

PCB Faults Detection Using Image Processing

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ABSTRACT

This paper reviews the digital image processing for PCB fault detection by using MATLAB software. In this project we are implementing different algorithms in sequential manner with GUI. In this process we are giving two input images one to be inspected for errors i.e. layout of circuit which is implemented on PCB and other one is reference image or standard image of PCB. After these process we can obtained numbers of faults in any respect like hole, Breakout etc. it helps to detect the fault at primary stage of designing. Hence to improve the image quality of compared image we use sharpened process, so we get sharpen images and fault can be detected easily and it is fast and accurate .it reduce the manufacturing cost of PCB

Keywords: Matlab. image processing toolbox. GUI toolbox. PCB database etc.

I. INTRODUCTION

Nowadays machine vision inspection process is necessary in manufacturing industry .In printed circuit board (PCB) there are many defect ,misalignment and disjoint of connection .vision or visual is generally the largest cost of PCB .in order to reduce the cost of manufacturing caused by defect there is need of develop of new software for PCB inspection .there are three process 1)Fault detection 2) fault location 3) fault classification this process is done before mounting of electronics and electrical component .currently there are many algorithms for fault detection by using image processing. There are many other fault such as overetching ,underetching and spurious metal. there are three stages have been proposed as shown in Fig.1

II. INPUT & REFERENCE IMAGE

IN these stage we gives image of PCB in which one will be the reference image or standard image of PCB and other image will be inspected or compare by reference image.

III.IMAGE CONVERSIONS

After giving input to first stage than these images are proceeds to the next stage i.e. image conversions in these images conversion process there are six algorithms are as follows:

- Gray Scale Image
- Filtered Image
- Edge Detected Image
- Sharpen Image
- Threshold Image
- EX-oring Image

IV.FLOW CHART

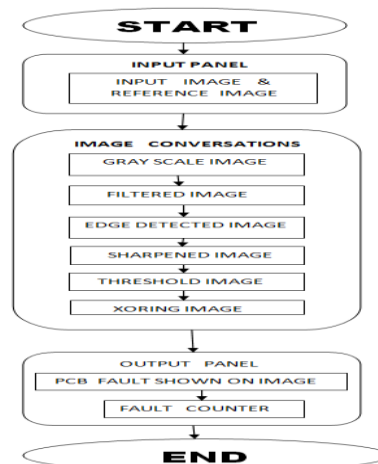


Fig 1: flow chart of the system

V. METHODOLOGY

1) GRAY SCALE IMAGE

As we know images are made of pixel and pixel contain of binary value 0 or 1 it called bi-level image. The gray scale image can have values between 0 to 255, it have shading in this value (i.e in between black and white). In our project we are using we are converting the color image into gray scale image. So that it is easier to proceed for further process by using `rgb2gray` function we are elementating the problem and saturated the informations so that image should be process properly.

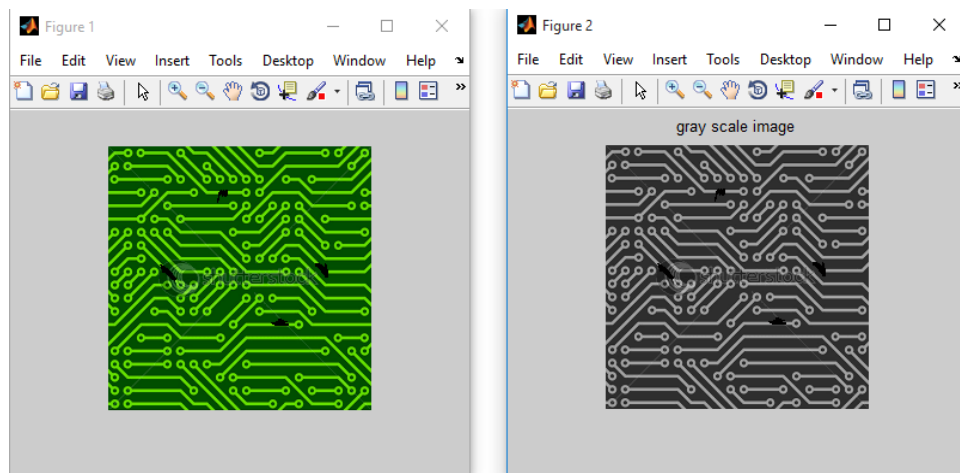


Fig 2: rgb to gray image

2) FILTERED IMAGE

filtering means implantation of an image it is used to smoothing the image between each pixel and reduce noise for image ,filtering is used as convolution filter between the images. In image processing it used to enhance the image to its best form. In our project we are using this function to remove noise from the image to get clear image. This function filters the image according to given dimension and shape so that it can differentiate between noise and required image.

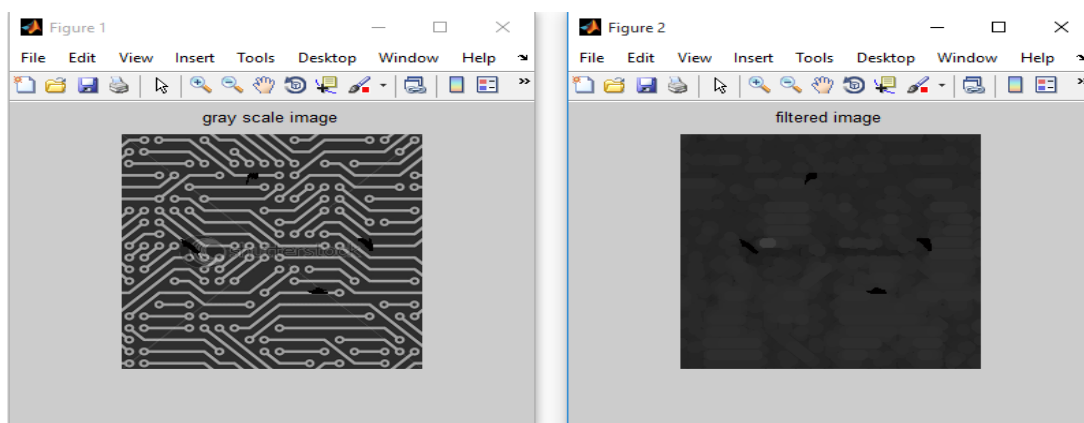


Fig 3: gray to filtered

3) EDGE DETECTION

It is an image processing technique that is used to find out the boundaries of object within the image, it uses segmentations and data extractions from the image. there are many algorithm such as sobel,canny ,prewitt etc. by applying this edge detection it reduces the large data into a specified edges so that the faults can be found easily.In our project thgese function are used to specific the edges of the PCB,so that we it is comapared to reference image it can find out faults easily. We are using the canny edge detection for smoothing the imageand detected edges should be close to real edges.

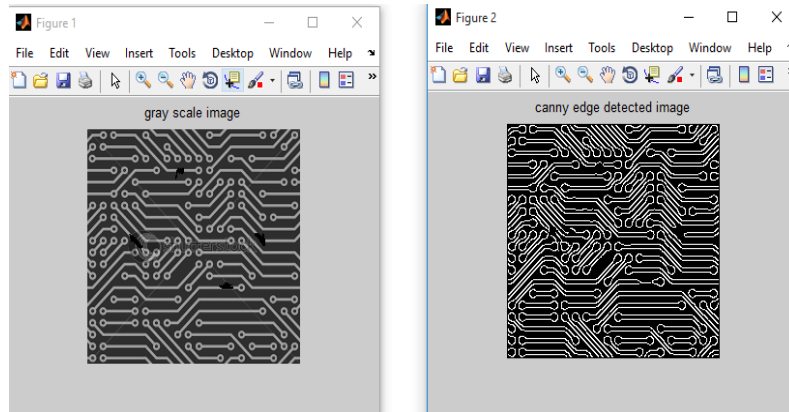


Fig 4: gray to canny edge

4) SHARPENED IMAGE

This algorithm is used to sharpen the edges of the images, so that it is more convenient to find to increased the contrast of the original image. sharpening is used to enhance the line structural in an image. out the faults it can be applied to gray scale image. This uses piece wise liner transformation.

Enhanced image = original image + line structural

We are using this function for sharpened the image obtained form edge detection image to get rectified image.

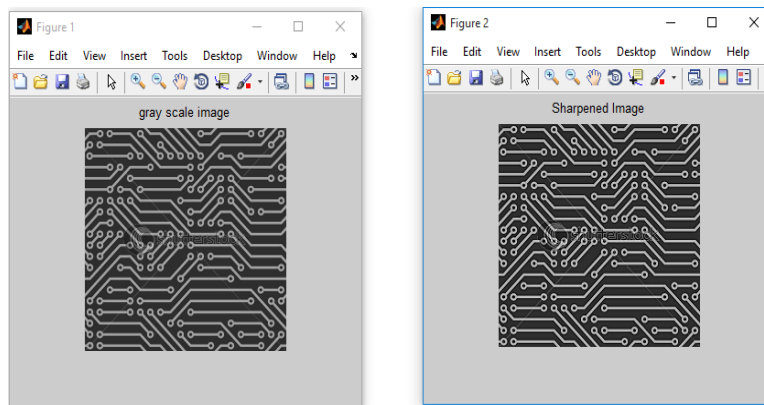


Fig 5: gray to sharpened

5) THRESHOLD IMAGE

It is one the simplest segmentation method; we used this for region separation of image based on intensity of that image. Here object pixel and background pixel are differentiate with the help of threshold, which are assign values from 0 to 255. In thresholding archaeological image to binarized image. The main propose of thresholding is to extract those pixels from the image which represented an object like holes, lines etc.

We are using these function for getting the output from previous stage ,as this function compares the object with pixels it will gives us the exact output of image.

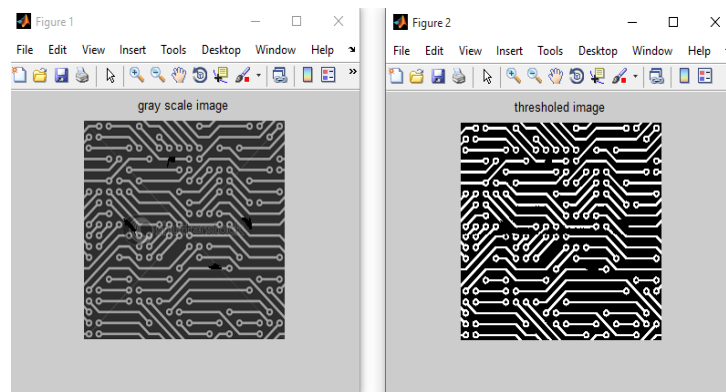


Fig 6: gray to thresholding

6) EX-ORING

The ex-oring process required both images i.e is input images and reference image have same sizes in pixel. The ex-or operation shows the faults inspected by comparing both the images. This function helps to give final output by ex-oring pixel by pixel of images and gives specified defects on image by highlighting it.

VI. GUI (GRAPHICAL USER INTERFACE)

GUI means (graphical user interface) used by programmer for ease for the user. Good GUI made by the programmer to provide consistent appearance with the help of control like push buttons, list box slider and so forth. We use GUI in our project to get good appearance of output screen, in which we are showing the three stages of process. And we are also showing the number of outputs at GUI.

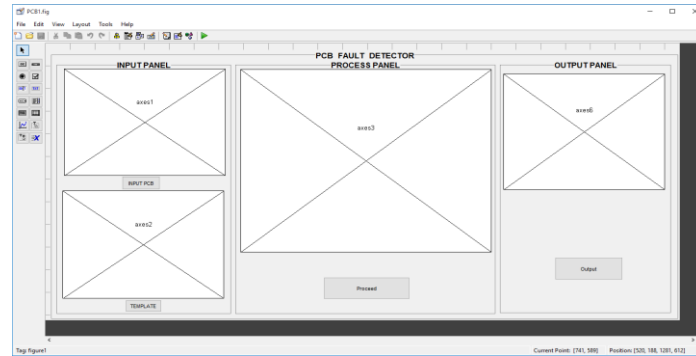


Fig 7: GUI Model

VII. OUTPUT PANEL

In these panel we get the output images of PCB which contain error or faults and we can count numbers of faults.

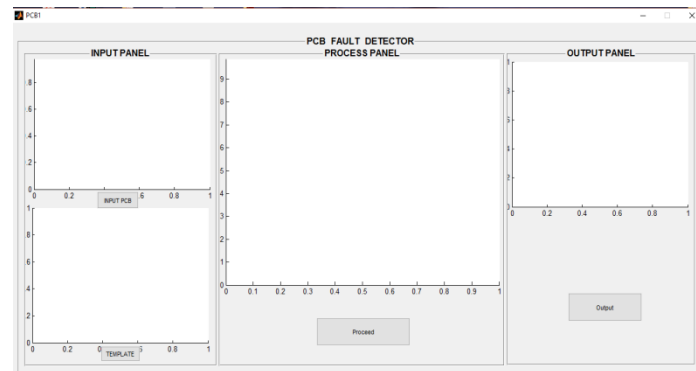


Fig 8: GUI base input output panel

VIII. RESULT

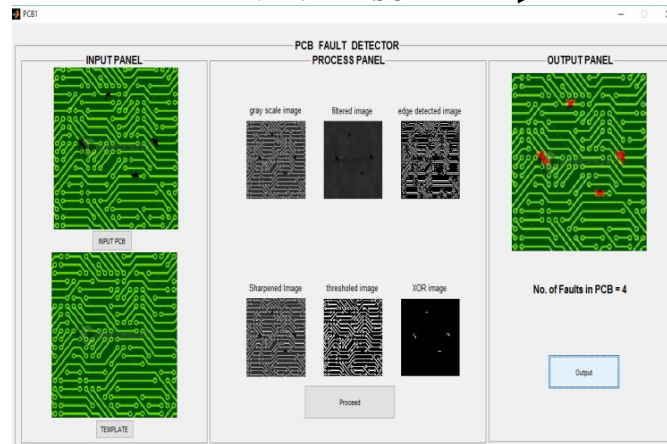


Fig 9: output panel shows fault in PCB & number of fault

IX. CONCLUSION

A new era of computers network or in electronics devices PCB is the main components. In mass productions the manufacturing cost of PCB is cheaper therefore there should not be any error and that is why we are designing the software which detects the fault of PCB at preliminary stage so we can reduce the manufacturing cost and testing cost.

X. FUTURE SCOPE

There are many convenient methods to detect the faults of PCB. And our method is one of them so there are some new methods or improvements should be developed to convert the system in real time system. Future works content of specified the faults of PCB and it also gives the number of specified fault in PCB.

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