

Research on the Embedded Machine Vision in Information Acquisition and Processing Analysis

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Abstract: With the development of industrial automation, the visual inspection system will gradually require real-time, reliability, availability and other characteristics, at the same time, it also needs low cost and high cost performance. However, embedded machine vision system can have these characteristics perfectly. With the embedded computer as the center, we can cut the hardware and software, which will expand and extend the machine vision technology. Firstly, this paper analysis the composition of embedded machine vision. Then, this paper introduces the information collection of machine vision. Finally, this paper introduces the information processing and analysis of machine vision.

1. Introduction

The current machine vision equipment has many disadvantages, such as large size, inconvenient to carry, expensive and so on. However, embedded machine vision system can solve these problems perfectly. Therefore, by studying the embedded machine vision information collection system and information processing, we can solve many practical problems, which is of great significance. At present, there are many methods of embedded machine vision information acquisition, but the acquisition components mainly include camera, information acquisition card and information acquisition software. Through a / D conversion equipment, we can digitize the embedded machine vision information. The quality of the information collected by this data collection method is poor. Embedded machine vision system includes not only hardware components, but also various integrated embedded software modules. With the continuous improvement of user's demand for function and performance, the design of embedded system becomes more and more complex. Through the development of various multiprocessor chips, we have realized the application requirements of complex systems. For modern automatic production, we can quickly acquire image information and interested information by using machine vision technology, which will achieve information extraction and control. Embedded machine vision information collection and processing will greatly promote the rapid development of automation industry.

2. Embedded Machine Vision System

2.1 Principle and composition of machine vision system

The working principle of machine vision system is mainly as follows. First, we can collect the real-time image of the target object through the visual equipment. Then, we can transform the original information into a processable information format. Finally, we transmit the information to the central system for image processing. According to the shape, color, light and other information of the image, the image processing center will extract the required feature values according to the control requirements, such as the number, size, contour, position relationship of the target, etc. Through physical analysis, we can generate control commands from the analysis results of these features. Through the control command, we can control the device to generate corresponding actions. Machine vision system is generally divided into three functional modules, namely image information acquisition, analysis and processing, display output and control, as shown in Figure 1.

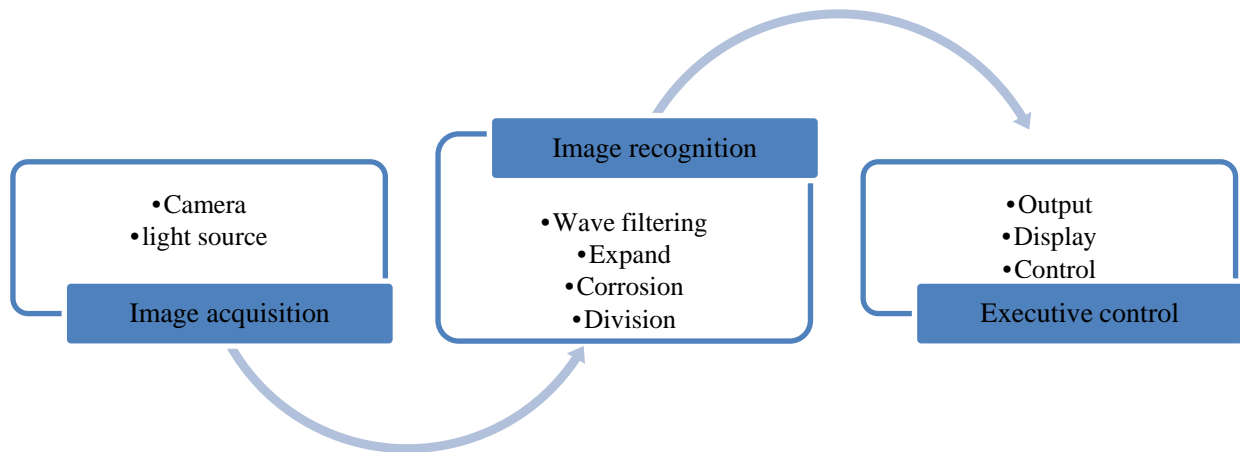


Figure 1: Composition of visual system

2.2 Composition of embedded machine vision system

According to the structure, the typical machine vision system can be divided into two categories: computer machine vision system and embedded machine vision system. Embedded machine vision system is centered on embedded machine vision system. Through software and hardware tailoring, embedded machine vision system can be applied to applicable scenarios, which has many advantages such as multi-function, high reliability, low cost, small volume, small power consumption and so on. Embedded machine vision system is the extension of machine vision application, which is generally composed of four parts: embedded processor, peripheral hardware device, embedded operating system and user's application program.

3. Information Collection and Processing Analysis

3.1 Image information acquisition

Acquiring image information is the foundation and premise of vision system. By collecting the real-time information of image, we can transform the information into a processable format, such as digital image information. Vision acquisition equipment is generally divided into two categories, vision camera and vision sensor. In the industrial machine vision system, most of the vision devices are CMOS and CCD, which have three forms: monocular, binocular and multiocular. Among them, CCD (charge coupled device) is also called charge coupled device, which is a semiconductor device that can transform optical image into digital signal. CCD is widely used in photography industry, such as digital photography, astronomy, scanner, optical telemetry technology, high-speed photography technology, optical and spectrum telescope, etc. CCD has many characteristics, such as high sensitivity, good imaging effect, low noise, fast response, stable performance and so on. CMOS (complex metal oxide semiconductor) is a kind of complementary metal oxide semiconductor, which is the basic unit of digital integrated circuit. Compared with CCD, CMOS has the advantages of low cost and low power consumption. Based on the hardware support, the embedded machine vision information collection process is described in Figure 2.

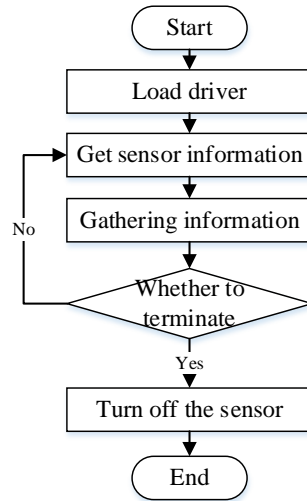


Figure 2: The embedded machine vision information collection process

3.2 Image processing analysis

The core step of vision system is image information analysis and processing. By simulating the thinking process of human brain, we can make decisions and generate control commands. Through image processing technology, we can segment the image information, enhance the effect, binary processing, contour detection, recognition and matching. By extracting the key information from the target object, we can generate control commands from the features and transmit them to the control equipment. Finally, we will generate the information we need. Figure 3 is the processing analysis result of an image.

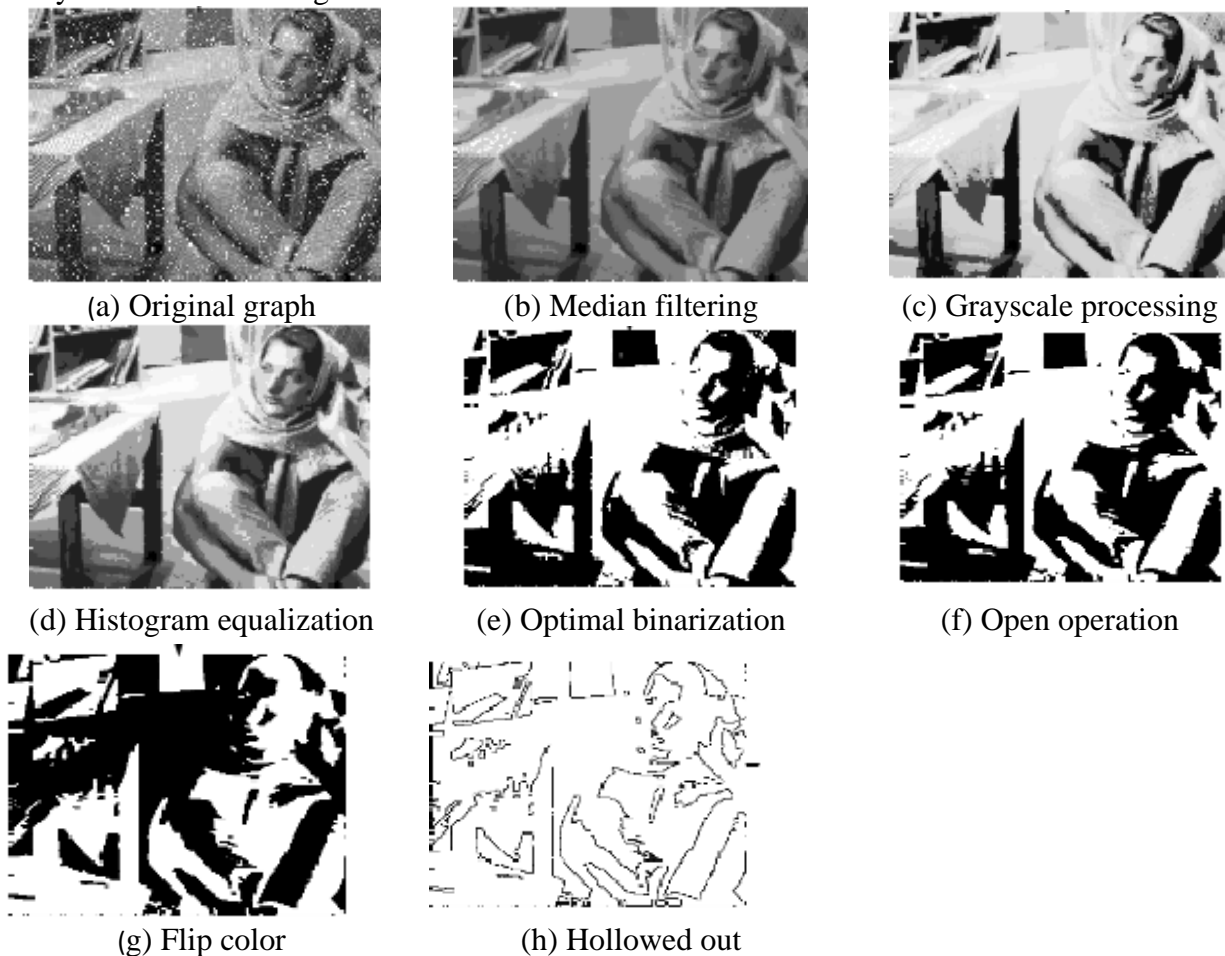


Figure 3: The image processing analysis

3.3 Display output or control

When the control equipment receives the control command, we can analyze and generate the corresponding action and signal output, such as the speed coordination of the master-slave axis, the movement of the manipulator, the alarm light on, etc. Through the development and debugging of visual system, we can adjust the algorithm and optimize the processing model.

Conclusions

Embedded machine vision system basically realizes the application of specific scene, which includes the related algorithm of machine vision system and the implementation based on embedded system. By improving the accuracy of the system, we can improve the type and quantity of samples collected. The algorithm in the system is optimized and verified for different environments. Machine vision can extract the information that users are interested in from the acquired image vision information, which realizes the information extraction and control.

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