电子元器件外形尺寸机器视觉测量系统设计

摘　要 电子元器件是电路的基本组成部分，有着广泛的应用。传统工业制造领域对于电子元件产品的尺寸检测多依赖于人工检测，人工检测极易造成漏检与误检，不能满足工业高速发展带来的需求。机器视觉尺寸测量技术由此应运而生，机器视觉由于自身具备高灵敏度、高精度及高耐用性的特性，对于提高工业自动化水平和工业生产效率有极大助力。

根据课题要求，以单片机芯片为研究对象，以检测单片机芯片二维平面上的长度与宽度为研究目标，设计了基于机器视觉的单片机芯片检测系统的硬件方案，硬件组成包括光源与照明方式的选择，以及相机与镜头的选择。完成硬件平台搭建后，同时制作了应用于相机标定的标定板并在调试完成的硬件平台上拍摄了三十张左右的标定图片。利用 MATLAB R2016A 作为系统的软件处理平台，一方面应用 MATLAB 标定箱对标定图做相机标定，另一方面编写用于单片机芯片尺寸测量的图像处理代码及测量代码。其中，在图像处理环节主要包括图像滤波、二值化处理和边缘提取等步骤。

单片机芯片的尺寸测量实验完成后将实验结果与真实尺寸的对比，可以看出构建的基于机器视觉的电子元器件外形尺寸测量系统满足了课题设定目标。

关键词：机器视觉；图像处理；相机标定；尺寸测量

The design of machine vision measurement system for the dimension of electronic components

Abstract: Electronic components are the basic components of the circuit and have a wide range of applications. In the traditional industrial manufacturing field, the size detection of electronic components mostly depends on manual detection, which is easy to cause missed and false detection, and can not meet the rapid development of industrial demand. Machine vision detection technology came into being. Because of its high sensitivity, high precision and high durability, machine vision has a great help to improve the level of industrial automation and industrial production efficiency.

According to the requirements of the project, the hardware scheme of the system based on machine vision is designed, which includes the selection of lighting source and lighting mode, as well as the selection of camera and lens. After the completion of the hardware platform, the calibration board for camera calibration is made and about 30 calibration pictures are taken on the hardware platform after debugging. Matlab r2016a is used as the software processing platform of the system. On the one hand, the camera is calibrated by MATLAB calibration box. On the other hand, the image processing code and measurement code for the chip size measurement are written. In the process of image processing, it mainly includes image filtering, binary processing and edge extraction.

By comparing the experimental results with the real size, the size detection system of electronic components based on machine vision meets the goal of the project.

Key Words: Machine vision; image processing; camera calibration; size detection

目　　录