Link to the Video Explanation:

https://drive.google.com/drive/folders/1RJJiMtFOvFU32MNJBB09Nd_Xu7B0F3j1?usp=sharing

MOSFET DRIVER PCB COMPONENTS CHECKER

1st ABHIJEET RAJ 19BEE0172
Electrical and Electronics
Vellore Institute of Technology, Vellore
Vellore, India

2nd KETAKA SINGH 19BEE0039
Electrical and Electronics
Vellore Institute of Technology, Vellore
Vellore, India

3rd PRIYANKA ROY 19BEE0377
Electrical and Electronics
Vellore Institute of Technology, Vellore
Vellore, India

***Abstract*—The aim of this project was to develop a android mobile application that can scan a PCB board to tell what all components are missing in the PCB and if all components are present then only give a green signal to the user for usage. For this the image processing technique TEMPLATE MATCHING was used. The openCV library was used to get the TEMPLATE MATCHING Functions.**

***Index Terms*—PCB,MOSFET Driver Circuit, Template Matching,Android,Object Detection**

I. INTRODUCTION

The usage of PCB boards is vast and probably every other electronics component or product you see has a PCB inbuilt in it. PCBs are everywhere. Hence the number of PCBs around us is unimaginable hence checking each PCB board individually could be cumbersome and a tedious task to be done. Thus technology has to step in here to help us save time and give us better accuracy in checking PCBs. A PCB can have many kinds of Faults. There could be missing components, or there could be a dent in the PCB or any other fault. But the most frequent or critical fault that needs to be taken care of is the missing components fault. Hence in this project we propose a product or a mobile android application that could give us accuracy and greater results with the checking of PCBs. Through this application a user/engineer can easily detect the components that are missing and need to fixed or replaced.

II. LITERATURE REVIEW

A. Saad ALBAWI , Tareq Abed MOHAMMED (2017) Understanding of a Convolutional Neural Network

In this paper the important issues are discussed that are related to Convolutional Neural Network (CNN) and explain the effect each parameter on performance of network . The most important layer in CNN is convolution layer Which takes most of the time within the network. Network performance also depends on the number of levels within the network. But in the other hand as the number of levels increases the time required to train and test the network. Today the CNN consider as power full tool within machine learning for a lot of application such as face detection and image , video recognitions and voice recognition. [1]

B. Jianqiu Chen (2020) Image Recognition Technology Based on Neural Network

This paper has conducted some research in the field of face image classification algorithms, and put forward some solutions and ideas for improvement, although it has achieved certain effects and improvements. However, there are still many shortcomings, and further work needs to be completed later. For example, whether the structure of the model can be further optimized to better balance model performance and detection efficiency. For the use of key information of the model, more new ways can be tried, combined with traditional image processing methods for better use. [2]

C. Azeddine Elhassouny Florentin Smarandache (2019) Trends in deep convolutional neural Networks architectures

In this paper, a survey of recent advances in CNN architecture design is discussed Until 2017, there are three major periods in CNN history, the period of lack of capacity of storage and computation resources, the period of highest accuracy, regardless number of parameters and the period of embedded CNN model on Mobile phone. However, there is no rule or theory how to build CNNs models, but researchers proceed by experimentation and model design copying. Experimentally, CNN with large depth gives the better results and high accuracy [3]

D. Jithendra P R Nayak ,Parameshachari B D et. al. (2017) Identification of PCB Faults using Image Processing

This paper attempts to detect two types of PCB faults effectively. The aim of this paper is to develop a more accurate PCB inspection system. In this method captured colored images are natural images i.e. without any precustomized environment and hence the every time the capture images varies with lighting conditions, the distance and inclination and these issues are to be handled effectively. Most of the work in this regard just detects the location of the fault but merely little work has been carried out to identify the type of the PCB faults automatically. [4]

E. Salunke Purva A,Sherkar Shubhangi N,Arya C.S.(2021)

PCB (Printed Circuit Board) Fault Detection Using Machine Learning In this paper it is discussed how a robotized testing framework for Printed Circuit Board (PCB) is likely Thus

in this area, digital image processing can be used mainly for the detection of faulty parts or missing components. This framework primarily manages examination to identify faulty PCB. Digital camera is utilized in mechanized visual assessment framework that catches picture of each example PCB item to get the innovative advances in PCBs plan and assembling, takes out specific angles and afterward gives quick, quantitative, and dimensional burdens.

III. Methodology

1) DataSet Generation
   - Clicking images of each component of the PCB
   - Crop them(Only PCB portion in image)
   - Store them in server as black and white (2D array) images with each file name as the name of the component itself.
2) Algorithm Building
   - Making use of 'TEMPLATE MATCHING ' creating a project specific algorithm.
   - What is TEMPLATE MATCHING?
     template matching is to find a smaller image or template into a larger image. The openCV library of python has implementation of template matching.
   - Applying this library we are building an algorithm
3) Implementation
   - Implementing the template matching algorithm to our data set and observing the outputs
   - Based on the observations creating an algorithm that solves the problem statement.

IV. Flow Chart with Explanation

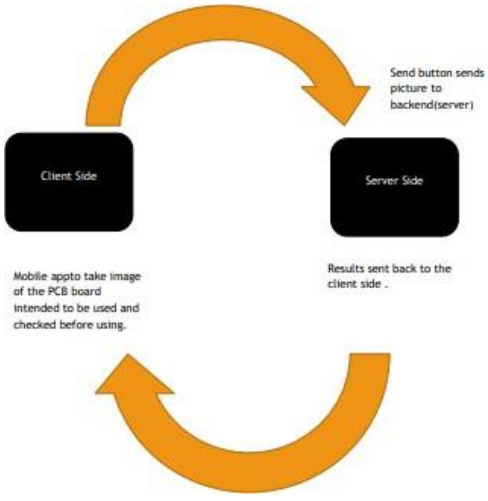

Fig. 1. Flowchart

V. Design with Explanation

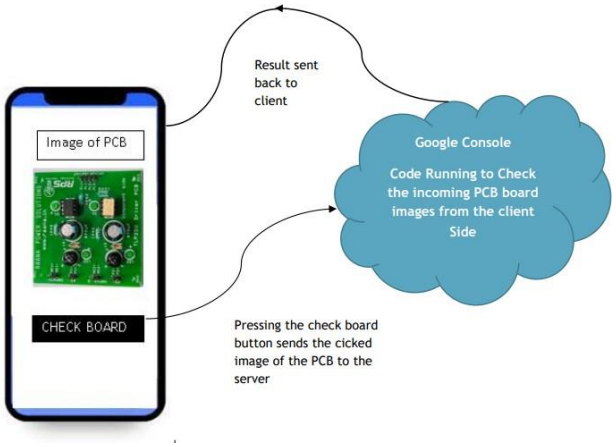

Fig. 2. Design of the Project

VI. Proposed Algorithm:

1) Take images of all components of the PCB and convert each of the colored(3 dimensional RGB) images into black and white(2D array) images and store these images as templates
2) Also store the location data of each template by usingthe correct PCB board
3) Find each component in the PCB board using the templates stored and the template matching algorithm.
4) If the component location found by the algorithm deviate by a very large value(¿500 or 600 units) then the component should be considered as missing
5) If the component location does not deviate or deviates very less (¡500 units) from the true location then the component will be considered to be present in the PCB board.

VII. Links to the Implementations

- LINK TO Backend Code - python
- LINK TO Android app code

VIII. RESULTS

A. SNAPS OF THE WORKING APP

Fig. 3. Welcome Page

Fig. 4. Training with Good PCB

Fig. 5. Training in proccess

Fig. 6. Training successful

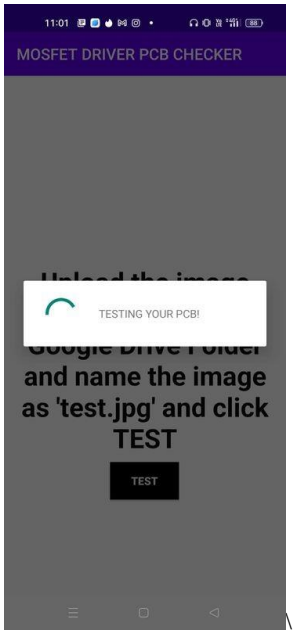

Fig. 7. Testing in process

Fig. 8. Testing Result

IX. CONCLUSION

From the results of the above implementation it was concluded that template matching can do wonders provided the images are of the same size and the images are always taken at the same angle. Otherwise the template matching can fail if any of the parameters change. Hence to make our application more robust we will have to incorporate more smart algorithms like CNN or any other form of CNN or neural networks.

REFERENCES

[1] T. A. M. Saad ALBAWI, "Understanding of a Convolutional Neural Network," in ICET, 2017.

[2] J. Chen, "Image Recognition Technology Based on Neural Network," in IEEEAccess, 2020.

[3] A. E. et.al, "Trends in deep convolutional neural Networks architectures," in IEEE, Morocco, 2019.

[4] P. B. D. e. Jithendra P R Nayak, "Identification of PCB Faults using Image Processing," in ICEECCOT, 2017.

[5] S. S. N. C. Salunke Purva A, "PCB (Printed Circuit Board) Fault Detection Using Machine Learning," in International Journal of Computer Science and Mobile Computing, 2021.