Application and Development of Virtual Reality Technology in Artificial Intelligence Deep Learning

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Abstract. Virtual reality technology is a key technology that can support multiple dimensional spaces. Virtual reality technology is often supported by computer graphics, digital image processing, multimedia technology, and sensor technology. Virtual reality technology is often not a single technology or discipline. With the rise of deep learning theory, virtual reality technology has also been vigorously developed with the help of computer graphics and other related theories. Virtual reality technology has been widely used in the commercial field, and products such as virtual VR glasses have become more and more popular. This article will give a more comprehensive introduction to the development of virtual reality technology, and this paper will introduce the relevant theory of deep learning to further introduce virtual reality technology.

1. Introduction
VR, short for Virtual Reality, is virtual reality technology, which is a combination of various technologies, including computer graphics, human-computer interaction, media, network transmission, sensing and simulation [1]. To some extent, this technology is an extension of the human body. Virtual reality technology provides a way for people to communicate with the virtual environment. To achieve this interaction, either visualize the virtual environment into a virtual environment, or visualize the virtual environment into a real environment, and the existing technology creates The virtual environment has been realistic until people can't directly discern them through the senses, which confuses their differences with reality [2].

In general, virtual reality technology can be divided into three main categories, namely:

- Desktop virtual reality system: The main feature is that the cost is relatively low, and it only interacts in a simple window, mainly used in the architect industry such as CAD/CAM.
- Immersive virtual reality system: The main feature of this virtual reality system is that it can use some hardware devices for human-computer interaction. The most typical ones are helmets, glasses, gloves and so on. These devices can provide a variety of sensory experiences for humans, such as vision, touch, and the like [3].
- Distributed virtual reality system: This kind of virtual reality system is less common than the above two virtual reality technology systems, mainly based on immersive virtual reality system and distributed computer simulation system. The main application is to perform some simulation training around the structure of the network. For example, some distributed virtual reality systems can be used for pre-training of medical procedures, early prevention of natural disasters, and so on [4] [5].
At the same time, virtual reality technology is a multi-modal technology collection, which mainly includes the following types or branches:

- **Dynamic environment modeling technology**: The establishment of virtual environment is the core content of virtual reality technology. The purpose of dynamic environment modeling technology is to obtain the 3D data of the actual environment, and use the acquired 3D data to establish the corresponding virtual environment according to the needs of the application. Model [6]. The acquisition of 3D datasets can be based on CAD technology (regular environment), while in more cases, non-contact visual modeling techniques are required. The organic combination of the two can effectively improve the efficiency of data acquisition.

- **Fast 3D graphics generation technology**: 3D graphics generation technology is relatively mature, and here is how to achieve rapid generation. In order to achieve the goal, how to improve the refresh frequency is the research content of the technology without reducing the quality and complexity of the graphics [7].

- **Stereoscopic display and sensor technology**: VR's interactive capabilities depend on the development of reality and sensor technology. For example, VR helmets and VR gloves, the development of these sensing technologies will largely limit the development of virtual reality technology [8].

- **Application system development tools**: The key to virtual reality applications is to find suitable occasions and objects, namely how to use imagination and creativity. Choosing appropriate application objects can greatly improve production efficiency, reduce labor intensity and improve product quality. For this purpose, VR development techniques and tools must be studied. For example: VR system development platform, distributed VR technology, etc.

### 2. Literature Review

In this part, this article will mainly describe the characteristics of virtual reality technology, and this paper will also introduce the relevant theory of deep learning.

Virtual reality technology has the following characteristics:

- **Immersion**: One of the most important features of immersive virtual reality technology. In layman's terms, it is to create a deep immersive environment for users through virtual reality technology [9]. Mainly to stimulate the user's perception system to a certain degree of special stimulation, so that users can generate thinking resonance, resulting in psychological immersion. Immersion can often play a decisive role in the performance of a virtual reality system.

- **Interactivity**: Interactivity means that users can generate certain feedback to the surrounding environment, mainly in terms of operability. A good virtual reality system can maintain good interactivity with the user and respond effectively to some instructions of the user.

- **Multi-perception**: Multi-perception is mainly the application of the computer's ability to capture human perception. For example, the more advanced artificial intelligence deep learning technology in recent years, the use of computer vision processing related methods can be effective for human visual images. Process synthesis, visually stimulating user updates.

Through the understanding of the characteristics of virtual reality technology, we introduce the relevant theories and knowledge of deep learning here. The concept of deep learning stems from the study of artificial neural networks. The multilayer perceptron (MLP) with multiple hidden layers is a deep learning structure [10]. Deep learning forms a more abstract high-level representation (attribute category or feature) by combining low-level features to discover distributed feature representations of data [11]. As a typical algorithm for traditional training of multi-layer networks, BP algorithm is actually not ideal for a network with only a few layers [12]. Depth structure (involving multiple nonlinear processing unit layers) The local minimum that is common in non-convex target cost functions is the main source of training difficulties.

Hinton et al. proposed an unsupervised greedy layer-by-layer training algorithm based on Deep Trust Network (DBN), which brought hope to solve the optimization problem related to deep structure [13]. Then the deep structure of multi-layer automatic encoder was proposed. In addition, the
Convolutional neural networks (CNNs) proposed by Lecun et al. are the first truly multi-layer structure learning algorithms [14]. It uses spatial relative relationships to reduce the number of parameters to improve BP training performance. In addition, deep learning also has many deformed structures such as denouncing auto-encoder, DCN, sum-product and so on.

Convolutional Neural Networks (CNNs) are the first learning algorithms to successfully train multi-layer network structures. Unlike DBNs, they are part of the discrimination training algorithm. Inspired by the structure of the visual system, when a neuron with the same parameters is applied to different positions of the previous layer, a transform invariant feature can be obtained. Later, LeCun et al. used this BP algorithm to design and train CNN. CNN as a deep learning framework is based on minimizing pre-processing data requirements. Affected by early time delay neural networks, CNNs rely on shared time domain weights to reduce complexity. CNNs is a topology that uses spatial relationships to reduce the number of parameters to improve general pre-BP training, and has achieved better performance in multiple experiments. A small portion of the image in the CNN called the localized region is used as the bottom-level input to the hierarchy. Information is passed through different network layers, so each layer can acquire significant features of the observed data that are invariant to translation, scaling, and rotation.

3. Cross application of VR and deep learning

Due to the excellent processing ability of deep learning for images, the combination of virtual reality technology and deep learning has become more and more extensive. In VR, in order to reflect excellent user interactivity and multi-perception, the processing power of visual images becomes more and more important. We know that more than 70% of the information centers captured by humans rely on vision, so it is necessary to use the excellent image processing capabilities of deep learning, and now many VR companies have begun to work with AI deep learning.

OpenAI has designed a more mature self-learning system based on the effective combination of deep learning and virtual reality technology. In this system, deep learning is first used to capture and process images of interest to the user. For example, some operations or instructions that can be performed by humans in the VR can be learned by the operating system and achieve an accurate level of operation. It mainly uses the convolutional neural network in deep learning to train and capture effective image information.

Virtual reality technology can also be effectively combined with deep learning in medical treatment. In modern medicine, doctors use some advanced medical imaging techniques to diagnose patients and even perform surgery. Similarly, with virtual reality technology, doctors can simulate the surgery that patients want to perform in advance, which can use deep learning techniques to present high-definition medical images of patients. This will make it easier for doctors to conduct simulation experiments. In addition, Facebook uses virtual reality technology to train artificial intelligence to play music. Kindred AI allows people to remotely operate intelligent robotic arms through VR, use the returned data to train the network, and use virtual reality technology to There are still many cases of artificial intelligence network training.

4. Discussion and Conclusion

With the advancement of technology, the development of virtual reality technology has become more and more a single technology, and virtual reality technology has become a multi-modal cross-composite technology collection. Similarly, with the development and advancement of technology, virtual reality technology has become more and more popular in human life, and VR is no longer a new vocabulary. With the rise of artificial intelligence deep learning, the combination of VR and artificial intelligence deep learning has become more and more popular. Of course, there are still many imperfections and defects in the current virtual reality technology. The hardware and software equipment technology of virtual reality technology is not very mature, and deep learning needs further development. However, we believe that in the future, VR+ deep learning will become a model of cross-industry and cross-industry cooperation.
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