

Environment Design and Exhibition Based on Convolutional Neural Network

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Abstract: With the rapid development of convolutional neural network, human society has entered the digital age, which has also had a profound impact on the development of exhibition design. The development trend of contemporary exhibition design shows that digitalization, integration, networking and intelligence will be the inevitable trend of exhibition design development. For the exhibition methods and design, it is more diverse. The application of digital technology in exhibition has broken through the traditional way of exhibition. The interactivity, multi-dimension and experience of digital exhibition have brought new vitality to the development of modern exhibition design, which represents the development direction of modern exhibition.

Keywords: Convolutional neural network; environmental design

1 Introduction

Environment design, also known as "environmental art design", refers to a practical art of integrated design through art design for the indoor and outdoor space environment of buildings. Art involves a wide range of disciplines, including convolutional neural networks, architecture, urban planning, ergonomics, environmental psychology, design aesthetics, sociology, literature, history, archaeology, religion, environmental ecology, environmental behavior and other disciplines. The artistic design of the environment adopts certain organization and enclosing means to artistically treat the shape, color, texture, etc. of the space interface (indoor and external wall cylinder, ground, ceiling, doors and windows, etc.), and uses design languages such as natural light, artificial lighting, furniture, decorations layout, modeling, and the configuration of plants, flowers, water bodies, sketches, sculptures, etc. to make the indoor and outdoor space environment of the building reflect a specific atmosphere and a certain style, to meet people's functional use and visual aesthetic needs[1-2].

2 Literature review

From the development of convolutional neural networks, it can be seen that neural networks are inspired by neuroscience, and sometimes artificial neural networks are used to help understand the brain mechanism. Therefore, biological neuron schematic diagrams will appear in many materials that introduced neural networks to help explain the principle behind neural networks. Convolutional neural networks have certain differences in structure in different

application fields. Convolutional Neural Network (CNN) is the most widely used in the field of image correlation, while Recurrent Neural Networks (RNN) is used in the field of language analysis. Compared with convolutional neural network, which refreshes records again and again, cyclic neural network has achieved many interesting experiments: writing papers, composing music, writing codes and so on. Up to now, convolutional neural network has achieved great success in many fields. Neural network is a computer model, which is based on traditional statistics to model complex input-output relationships and explore patterns between data. In the computer, whether sound, pictures or words appear in the form of numbers in the neural network. By processing these data, cognitive results are finally produced. The neural network is composed of a large number of connected neurons, which is responsible for transmitting and processing information. On the basis of external information, the internal parameters are gradually modified and constantly strengthened to form a fixed form, which will have a stronger response to specific information. The whole process is a gradual adaptive process, which is called training or learning. Training neural network needs to prepare a large number of labeled data, and then after a certain number of iterations, each iteration corrects the parameters of the whole neural network by comparing the difference between the predicted answer and the real answer, and finally obtains the trained neural network.

3 Research on Convolutional Neural Network

The typical structure of convolutional neural network is divided into four levels: input image, multiple convolution downsampling layers, rasterization, and traditional multilayer perceptron. Convolutional neural network comes from multilayer perceptron, and it solves the problems of too many training parameters of multilayer perceptron. Its core starting points are as follows: Table 1:

- (1) Local receptive field: Just as we generally see something in life, we also see the local part first, and we won't see all the contents of the object at once. Each hidden layer node is only connected to a pixel point of a small enough part of the image, thus greatly reducing the weight parameters that need to be trained[3].
- (2) Weight sharing: It can be seen as a way of feature extraction. The same convolution kernel is used to scan every position of the image, so the weights are the same, thus greatly reducing the parameters to be trained.
- (3) Pooling: downsampling by a certain pooling function not only reduces the resolution of the image (thus reducing the accurate position information), but also does not lose too much effective information, which greatly improves its irrelevance to the geometric transformation of the image.

Convolution neural network is used for image classification and recognition, which mainly includes four operations: convolution, downsampling, rasterization and multi-layer perceptron prediction.

Table 1 Convolutional neural network

Input layer	Vector kernel	RELU	Full connection layer
	Convolution layer		Dropout
	offset		Softmax Classified output

3.1 Convolutional neural network structure

The neural network used in this system is VGG46, and the data set is ImageNet. VCC46 is a convolutional neural network structure developed by the Visual Geometry Group of Oxford. The network won the title of ILSVR (ImageNet) 2014. The model consists of 13 layers plus 3 fully connected layers, and the structure is shown in Figure 1.

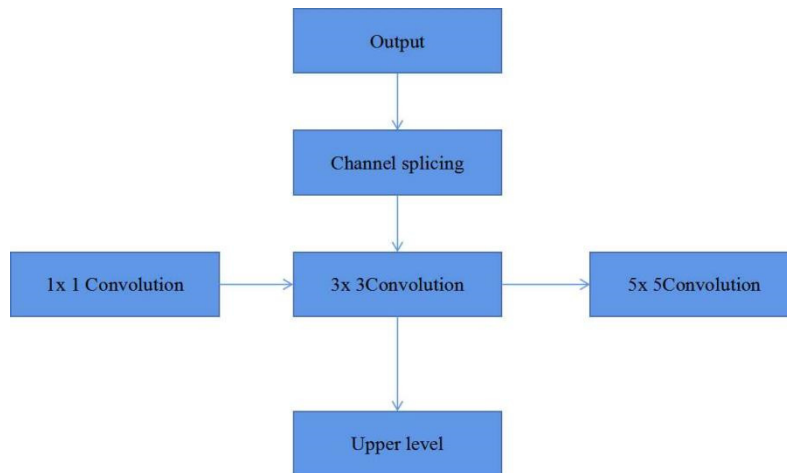


Figure 1 Convolutional neural network structure diagram

3.2 Exhibition space design of environmental art design

In the design of exhibition space, based on psychological analysis, it is necessary to make full use of the relationship between enclosure and transparency. If the design of a space does not adopt any perspective method, it will inevitably give people a feeling of oppression. If the design of the space is just the opening, the characteristics of the internal space can't be brought into full play, and the use function can't be brought into play. Therefore, in the design of the exhibition space, we need to grasp the scale of circumference and transparency, and design according to the specific things that need to be displayed. As shown in Table 2:

Table 2 Art Design

category	Class A: design works.
	Class B: conceptual and creative works
Specific content	1- Residential space design 2- Office space design 3- 3- Life and entertainment space design 4- Commercial Space Design 5- Exhibition space design

3.2.1 Spatial mobility and guiding design

The exhibition space itself is a kind of three-dimensional space. People can't see all the designs at a glance. They need to see all kinds of designs while walking, that is, they need to pay attention to all the design parts. This walking process is a continuous process, and the information people see is also a continuous process. Therefore, in the design, it is necessary to ensure the continuity of space changes, ensure that the display effect of each space is consistent, ensure that people can get a good visual effect, and ensure that people feel the coordination and consistency of space during walking, and at the same time, it is rich in changes and enhances people's feelings. In principle, the design of exhibition space needs to adopt the principle of orderliness. When people visit exhibitions, they have great mobility. Generally, they walk to the right, take shortcuts, and don't go back. This requires the space design to detain mobility and guidance, and reasonably arrange the space layout to arrange visitors' visits and guide people to stop[4-5].

3.2.2 Design of space length and color

In the design of exhibition space, the length factor is one of the main factors that affect people's psychology. Generally speaking, in the design of exhibition space, the climax part needs to be biased towards the rear part, and the front space design makes people have a sense of expectation and enhances the performance effect of space. In the design of architectural space, if it is necessary to emphasize the importance of the climax part and satisfy people's idea of returning on a whim, the space design for viewing and browsing can be appropriately lengthened. For some special objects, the climax part needs to be placed in front in the design of exhibition space, which will arouse people's novelty. In the design of exhibition space, color is also one of the important factors that affect people's psychological changes. Color has a strong visual effect and can attract people's attention. Psychological research shows that when people look at things, they always see the colors first, and then the objects. The design of color involves public color psychology, because different colors have different intuitive effects for people, and they are also influenced by religious beliefs and social norms. For example, red symbolizes health and happiness in America, and confidence and tradition in China. Therefore, the influence of color on people's psychology should be considered in the design of exhibition space[6-7].

3.2.3 Design of vertical and horizontal space

According to psychological analysis, in the vertical direction, the higher the vertical distance

of an object, the easier it is to cause people's oppressive feeling. Because of this vertical space, people are used to watching from a distance. From the perspective of space psychology, tall and thin things will cause insecurity, so it is necessary to try to avoid this kind of space design in design. In the design of vertical space, a method of suppressing space can be adopted. The top surface of high space can be packaged into a step-by-step change to reduce people's insecurity of space. You can also use a design method of superposition space to acquire new space by superposition and heightening. The horizontal space design is mainly designed according to different space requirements. In the design of exhibition space, space atmosphere, exhibition space, rest space, etc. are required. It is advisable to adopt the dimensional space method, which is the most commonly used design method. It is also possible to connect different spaces by means of corridors, ribbons, flowers and plants, etc., in order to enhance the unity of space. Space design method is a comprehensive design, which mainly achieves the goal of increasing the display level and achieving refinement. At present, there are four main ways of exhibition space design. The central layout method refers to shaping the center in the center of the space. The exhibition stands are mostly cylindrical, and the periphery is designed around the center. Scattered layout is generally used in irregular space design, while network layout method is used in commercial exhibition space design, which is the basic method of economic and trade exhibition space design. It attaches importance to the orderliness of booths, and mixed layout method is the combination of former centralized design methods, which is also the most commonly used one[8].

4 Generation and dissemination of digital display design

The traditional exhibition design has great limitations. With the development of science, technology, economy and culture, the exhibition industry is also greatly affected. With the development of computer technology and the rapid popularization and development of Internet, exhibition design activities have entered a new stage. With the development and application of digital technology, exhibition activities have also begun to enter the digital age accordingly.

The development of architecture has also deeply influenced the development of exhibition design. The traditional exhibition space is limited in the specific exhibition space of the museum. In order to change the situation of insufficient light and unreasonable space in traditional museums, and change the fixed and static mode of traditional exhibition space, the modern architectural concept provides the theoretical basis for it, and the exhibition space that can be divided flexibly emerges as the times require. The West National Gallery of Berlin is a typical representative of this universal space. The design changed from the traditional and vertical wall display to the horizontal ground and vertical space, and the technology of sound, image and interactive device was added to break through the space limitation.

With the development of digital technology, virtual exhibition space has emerged. Powerful technical forces have reconstructed people's traditional concept of space, changed the traditional way of information exchange, and formed a new trend of digital exhibition space. Exhibition design has also entered the digital era[9-10].

5 Conclusion

To sum up, this paper mainly analyzes environmental art design and exhibition space design. In the design of exhibition space, the best design purpose can be achieved only on the basis of being familiar with psychological characteristics. Every detail of exhibition space will affect the psychology of the audience and provide information to the audience. Only by conforming to people's psychological changes can the success of exhibition space design be guaranteed.

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