

# Research on Image Processing Technology of Computer Vision Algorithm

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**ABSTRACT**—With the gradual improvement of artificial intelligence technology, image processing has become a common technology and is widely used in various fields to provide people with high-quality services. Starting from computer vision algorithms and image processing technologies, the computer vision display system is designed, and image distortion correction algorithms are explored for reference.

**Keywords**—Vision Algorithm, Image Processing, Technology Computer

## I. INTRODUCTION

The traditional two-dimensional display method can only display the side projection of a single object. The main reason is that it is limited by technical factors. In order to meet people's increasing needs, researchers have proposed three-dimensional stereoscopic images and formed new display technologies. The advantage of image processing is that 3D voxels can be used to represent the real position in 3D space and form 3D space image, so as to improve the visual effect.

## II. Computer Vision Algorithm and Image Processing Technology

### A. Computer Vision Algorithms

Computer vision algorithm can be said to be a mathematical model for processing images. It is more common in the field of artificial intelligence and has strong technical advantages. In essence, it obtains information from images or data. For humans, facing different images can be directly analyzed according to their own understanding, but using computer for image analysis will produce more interpretation methods, which are more complicated overall. Therefore, researchers choose to use image data types for analysis. The image is interpreted through a physical probability model, and finally a computer vision algorithm is formed. In the application process of this method, it can flexibly identify the image accurately by its own advantage and draw a three-dimensional model and predictive simulation based on the image to provide people with convenient services [1].

### B. Image Processing Technology

Image processing technology mainly refers to the use of computers for image information processing. Due to the characteristics of the image itself, there must be a large number of points, lines, and colors in the geometric figures. The elements are stored by the computer and reasonably reassembled, Split, and adjust to achieve effective image

processing. Common image processing technologies are mainly image restoration, image digitization, image segmentation, image recognition, image coding, etc., to improve the quality of image processing [2].

## III. Computer Vision Display System Design

### A. Light Field Reconstruction Analysis

Compared with the pixel correspondence in traditional two-dimensional display, the true three-dimensional stereo display technology is more complicated, and the overall technical level is higher. Based on the points in the three-dimensional data field, a three-dimensional space is formed for urban and rural areas. The pixel (voxel) is the most basic unit, expressed in the form  $(x, y, z)$ , forms a true three-dimensional stereo image through multiple column body points. In the application process, the mechanical field and optical engine are used to realize the light field reconstruction process [3]. For example, taking the actual five-dimensional light field function as an example,  $F: L \in R^5 \rightarrow \in R^3$  describes the light field function distributed in three-dimensional space, where  $L = [x, y, z, \text{quasi}, \text{quasi}]$  is expressed as the midpoint of the space  $Y = [r, g, b]$  represents the color information of the image. During the display process of the three-dimensional image model and texture, it can be presented as a discrete set of points, expressed as  $L = [L_1, L_2, L_3, \dots, L_n]$ , and the position and color representation of the points in the process space is  $L_i = [P_i, Y_i]$ ,  $P_i, Y_i$ , as shown below is the light field propagation diagram under the visual algorithm, as shown in Figure 1.



Figure 1. Light field propagation diagram

Perform a 3D light field reconstruction on the h depth subset in the point set  $L$ , divide it based on the depth, and divide it into multiple subsets. In this subset, each subset can form a light field reconstruction to form a 3D state image. At the same time, the use of two-dimensional projection technology to reconstruct the slice image can achieve high-speed operation, and the

reconstructed image generated by it belongs to the three-dimensional light field [4].

### B. Designing A Display System

For the current three-dimensional display of the rotating LED dot matrix, imaging can only be performed in the form of a column to form a three-dimensional three-dimensional light field, but its resolution is low and the angle of view is small. A true three-dimensional display system is designed, which mainly focuses on the intelligent interaction of the ARM processor, and flexibly uses its advantages to improve the resolution and improve its voxels.

In the process of shooting an object using a three-dimensional environment, it is necessary to clearly show the three-dimensionality of the object, store the imaging sequence of the object after shooting, and flexibly use video acquisition technology to import the sequence of the image and complete the slice processing of the image. The data information is transmitted to the video interface, and the image information is processed at a high speed after being processed by the DMD device. Finally, the data image is projected back using a scattering screen. The high-speed operation of image information is inseparable from the drive of the motor. The rotation speed sensor is used to detect the angle of the turntable flexibly, and the detection signal is transmitted to complete the final control. During the operation of the servo motor, the related equipment will synchronize the position information of the acquisition device and use the advantages of the controller to generate a code to form a DVI frame rate signal, and flexibly use its advantages to achieve synchronization between the scattering screen and image projection. Design an intelligent interactive true three-dimensional display device, which uses information analysis. The intelligent interactive true three-dimensional display device is composed of a scattering screen and a turntable, and contains a large number of acquisition equipment, motors, projectors, controllers, and processing devices to form a complete display device [5].

## IV. Image Distortion Correction Algorithm

### A. Correction of Distortion

Under the computer vision algorithm, the advantages of the computer can be brought into full play for distorted image processing. When the projection device performs vertical projection, the magnification of the vertical axis is gradually increased due to the factors of the field of view, which leads to the intelligent interactive true three-dimensional display. Significant shifts occur in the prime points in the device. When the shift increases, the image will appear significantly distorted. At this time, staff need to flexibly apply technology to process to eliminate the effects of distortion. Utilize computer image processing technology flexibly to correct, process pictures, eliminate distortion, and promote its restoration to its original state to meet the needs of the current stage. There are two main types of distortion removal techniques commonly used in processing. One is tangential distortion and the other is radial shear. However, the first case is not effective and the application is rare. In fact, for the current distortion processing, in the actual processing, radial distortion includes pincushion distortion and barrel distortion, which are common in barrel

distortion of device images. Because straight lines are mainly symmetrical in image space the center is a straight line, and the rest is not a straight line. It is necessary for the staff to clearly determine the center of symmetry during the processing and use computer vision algorithms to flexibly correct the image distortion to achieve the final purpose. For image distortion, the main reason is the distortion of the spatial state, which is often called curve distortion. Traditionally, the quadratic polynomial matrix is used to process the distortion coefficient in the processing process, but there is a certain degree of ambiguity, which needs to be determined according to Perform matrix adjustments to improve the quality of programming analysis. Distortion correction using computer vision algorithms is an advanced method at the current stage. It uses the advantages of neural networks to perform reasonable processing and forms a network sharing structure to reduce the complexity of network models and ensure high-quality recognition of distorted images [6].

### B. Distorted Image Processing

In the process of distorted image processing, convolutional neural network technology can be used flexibly, and its technical advantages can be fully utilized to innovate to achieve the ultimate goal. In fact, the convolutional neural network technology has good weight sharing and sparse connectivity. The overall method is simpler and less difficult and can be flexibly applied in the deformation process. In this process, multi-dimensional image input is used as the basis to promote the penetration of images into the network. The traditional algorithm recognition method has been changed, the technical advantages have been fully realized to extract data, and training parameters have been reduced based on computer vision algorithms to increase control capacity. To improve the level of data processing. In this process, convolutional nerves play an important role. Compared with traditional networks, the presence of pooling layers and convolutional layers can avoid the occurrence of feature sampling and obtain data information from training to improve its integrity. The original neural network classifiers are separated to reduce the characteristics of weights, integrated into multi-layer perceptrons to achieve structural reorganization, and directly perform grayscale image processing to ensure its image classification. During the calculation of the convolution layer, the feature map can be convolved with the convolution kernel to activate its functional features, ensure that its operation process is reasonable, and obtain the final feature map.

## V. Conclusion

In the current era, network information technology is gradually innovating, which promotes the improvement of the overall technical level. It optimizes traditional analog images and converts them into digital images. Its technology has more advantages and provides people with convenient services to ensure the authenticity of the images. Clarity. At the same time, this paper further studies the image distortion correction method, based on computer vision technology, flexible innovation, through convolution neural network calculation of image distortion, the image of high-quality geometric distortion correction, so as to make the image clear.

## REFERENCES

- [1] Chen Hongjun, Xie Jianmin. Research on image processing technology based on computer vision algorithm [J]. Journal of Jilin Radio & TV University, 2019, 12 (10): 158-160.
- [2] Zhang Peng, Bai Yongju, and Mu Renlong used image processing algorithms [J] .12 (05): 61-63. Research and Exploration of Computer Vision Lab, 2018,12 (05): 61-63.
- [3] Li Guanfa. Analysis of Image Processing Technology Based on Computer Vision Algorithms [J]. Information Recording Materials, 2019, 20 (06): 125-126.
- [4] Liu Hailing. Image processing technology based on computer vision algorithm [J]. Computer and Digital Engineering, 2019, 47 (03): 672-677.
- [5] Zeng Zhenzhen. An image processing technology for computer vision algorithm [J]. Information Technology, 2018, 10 (04): 74-78.
- [6] Wang Hong. Plastic vision sorting system based on computer vision algorithm [J]. Plastic Industry, 2019, 43 (11): 69-72.