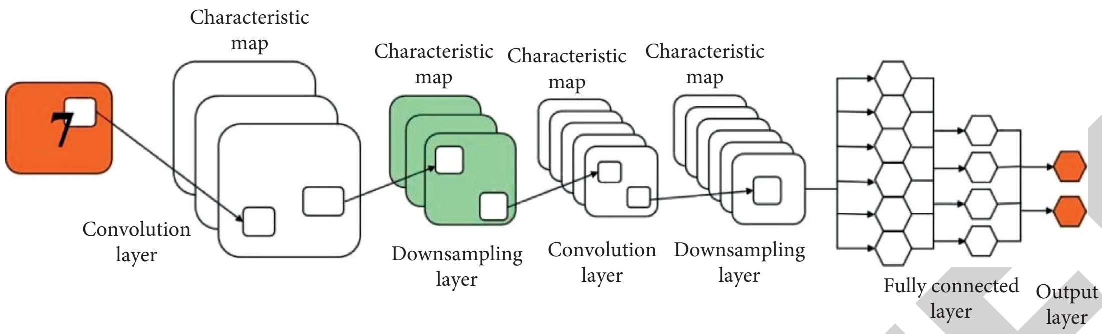


Figure 5: Topology of a convolutional neural network.

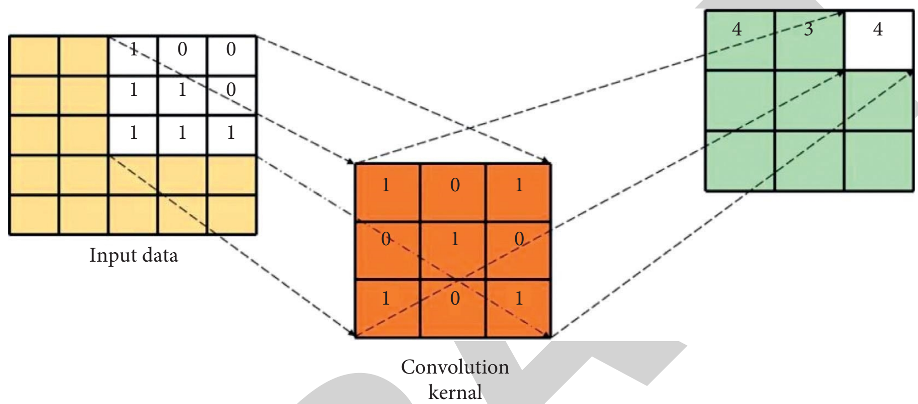


Figure 6: Schematic diagram of convolution calculation process.

function, but the output value of the sigmoid function is always greater than 0 and has saturation characteristics after exceeding a certain threshold, which will slow down the convergence speed of model training. This will lead to the phenomenon of unstable gradient in the process of neural network parameter learning, resulting in the disappearance of gradient. Therefore, after the experimental verification of scholars, the modified linear unit (ReLU) and exponential linear unit (ELU) are mostly used as their activation functions in convolutional neural network, as shown in Figures 7(a)–7(d).

4. Experiment and Discussion

In order to understand the views of relevant Chinese designers on the development of dynamic logo design in the new media era, relevant investigations and research have been conducted on this issue, and the collected questionnaires have been sorted and summarized. 82% of the designers surveyed were design professionals, and 53% were between the ages of 24 and 30. In terms of age, the staff for dynamic logo design are generally young and are very excellent in creativity and imagination [29, 30]. After analyzing the collected data , the conclusions are as follows:

(1) In the design of dynamic standards, in addition to the need to improve its basic elements, creativity is indispensable. In the questionnaire for designers, question 7, when designing a dynamic logo, which of the following aspects do you pay more attention to (multiple choices)? By sorting out the data collected from the questionnaire, it can be seen that the proportion of designers who think creativity is very important accounts for 69% (as shown in Figure 8). For the audience, the innovation and creativity of the dynamic logo are very attractive. A creative animation logo is extremely impressive in the eyes of the audience. Therefore, the reputation and image of an enterprise are closely related to whether its works are creative or not. When designing dynamic signs, while paying attention to the creativity of signs, we should not ignore the shaping of sign style and the application of shape, color, and other attributes. Creativity is not only the core of dynamic signs, but also the most intuitive direct factor to highlight the advantages and disadvantages of works. Creative content directly affects whether they are able to attract and impress first-time viewers.

(2) According to question 8 of the questionnaire, what kind of role do you think dynamic logo design will play in the promotion of corporate image in the future? From the statistical data, 76% of designers believe that the dynamic logo has promoted the corporate image (as shown in Figure 9). This can explain a problem. Designers are generally optimistic about the development prospect of dynamic signs. The designer's confidence in the future development

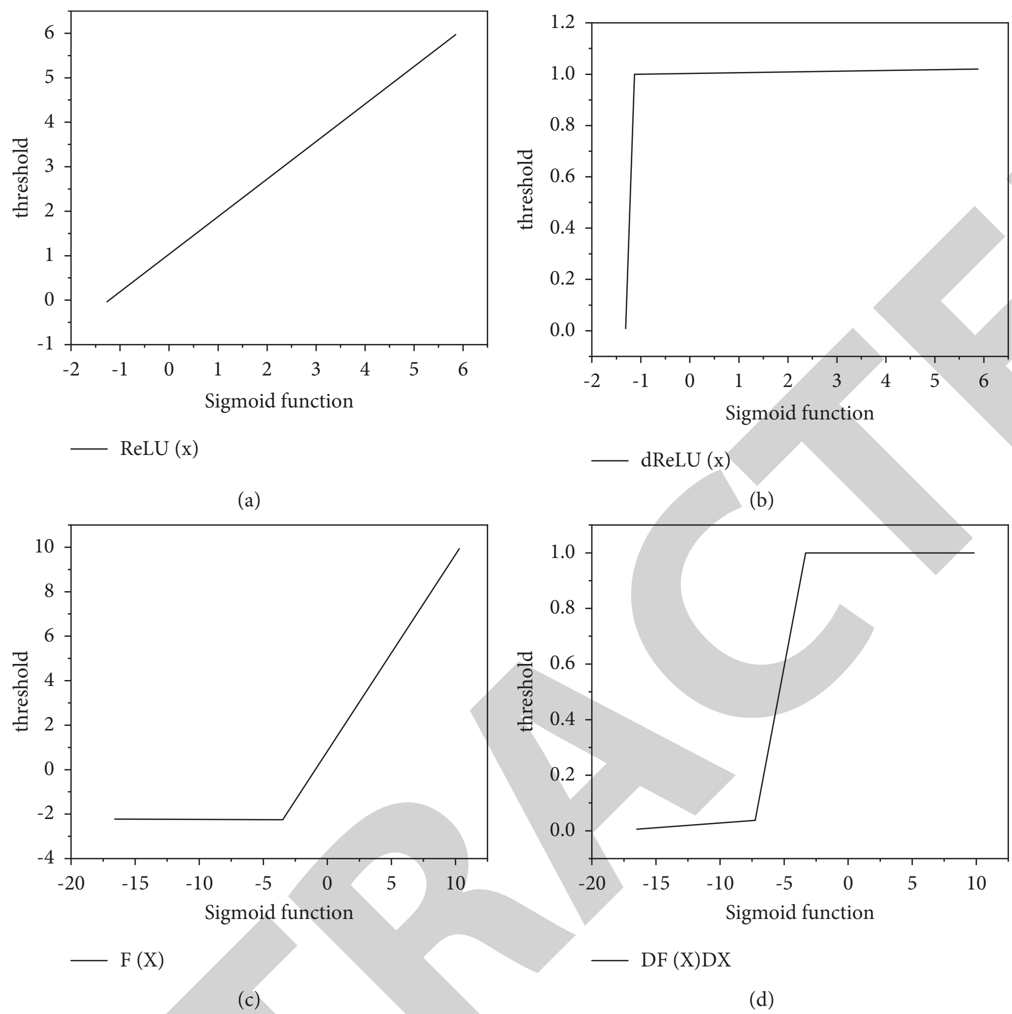


Figure 7: ReLU and ELU and their derivatives.

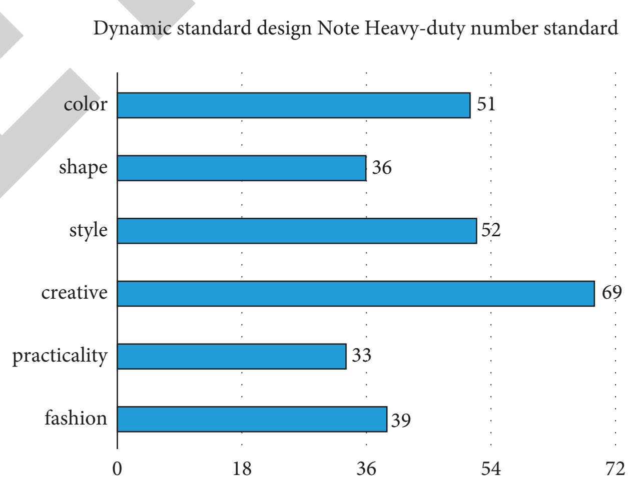


Figure 8: Statistical chart of dynamic logo design focusing on aspects (unit:%).

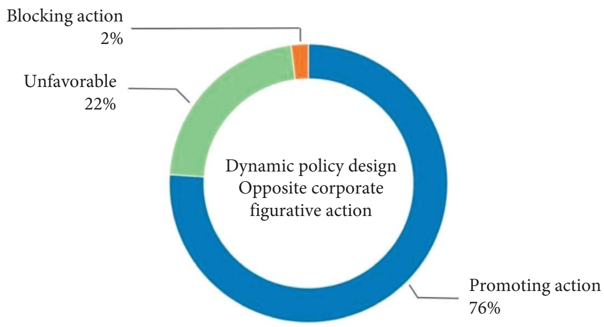


Figure 9: Statistical chart of the effect of dynamic logo design on corporate image.

of dynamic signs can also play a very good role in promoting the development of dynamic signs.

Global trade not only enables countries to develop rapidly, but also continues to emerge batch after batch of modernization symbols. With the continuous development and progress of science and technology, the form, significance, and specific content of signs have become richer. Traditional static signs can no longer meet the increasingly demanding aesthetic demands of the audience, and dynamic signs are gradually carried out in our life. As for the dynamic logo of 2020 Tokyo Olympic Games, once released, it has aroused heated discussion on the Internet. Based on the static icon released a year ago, a dynamic effect is added to make it more flexible and catch people's attention immediately. It can be seen that dynamic logo, as a new expression form of logo design, is bound to become the mainstream form of Chinese logo design in the future.

Throughout the whole historical process of the development of logo design, it is not difficult to find that from the birth of the original logo to the dynamic interpretation of it with simple technology, and then to now, dynamic has become a normal state. This is not only a process of innovation and development, but also the result of historical inevitability. In addition to objective external factors, such as the progress of new media technology, the demand of market environment, and the progress of human aesthetics, it is more important for people to become the recipients of information transmission. People are not satisfied with almost the same expression methods and the internal needs of freshness and interest brought by innovation. Although human needs will be affected by objective factors, they always exist. The profound historical accumulation, the satisfaction of objective conditions, and the internal needs of mankind are closely related. In order to meet the needs of mankind to the greatest extent, the choice of dynamic logo design is undoubtedly the best result in logo design. The emergence of the concept of dynamic sign is inseparable from the integrity principle of Gestalt psychology, which holds that the sum of the whole is greater than the sum of the parts. In fact, the dynamic logo design adds the concept of time, connects the pictures of each frame, and then constructs it into a whole, so as to express more information. At the same time, dynamic logo design is not only a simple way to give dynamic effects to logo design, but also pays more attention to interactive experience. This shows that in order to realize the dynamic of signs, we need to make full use of sensory experience to make better use of visual recognition system. From it, we can also realize that this is the development trend of the improvement of logo design and even the whole visual recognition system in the future. In modern and contemporary society, all walks of life are developing with the passage of the times. Design must keep pace with the times and innovate to meet changing needs. Although dynamic signs are the product of the times, they are also the power of information technology. But at present, the exploration in this area is far from enough. We also need to constantly innovate its content, overcome technical problems, and further improve and innovate. The innovation of dynamic logo design not only requires us to master the content of each link in the dynamic logo, but also requires us to change our design thinking and improve it in all aspects. When we break through the upgrading of each link one by one, it is a big step to realize the dynamic mark. As a product of the new era, the innovation of dynamic logo cannot be limited to the visual field. Its design can span the visual design and go deep into other fields such as environmental design, industrial design, and advertising design, so as to make it more diversified. Cross-border cooperation turns dynamic signs into a variety of design integration, seeking more space for survival and development in multiple fields, and the innovation points of dynamic signs will increase with the increase of fields. This also requires relevant designers to focus on details, pay attention to integration, innovate, and enrich the connotation of dynamic logo design. For the design language, we should also innovate and constantly enrich the design language with various forms and innovative thinking, so that the dynamic logo can better play its potential, so as to create representative dynamic logo works. Of course, there may be setbacks, troubles, and failures in this innovation process, but as long as we have confidence and perseverance, we will eventually realize the innovation of dynamic signs. In short, in the new media era, in the future design field, dynamic logo design is bound to become the focus of attention. It is not only a new application of the art field in the high-tech industry, but also a self-innovation of art accepting the development product of the times. In the future, the dynamic logo will also continue to maintain a good state of development and promote the field of logo design. The wide application of dynamic signs will also provide a broader space for the establishment and dissemination of enterprise brand image.

5. Conclusion

With the advent of the information age, ordinary and popular visual images are gradually eliminated. Dynamic signs are the inevitable trend and direction of the development of signs in the future. At the same time, because they are not constrained by material forms, dynamic signs that rely on digital media to flourish are more humanized and richer in expression forms, and their significance is to create a series of new visual languages, adapt to the needs of future development, and meet the public's curiosity about emerging things. The study found that 76% of designers believe that the dynamic logo has promoted the corporate image. This can explain a problem. Designers are generally optimistic about the development prospect of dynamic signs. The designer's confidence in the future development of dynamic signs can also play a very good role in promoting the development of dynamic signs. There is an inseparable relationship between dynamic signs and static signs. As the raw material and motion basis of dynamic signs, a model based on convolutional neural network is proposed, which plays a supporting role in dynamic signs. Both obey the basic characteristics of recognition, applicability, and function of signs at the same time. However, there are significant differences between them in sports, visual communication forms, communication characteristics, and visual performance effects. The factors affecting the development of dynamic logo design mainly include technological progress and network media, enterprise brand awareness, design theory update, etc. Among them, technological progress and the development of network media are the main carriers of dynamic logo, which help visual culture to be diversified and then integrate graphics, animation, music, sports, and other elements to reflect timeliness, interactivity, and multiplicity. Finally, the shot design of dynamic logo is based on the visual language of film and animation, and follows the visual language rules of film and animation. The research uses visual language to analyze the scene, lens, angle, and music design of dynamic signs. The setting details of sublens determine the final visual effect of dynamic signs. Sublens setting is not only the overall framework structure of dynamic signs, but also the guiding basis for the production of dynamic signs. As an extension and extension of static logo design, dynamic logo breaks the traditional design form, follows the original rules and rules of traditional static logo design, and adds the concept of "time axis," which is diverse and unstable. Compared with the communication platform of static signs, dynamic signs rely on Internet technology. Therefore, with the development of digital media technology, visual symbols are no longer single static, but transformed into a dynamic and changing form, so as to meet the aesthetic needs of the audience. The emergence of dynamic signs conforms to the development and needs of the times, and its forms of expression will change according to the environment and the background of the times.

Data Availability

No data were used to support this study.

Disclosure

The authors received no financial support for the research, authorship, and/or publication of this article.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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