

Description

Automated Optical Inspection (AOI) uses a combination of optical imaging and digital image processing for the inspection of printed circuit boards (PCBs) in the electronics industry.

The technique employs a Golden Image of a 'good' PCB from which the active image of the PCB being inspected is subtracted. Any resulting difference can be used to pinpoint potential defects and for automatic defect recognition. TWI is investigating this technology using Machine Vision Products (MVP's) Gem Tabletop system and using TWI's own bespoke hardware and software algorithms. The photograph below shows a PCB being inspected with the optical imaging camera.

There are three critical stages in PCB manufacture; solder paste printing, component placement and reflow oven. AOI can be used after each stage. After printing, AOI can detect whether the stencil was correctly aligned. Incorrectly placed or missing components can be detected after the board has been populated. The final inspection after the PCB has been through the reflow oven can show up excess or insufficient solder and can detect if any component has 'migrated' during the reflow process.

The residual image left after subtracting the golden image from the image of the target PCB will be black except for areas of difference. These are therefore potentially defective. The four images at the top of the page illustrate the technique. The image labelled 'd' shows the residual image overlaid on the golden image. Suspect areas or components are indicated in green.

AOI is not restricted to PCB inspection. It can be used for surface inspection of any material and can be used to replace other forms of visual inspection.

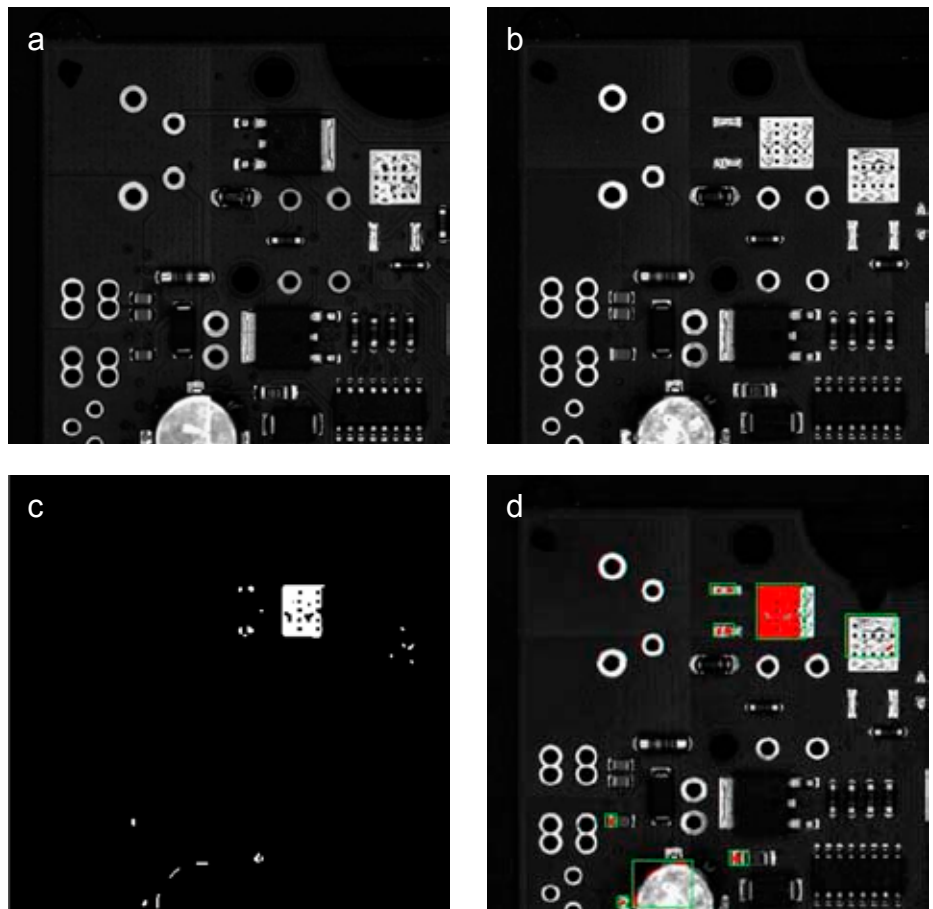


Illustration of the Automated Optical Inspection technique, showing (a) the Golden Image, (b) the target image, (c) the residual image (target image subtracted from the Golden Image), and (d) the residual image overlaid on the Golden Image showing defective areas highlighted in green.



A PCB under the optical imaging camera

Applications

TWI is currently investigating the use of AOI as one technique in an integrated system for PCB inspection. Other techniques for potential inclusion in the overall inspection system are micro-focus x-ray, acoustic methods and thermal / infrared imaging. This work is being undertaken in the Microscan collaborative project partly funded by the European Commission.

For more information on the services offered in this leaflet, contact:

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