

# On Application of Computer Vision Technology in Industrial Field

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**Abstract:** China has a perfect industrial system, and industrial production is also a pillar industry to promote social and economic progress. After the government put forward the strategy of “Internet plus”, information technology has been applied to industrial production and has played an important role. Computer vision technology is a new technology. Its application in the industrial field can quickly and efficiently complete the information collection and acquisition, improve the production efficiency and reduce the production cost. Therefore, based on the characteristics of the industrial age, enterprises should reasonably apply computer vision technology to improve the informatization and intelligence of industrial production.

## 1. Introduction

With the continuous acceleration of industrialization, various new production technologies and production processes are emerging and promoting the rapid progress of China's industry, especially the emerging technologies supported by information technology, which play a key role in modern industry. In the past industrial production, data acquisition mainly relied on traditional means, which not only consumed a lot of human and material resources, but also difficult to ensure the accuracy of data. Computer vision technology is a new technology. It can dynamically, efficiently and accurately obtain production data, extract valuable information resources and help enterprises carry out production analysis and make decisions. It has important value and positive significance to promote industrial progress.

## 2. Computer Vision Technology and Industrial Vision

With the fast progress of industry, the concept of industrial vision came into being. The application of computer vision technology can give better play to the production advantages of industrial vision. Its advantages such as long-distance acquisition, non-contact acquisition and large amount of information can provide assistance for industrial production.

### 2.1 Computer Vision Technology

The principle of this technology is to simulate the visual function of human eyes, extract valuable information from images and data, and effectively recognize different data and different forms. The input method is the main theoretical basis of this technology. In the projected image or scene, the symbol description can be obtained through different time, different angles and different directions according to the input array. The application of this technology is mainly divided into three stages. The first stage is to extract the features of the given image, scene and data, obtain the data such as direction, material and distance, and analyze and process the data by computer. The second stage is to take the established observation coordinates as the core, form a scientific coordinate system, describe the surrounding scenery or image, and reconstruct the scenery in combination with the specific situation. At the same time, it also has the functions of volume segmentation and surface materialization. The third stage is to complete the construction of

three-dimensional graphics according to the obtained data and information. The graphics construction takes the observation angle as the coordinate and uses symbols to complete the description of three-dimensional space and structural relationship. With the fast progress of computer vision technology, it has been widely used in many fields, including building detection, military, medical diagnosis and manufacturing.

## **2.2 Industrial Vision**

Industrial vision is a new concept, which is supported by information technology, intelligent technology and communication technology, and can fully meet the needs of industrial production. For example, in visual detection, it can quickly complete object data extraction and analysis, promote the measured object to better assist production and achieve the established detection purpose. Meanwhile, industrial vision is essentially different from the previous vision system. It has diversified functions and can assist production. From the perspective of the current development of industrial vision, it mainly includes robot system and monitoring system. Firstly, robot system, mainly represented by artificial intelligence robot, has computer vision function. It can control and guide production through visual measurement. Secondly, the detection system completes the analysis and comparison of object images through vision technology, which is mainly used in quality detection and product design.

## **3. Application Value of Computer Vision Technology in Industrial Field**

As an advanced technology, the application of computer vision technology in the industrial field has the following values. Firstly, it can ensure the product quality. The application of computer vision technology in product quality inspection can realize the nondestructive inspection of products and find the existing quality problems in time. Compared with the previous manual inspection, it has higher accuracy and efficiency. Secondly, it can reduce production costs. Industrial enterprises aim to maximize benefits. Reducing production costs can improve economic benefits. The application of computer vision technology can reduce human and material costs and avoid excessive waste of resources. Thirdly, it can improve production efficiency. With the support of information technology, the production efficiency of enterprises continues to improve. The application of computer vision technology provides an important technical means for industrial production, new product R & D and quality inspection.

## **4. Specific Application of Computer Vision Technology in Industrial Field**

### **4.1 Template Matching**

In the application of template matching, it is necessary to formulate the detection object and template in advance, and solve the problems in production through template comparison and matching. With the expansion of industrial production scale, the application of template matching technology can solve some common problems, but in order to give full play to its application value, we should fully combine computer vision technology and template matching technology. In the combined application of the two, it can complete three-dimensional and all-round comparison, and then quickly extract and analyze data. For example, computer vision technology has a significant function in measuring object distance, which is similar to template matching. Meanwhile, computer vision technology also has strong fault-tolerance and anti-infection ability, which can avoid the influence of external factors and improve the accuracy and reliability of data acquisition.

### **4.2 Image Preprocessing**

The function of this technology is to extract, process and analyze the information in the image, which can provide convenience for subsequent construction, improve production efficiency and reduce production cost. In the application of computer vision processing technology, the accuracy and resolution of the image are judged according to the preprocessing results. Through processing, the information in the image can be extracted to provide guidance and reference for production

behavior. With the rapid progress of computer vision technology, its edge effect is more significant, which can improve the accuracy of image processing, and simplify the processing process. For modern industrial production, the technical advantage is more significant.

### **4.3 Visual Detection**

Visual detection is the main application field of computer vision technology. In specific applications, relevant information and data can be obtained through image detection, and the extracted data can be comprehensively processed and analyzed according to the needs of users. In visual inspection, to improve the accuracy of data, it is necessary to ensure the output frame format of the image, so as to improve the detection quality. Meanwhile, computer vision technology can also build a three-dimensional model according to the obtained data, which can not only realize energy analysis, but also complete energy distribution. The application of visual inspection can significantly improve production efficiency, ensure product quality and inspection effect, and reduce the investment of human and resources.

## **5. Future Development of Computer Vision Technology Based on Industrial Field**

### **5.1 Improve Application Performance**

With the rapid innovation and progress of industrial field, various new technologies and processes are emerging, and computer vision technology will also develop rapidly. Industrial vision is applied in the industrial field. The main judgment index of its application results is resolution. There are certain differences in component volume and industrial environment, so the standards of visual resolution are also different. Under the established production conditions, if you want to give full play to the application advantages of computer vision technology and ensure the accuracy and reliability of detection, you should start from the aspects of gray level and spatial change, improve the image accuracy and resolution, so as to realize the rapid detection of product performance and complete the accurate accounting of the size and shape of industrial components.

### **5.2 Expand the Application Scope**

From the analysis of the current situation of China's industrial development, various advanced technologies are constantly applied to industrial production. Intelligence and informatization have become the inevitable development direction of the industry. As a new technology, computer vision technology has been deeply applied in industrial production. Especially in image processing, the processing accuracy and efficiency have been significantly improved. Based on the characteristics of computer vision technology, relevant enterprises should actively expand its application scope, such as providing technical support for automatic processing and automatic recognition in industrial robots and visual inspection, so as to realize the sustainable progress of industry.

### **5.3 Reduce Application Cost**

In the process of industrial development, although computer vision technology has played a key role, the main factor restricting the development of technology is the high application cost, which has certain requirements for the informatization degree of industrial production process. With the acceleration of global industrial competition, how to reduce the production cost is a key issue faced by industrial enterprises. In the application of computer vision technology, we should also comprehensively consider the cost elements, take various measures to reduce its application cost, and then give play to its value and role.

## **6. Conclusion**

In short, the rapid progress of modern technology has changed the lifestyle of residents and the mode of social production. After entering the industry 4.0, information and intelligence have become the important signs of industrial production. Under the guidance of the "Internet plus" strategy, Chinese industrial enterprises are actively exploring new development models supported

by information technology. Computer vision technology is a comprehensive technology. Its application in the industrial field can replace manual recognition, improve the efficiency of image processing and data acquisition, reduce enterprise resources and capital investment, and reduce enterprise production cost. It has high promotion and application value. Therefore, enterprises should recognize the advantages of this technology, reasonably apply it to production, and improve the intelligent level of industrial production.

## References

- [1] Wang Shengze, Bao Kaichen, Fan Xijian. On the Application of Computer Vision Technology in Industrial Field [J]. Network Security Technology and Application, no.4, pp.146-147, 2021.
- [2] Yang Junye, Liu Jia, Wang Li. Application of Computer Vision Technology in Industrial Field [J]. Journal of Scientific and Technological Innovation, vol.17, no.1, pp.108-109, 2020.
- [3] Lv Dongsheng. Application Analysis of Computer Vision Technology in Industrial Field [J]. Modern Information Technology, vol.2, no.1, pp.103-104, 2018.
- [4] Huang Wenqing, Wang Yaming, Zhou Zhiyu. Application of Computer Vision Technology in Industrial Field [J]. Journal of Zhejiang Institute of Engineering, vol.19, no.2, pp.92-96, 2002.
- [5] Li Dong. Application of Computer Vision Technology in Industrial Field [J]. Electronic Technology and Software Engineering, vol.0, no.16, pp.147, 2017.
- [6] Li Hongbo, Li Xin, Li Juan. Analysis of Computer Vision Technology and Its Application in Industry [J]. Digital User, vol.25, no.46, pp.130-131,135, 2019.
- [7] Zhang Shun, Gong Yihong, Wang Jinjun. Development of Deep Convolution Neural Network and Its Application in the Field of Computer Vision [J]. Journal of Computer Science, vol.42, no.3, pp.453-482, 2019.