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## PCB fault detection using Artificial Intelligence

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### ABSTRACT

*PCB (Printed circuit board) is that the fundamental carrier in electronic devices on which a number of small electronic components are placed. Performance of devices is affected largely by a fault in PCB. To overcome the inefficiency of manual detection, time and cost, automated optical inspection (AOI) supported machine vision has been widely utilized in industry. As PCB designs get more and more complicated, the tasks like detection and classification also get more harder than before. For the purpose of solving above problems, we have proposed a PCB fault detection system using machine learning. The system will automatically detect the PCB with the help of computer vision and compare with working PCB image which will be already saved in database. After comparison, the application will be able to tell whether PCB is working or faulty and likewise generate a report. It will also recommend a solution on faulty PCB.*

**Keywords:** Printed Circuit Board, Machine Learning, Algorithm, Django Framework, Python, Computer Vision.

### 1. INTRODUCTION

PCB (Printed circuit board) is that the fundamental carrier in electronic devices on which a number of small electronic components are placed. Performance of devices is affected largely by a fault in PCB. With the ever-growing development in technology the components and circuits on the printed circuit board are becoming far more complex, and thus cost for production is on rise. Traditional detection methods are now facing many new challenges to meet the world's ever-growing demand for more complex circuit boards.

In this paper, we are proposing a Automatic system that will detect the faults within circuit board with help of technologies such as machine vision and machine learning.

### 2. LITERATURE SURVEY

When circuit boards design were simple, with few components and solder connections, manual visual inspection technique was used for identifying placement errors and solder problems. To reduce human errors, Automated Optical Inspection technique is now a widely used to check a variety of possible faults that may have taken place during production. Another widely used testing technique is In-circuit testing. This technique focuses on the functioning of individual components after they are soldered in right place.

Many researchers from different parts of globe conducted studies on ways to improvise the testing techniques for more complex circuits. Priyanka Tanaji Rupanavar presented a method by using image processing technique to detect two types of faults [1]. Method used a simple image subtraction algorithm to conduct tests and find faults. Anoop K.P, Sarath N.S, Sasi Kumar V.V. represents studies for fault detection using image processing and image segmentation [2]. Method focuses on testing single layer circuit board by hybrid algorithm. Ahmed Mosad Mohamed, Mohamed H. ElMahlawy presented a testing method called REFD method [3]. Method uses IOT hardware and various algorithms to conduct tests.

### 3. PROPOSED SYSTEM

we have proposed a PCB fault detection system using machine learning and computer vision. The system will automatically detect the PCB with the help of computer vision and compare with working PCB image which will be already saved in database using Image subtraction technique. After comparison, the application will be able to tell whether PCB is working or faulty and likewise generate a report. It will also recommend a solution on faulty PCB.

A. System Requirements

- i) The user interface or UI for the software should be compatible to be used by any standard browser such as IE, Mozilla or Google chrome.
- ii) Intel Core I3 or Higher 2 processor , 4 GB or Higher RAM .
- iii) Windows OS , linux distributions , MAC OS.

B. System Architecture

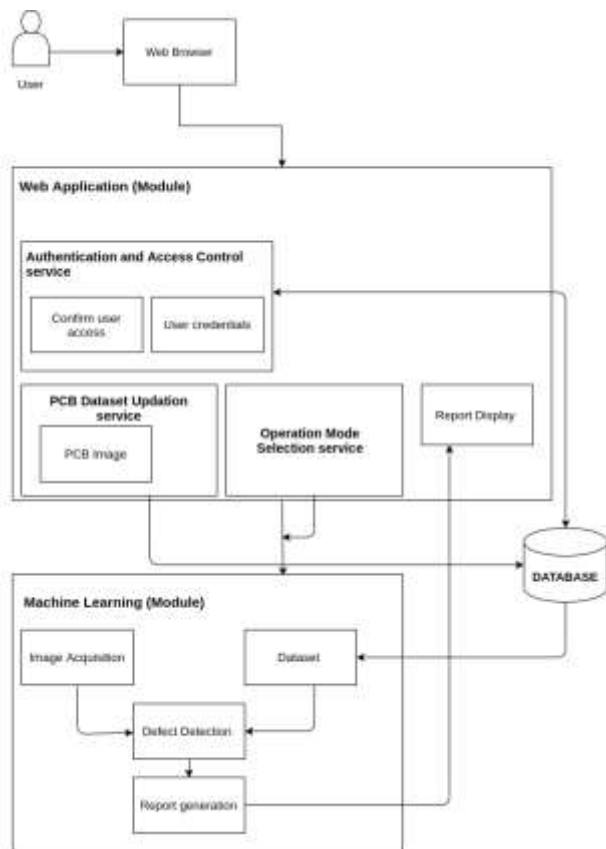


Fig: System Architecture

In this architecture user interact with system through web browser. In this system there are three module first is Web Application module, second is Machine Learning module, third is database as shown in above diagram.

i) Web application module is responsible for Authentication and Access Control service which will confirm user access . This

module will also be responsible for PCB dataset updation service and Operation mode selection service which will be invoked by system administrator. This module will act as simply user-interface between system and user.

ii) Machine Learning module is responsible for handling backend processes like image acquisition and detection. This module will make use of neural networks and YOLO algorithm and image subtraction technique to perform fault detection process on given input.

iii) As a database server, primary function of this software is to storing and retrieving data as requested by other from end software applications which may or may not run either on the same computer or on different computer.

4. CONCLUSION

Proposed system provides accurate detection of Faulty PCB. The PCB inspection system is able to detect a defective PCB in a very fast pace using Artificial Intelligence. Simple User-interface allows user to interact with system more easily to make any necessary changes. It reduces cost and time of company to test multiple PCBs. The accuracy of using YOLO algorithm for an PCB Inspection on Etched boards is not satisfying despite being able to spot a defect in every single tested board, this will be critical if there are lots of boards with copper trail or circuit defects. However, from the result of the testing we can conclude that the resolution of the Images directly affects the accuracy, as the higher the image size, the accuracy of the detection is also higher.

5. REFERENCES

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