

Image processing application for detecting common defects in printed circuit board production

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Abstract: This study presents an image processing application for the automated detection of common defects in printed circuit board (PCB) manufacturing. Manual visual inspection is often slow, subjective, and prone to human error, creating a bottleneck in high-volume production. To address this, a computer vision system was developed to identify prevalent faults, including short circuits, open circuits, missing components, and solder joint defects. The methodology involves capturing high-resolution images of assembled PCBs, followed by preprocessing steps such as grayscale conversion, noise reduction, and image alignment. Defect detection is achieved through a combination of template matching, morphological operations, and pixel-based subtraction between the inspected board and a reference image. Experimental results demonstrate that the proposed system achieves high accuracy and efficiency, significantly reducing inspection time compared to manual methods. The approach offers a reliable, cost-effective solution for quality control, enhancing production yield and minimizing the risk of defective products reaching the market.

Keywords: Image processing, defect detection, printed circuit board, manufacturing inspection