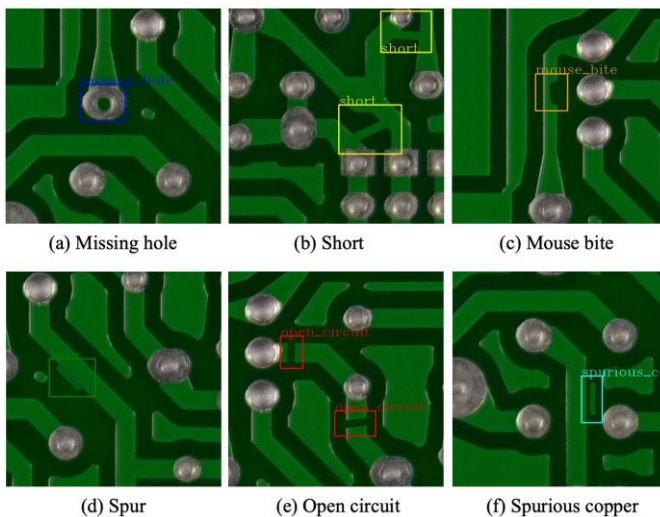


Printed Circuit Board (PCB) Defect Detection Project

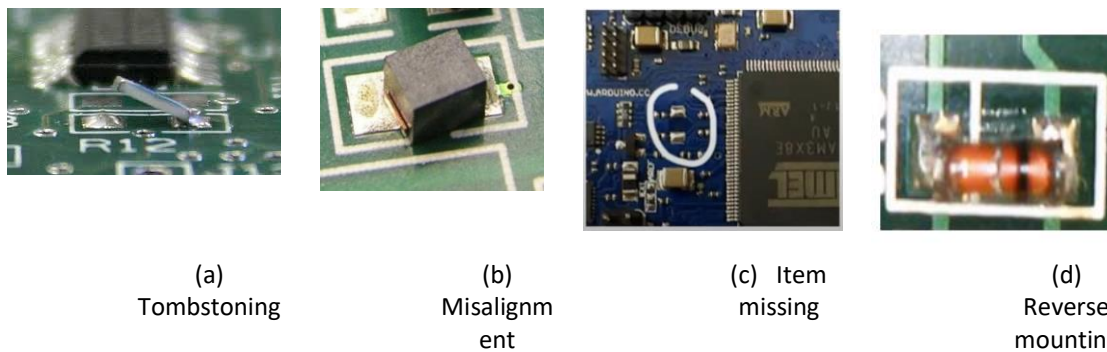
The performance and lifespan of electronic products largely depend on the quality of PCB boards used. Throughout the production process, the product undergoes testing at multiple stages: component level, PCB level, pre-packaging, and system level. Detecting faults early in the process (before the product reaches the customer) helps minimize manufacturing costs, as faulty products can be repaired or discarded before packaging.

In this project, you will design an automated system to detect defects on a PCB. The system consists of a conveyor, an imaging system and an associated software. PCBs are SMD (surface mount devices) where the circuit is designed to be mounted onto the PCB. The defects to be detected in the project can be classified into two: a) Bare PCB defects and b) Component Mounted PCB defects. An image of possible defects in each class is given below. In this project, you are asked to automatically detect all defect types in each class. For class (b) defects you can assume that the layout diagram (.pdf) and component list (.xls) are available for the given PCB.

a)



b)



Features of specific parts are given below.

1. PCB Inspection Conveyor features

- a. The conveyor is fed with a single size PCBs (the maximum PCB dimension is 10 cm x 10 cm) in random orientations. The PCBs can be defect-free, have a single defect, or contain multiple defects of various types. Only bare or component mounted PCBs can be fed at a time,
- b. The conveyor belt should be at least 1m.

2. Imaging System Main Components:

- a. Appropriate lighting system can be used,
- b. Multiple cameras or a single moving camera can be used,
- c. Defects are shown to the user by a visual mark.

3. Defect Detection Algorithms and Performance Criteria:

- a. The system is expected to operate in near real-time,
- b. The system is expected to process PCBs with class (a) defects at a speed of at least 10 PCB/min and PCBs with class (b) defects at a speed of at least 3 PCB/min,
- c. Precision-recall curves should have acceptable performance.

Optional: Defect types are identified. Defected PCBs are collected automatically.