Development and Application of Machine Vision Technology

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Abstract: As one of the hot research topics at present, machine vision has a wide range of applications, and with the development of technology, the research depth and application effect will be better and better. In order to help scholars who want to engage in machine vision research, this paper introduces the existing relevant research directions and application fields, and has a certain guiding role in the research of new directions.

Keywords: Machine vision technology, agricultural production efficiency, intelligent manufacturing, Convenient for daily life.

1. Introduction

Since the birth of machine vision in the United States in the 1960s, it has gradually become one of the main technical means in today's world after decades of development. Machine vision is the vision technology of robots. Its core includes image acquisition, image transmission, image processing and image display. Among them, image processing is the most important. At present, the research on machine vision is mainly focused on image processing. Through the powerful processing ability of the computer, more analysis and understanding of the information contained in the original image can be carried out, it realize the intelligent behavior related to human vision, so as to achieve the simulation and extension of human vision [1], which can be used to help humans better understand and understand the external world.

Up to now, machine vision is no longer a single technology, but a comprehensive technology involving a rich range of knowledge. Specific subdivisions include digital image processing technology, mechanical engineering technology, control technology, light source lighting technology, optical imaging technology, sensor technology, analog and digital video technology, computer software and hardware technology, human-machine interface technology, etc[1]. Through the above-mentioned multi-disciplinary

crossover, machine vision can get better application effects in various fields. Through the research of the subject and the research of the literature, this paper will introduce the current application directions of machine vision.

2. Improve Agricultural Production Efficiency

Agricultural production is related to national development and people's happiness, and is the basis for the development of other industries. Primitive agriculture mainly relies on farmers and simple agricultural implements, with low production efficiency and low controllability. With the advent of the modern industrial revolution, some mechanized production tools gradually played an important role, providing significant help in the cultivation, cultivation and harvest of agricultural products, basically solving the problem of food and clothing for human beings. However, due to the increasing demand for material culture, not only the production of agricultural products have been raised, but also more attention has been paid to its quality inspection. Machine vision is a relatively mature technology. It can provide high help in the fields of agricultural production, agricultural harvesting, product sorting and product processing. In term of agricultural production, the main problem lies in the spraying of pesticides. The traditional average spraying method not only wastes resources and has a poor killing effect on different weeds, but also pesticides are easy to remain in crops and harm human health. To solve this problem, machine vision can help by spraying pesticides on different weeds in a differentiated way, improving the effectiveness of weeding without harming crops. At present, the research direction of relevant scholars mainly lies in the use of image processing technology[2.3]. According to the different morphological characteristics of crops and weeds, the spraying of pesticides has a purpose, and the accuracy of the technology is high, but the problem is that it is difficult to determine the relative position of crops and machines[4.5].

For agricultural harvesting, product sorting and product processing, machine vision can be used for the identification and detection of different fruits and vegetables due to its powerful processing capabilities[6]. According to the different color, shape, size and other characteristic parameters of the crop, they can be classified. The quality and quality of the crop can be detected by comparing the actual shape of the crop with the standard form. The technical method is less difficult to implement and the application is mature. The accuracy rate is very high. Chinese researchers Jiang Huanyu, Ying Yibin and Wang Jianping have developed a real-time detection and grading line of fruit quality suitable for the current situation of domestic agricultural production, which has high theoretical and practical significance[7].

3. Assisted Intelligent Manufacturing

Intelligent manufacturing is a hot topic in today's society. Since the introduction of Industry 2.0 and China 2025, both countries and enterprises have been committed to transformation and upgrading. The emergence of modern intelligent manufacturing technology has not only changed the traditional production methods and organizational structure, but also changed the circulation and sales mode of products dramatically[8]. Machine vision technology is an indispensable key link for intelligent manufacturing. Only when the equipment can automatically capture the target object and send information to the subsequent link according to the target object, can the manufacturing link proceed smoothly. At present, the application of machine vision in intelligent manufacturing mainly includes automobile manufacturing, microelectronic device manufacturing, and intelligent manufacturing of machine tools.

In the process of automobile manufacturing, due to the variety of parts and high processing requirements, machine vision technology is widely used to improve its production efficiency. Researchers such as Bai Guojun proposed the application of machine vision technology to the automatic checking of automobile tires. The fusion Hu is used as the contour feature to match the target tire contour with the template tire contour, thus realizing automatic detection of different types of tires[9]. Wang Yingying put forward the research of piston rod coaxiality error detection based on machine vision, and established the mathematical model of coaxiality error, which can effectively and correctly determine the coaxiality error[10]. Machine vision can also help the parking process of the vehicle. It can search for the parking space and obtain the position of the vehicle body through machine vision, which avoids the disadvantages of having to use the car on the left and right sides when using the ultrasonic to detect the parking space in the traditional method[11].

In other fileds of intelligent manufacturing, machine vision technology is also widely used. For example, some scholars have proposed PCB manufacturing and production technology based on machine vision, and Single Yuekang used machine vision to assist the positioning of PCB CNC drilling rig, the testing and practical use show that the drilling position accuracy is better than 25um, which can meet the high precision PCB positioning requirements[12]. Liu Chunsheng proposed the correction of the positioning deviation of the pcb board based on computer vision technology. The experimental results show that the positioning correction method based on computer vision technology can meet the hole processing precision and production efficiency requirements of PCB board[13].

4. Convenient for Daily Life

With the improvement of quality of life, people pay more attention to the comfort of

daily life and high intelligence, hoping to achieve the control of surrounding things through some simple actions or language, so the concept of smart home is put forward. With the gradual maturity of computer technology, sensor technology and communication technology, the application of intelligent monitoring technology to monitor the elderly at home has become a research hotspot in the field of elderly guardianship.

With the development of the elderly monitoring instruments, its functions are increasingly perfect and diversified, among which machine vision, as a kind of machine sense technology, is of great importance. Vision sensor-based monitoring technology for the elderly refers to the use of single or multiple vision sensors as front-end data acquisition devices, and then through the prospect of extraction technology, target tracking technology, motion recognition technology and abnormal behavior analysis technology to determine whether the current behavior of the elderly is normal, once an abnormality occurs, the system will automatically alarm and send the information to the medical personnel or guardian[14], real-time understanding of their children to the old situation provides a great help.

5. Summary

In view of the widely used machine vision technology, this paper starts from its development process, clarifies the working principle, and introduces its application scenario. At present, machine vision technology is mainly used in industrial manufacturing. Compared with traditional manufacturing technology, it can improve processing precision, increase product complexity, and provide great help for quality inspection of processed products. As described in this paper, in the term of agricultural production, if high-end technology such as machine vision can be combined with traditional machinery to solve the problem of positioning of equipment in complex environments such as farmland, it has revolutionary significance for improving the output and quality of agricultural products.

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