

The introduction of AOI in PCB defect detection based on linear array camera

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Abstract. Along with the rapid development of computer technology and digital image processing, traditional PCB technology of defect detection could not meet the demand of the quality of PCB, meanwhile AOI has received increasing attention. This paper mainly introduces the AOI machine based on PCB defect detection, hardware structure and software system is respectively carried on the design. In addition, provide a new method of defect detection which is based on the comparison of contour and introduce the process of camera calibration chiefly.

Introduction

With the development of science and technology, PCB (Printed Circuit Board) keep forward moving to the trend of high accuracy, high complexity and high performance, which challenge the quality of PCB detection^[1]. Because of immature technology, high costs, low efficiency and other factors, traditional PCB defect detection method is hard to meet the demand of accuracy of PCB now, however, as a new automatic detection technology, AOI is just able to solve the problem. This paper studied the application of high-precision, high accuracy, enabling rapid detected AOI in PCB defect detection, which using a new method to detect PCB defection based on comparison of contour. Meanwhile, the camera calibration is also an important part of AOI.

AOI Brief Introduction

AOI system first analyzes and deals with standard PCB image information in CAM file. Then optical imaging unit is settled on a precision X-Y table, scanning the PCB which is to be detected^[2]. It forms test PCB image in the computer. By comparing the standard image and test PCB image in logic, we can detect and classify the defect through its contour feature^[3]. The last step is to make the data feedback to users. Hardware and software collaborative work and make a whole. AOI flow chart is shown in Fig.1.



Fig.1. AOI flow chart

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Pattern Recognition DAGM (Organization). Symposium,2003 *Proceedings of the IEEE International Symposium on Industrial Electronics* ,2001 **AUTOMATIC OPTICAL INSPECTION-BASED PCB FAULT DETECTION USING IMAGE PROCESSING** ,2023 Abstract Increased Printed Circuit Board PCB route complexity and density combined with the growing demand for low scale rapid prototyping has increased the desire for Automated Optical Inspection AOI that reduces prototyping time and production costs by detecting defects early in the production process Traditional defect detection method of human visual inspection is not only error prone but is also time consuming given the growing complex and dense circuitry of modern day electronics Electric contact based testing either in the form of a bed of nails testing fixture or a flying probe system is costly for low rate rapid prototyping An AOI is a non contact test method using an image processing algorithm that quickly detects and reports failures within the PCB layer based on the captured image A low cost AOI system has been created using commercial off the shelf components specifically for low rate production prototyping testing allowing testing of varying layers or various electronic designs without additional setup cost Once the AOI system is physically configured the image processing defect detection algorithm compares the test image with a defect free reference image or by a set of pre defined rules generated through Electronic Design and Analysis software Detected defects are then classified into two main categories fatal and potential Fatal defects lead to the board s rejection while potential defects alert the operator to determine if the board should be rejected or will still satisfy pre defined prototyping criteria The specifications of an imaging system camera sensor imaging lens and illumination set up used in the creation of the AOI were designed considering a test PCB article already in production The algorithm utilized is based on a non reference defect detection method utilizing mathematical morphology based image processing techniques to detect defects in the PCB under test

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