

FAULT DETECTION OF ASSEMBLED PCB THROUGH IMAGE PROCESSING USING LABVIEW

Submitted in partial Fulfilment of the requirements for the award of Bachelor of
Engineering degree in Electronics and Communication Engineering

By
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**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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MARCH – 2021



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **PEDDAREDDYGARI PRANEETH REDDY(37130306)** who have done the Project work as a team who carried out the project entitled "**FAULT DETECTION OF ASSEMBLED PCB THROUGH IMAGE PROCESSING USING LABVIEW**" under my supervision from September 2020 to April 2021.

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DECLARATION

I, PEDDAREDDYGARI PRANEETH REDDY(37130306) here by declare that the Project Report entitled **“FAULT DETECTION OF ASSEMBLED PCB THROUGH IMAGE PROCESSING USING LABVIEW”** done by us under the guidance of **Dr.M.SUBRAMONIAM,M.E.,Ph.D** at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

DATE :

PLACE:

1.

SIGNATURE OF THE CANDIDATE

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ABSTRACT

In the current situation of covid pandemic, lockdown hit semiconductor industries in a big way. Which affect the Demand on electronic devices. That leads to be quick and high performance PCB'S. Major semiconductor companies like Micron, Texas instruments are planning to focus more on Research and Development to fill this big demand. There are also small scale electronics companies which are developing there own electronic parts by themselves according to the customer orders. But these small scale Industries can't afford the PCB test and verification equipment like Big companies. This project is about to make work easy to Individual PCB designers and small production electronic companies. Through this project any PCB designer can verify the defect of a fabricated Printed Circuit Board easy. The major software used in the project is LabVIEW and its attached software. Labview helps to design virtually. So that the PCB inspection team and find the defect or missed components easily by viewing the difference shown by labview software. Not only for the PCB designers this is also useful for Analog circuit designers.

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CHAPTER 1

INTRODUCTION

Semiconductors are key to the current world development. Semiconductors and active,passive electronic components are becoming tainer day by day. We will embedded the semiconductors and Anolog Devices in Printed Circuit Board to develop a system based on the electronic components. So these Printed Circuit Boards(PCB) will play a good role in the electronics industries.

Printed Circuit Boards can hold even very tainy electronic components. As the electronic components are very tainy or small comparing to the human operation is becoming some problem. There are many chances to get error in the process of Placing comonents in the printed circuit board. Mainy designers miss the components and get defect in the execution of the System or Circuit Board. I dentification and fixing (or) verification of Printed Circuit Board is very important in the Electronics Industries as they can mainy fix at initial stage. Because in a Printed Circuit Board the designer will choose first to fix small components and then big components.

Major defcts occure in tehe printed circuit board in the are of the small components. If a Printed circuit Board move to the Next stage of big components. It is tough or very defeluct to fix the smaller components. These components are even smaller then grain.

We need some specific soluction to identify the defect of the Printed circuit board. We can use the G programong softwars to identify the problem in the Printed circuit Board. LabVIEW is one the software tool based on the Graphical code. Any individual PCB designer can design the PCB correctly similar to the high performance printed circuit boards in the electronic devices. High Performance PCB's leads to good output results in the applications.

CHAPTER 2

LITERATURE SURVEY

F. Xie, A. L. Uitdenbogerd, and A. Song, “Detecting PCB component placement defects by genetic programming”, in Evolutionary Computation (CEC), 2013 IEEE Congress on.IEEE, 2013, pp. 1138–1145.J

Fabiana R. Leta and Flavio F. Feliciano, “Computational System to Defects in Mounted and Bare PCB Based on Connectivity and Image Correlation”,2008

B. Kaur, G. Kaur and A. Kaur, “Detection and Classification of Printed Circuit Boards Defects”, in Open Transactions on Information Processing on May 2014.

Mohit Borthakur, Anagha Latne And Pooja Kulkarni, “A Comparative Study Of Automated PCB Defect Detection Algorithms And To Propose An Optimal Approach To Improve The Technique’, In International Journal Of Computer Applications (0975 – 8887), On March 2015.

CHAPTER 3

INVESTIGATIONS

3.1 EXISTING SYSTEM

The Existing System is using the simulation software and specially designed application softwares to write and read the Printed Circuit Board. Almost all the existing systems to detect the fault in the Printed Circuit Board are for large Scale or large Belt Perposes. Like Optical Microscopy or SEM technologyes which are using equipped Alog detectors in the system. To detect tainer defects in the Printed Circuit Board systems. Another Technique called X- ray inspection by using x-ray's we are analyzing the defects in the Printed circuit boards are quite expensive. There are Image processing techniques to detect the defect in the printed circuit board wher as these mainy focus in the joint fabrication process only.

PROPOSED SYSTEM

The Process used in the Project will help to the small sector or even individual Printed Circuit Board Designer's also. The main focus in the project is to develop a non programmer and technical person or techniququestion can be use the LabVIEW for the product verification. In This Project I used G progaming to develop the system for Printed Circuit Board Fault Detection. So, If some one wants to use this they need only the software that's it's. Very small Circuit Board's also can be used. Like if some one is making there own MSP430 Lunchbox board then can download the design of MSP430 Lunch Box from Texas Instruments website and compare our design with the correct design.

3.2 BLOCK DIAGRAMS

BLOCK DIAGRAM OF EXESTION SYSTEM

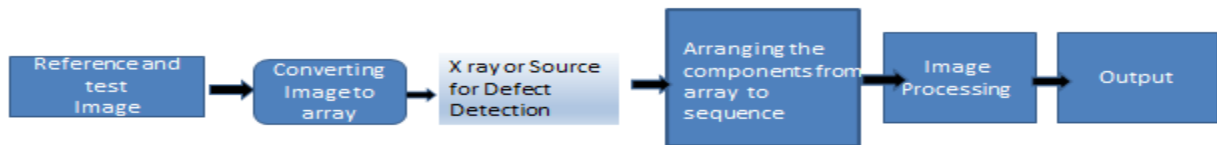


Fig 3.1 Existing Block Diagram

BLOCK DIAGRAM OF PROPOSED SYSTEM

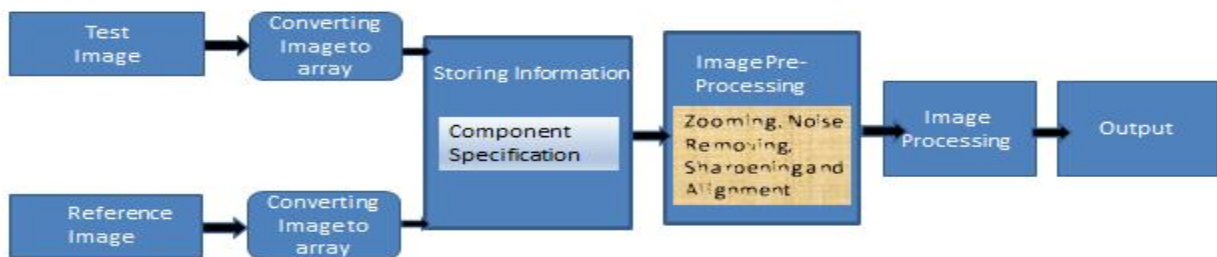


Fig 3.2 Proposed Block Diagram

3.3 WORKING

Since this project is base G programing, we need to develop a G programing in the LabVIEW. LabVIEW supports the user by providing the default interfaces in the source code. First an Algarithem base G program is designed and then thet algarithem is converted in to the Block Diagram. In Labview we have two windows makourly the Front Panel and Block Diagram These two will communicate between user and the source cource of the coumpeter and user can easily use the options given in the claeary by looking what the specific need for the Printed circuit board or the content based input and ouput requirement. So we first cerat the block diagram and then we intercace vision development module and then we will scan the image of the Printed Circuit Board, But there is a very strit specification that Labview will only compaile the LabVIEW software only compile the image or process the input only when we give the input image with Grayscale 8-bit only. Because there is only one way to get output that is by processing the image in the zero and one formate, that is binary zero and binary one. After taking the image in the camera which is custimed features we need to give the .jpg or .png file in to the front panel input. Then the hole operation will they place and we will get the output and and rectiy the defect in the PCB by looking in the screen. The results will be display in the form as pi chart and Tabulation form.

CHAPTER 4

HARDWARE DESCRIPTION

4.1 INTRODUCTION

The Printed Circuit Boards(PCB) has a very good market in the current world. Manufacturing Procedure is very complicated work. So we need some techniques like image subtraction. Fault detection can be achieved by the Charge Coupled Device(CCD) by using the pattern recognition formula, The reference image and the inspected image will be varied with the capturing the image in the camera and a Perfect Printed circuit board with good execution OR output performance. Because we have to find the defects easily.

4.2 CAMERA

In LabVIEW we have many alternatives for the camera there are Area Scan Camera, Line Scan Camera etc., Camera compatibility is based on many parameters, but we need to determine the camera internally it supports the NI hardware and software is main criteria. The types of cameras are USB 3.0 Vision, GigE Vision, Camera Link, IEEE-1394 FireWire, USB 2.0, Ethernet IP etc.,. And also we should consider the drivers In the National Instruments (NI), NI-IMAQ or NI-IMAQdx. We need to create a custom camera file using the NI camera file Generator. And then we store the file in the NI software.



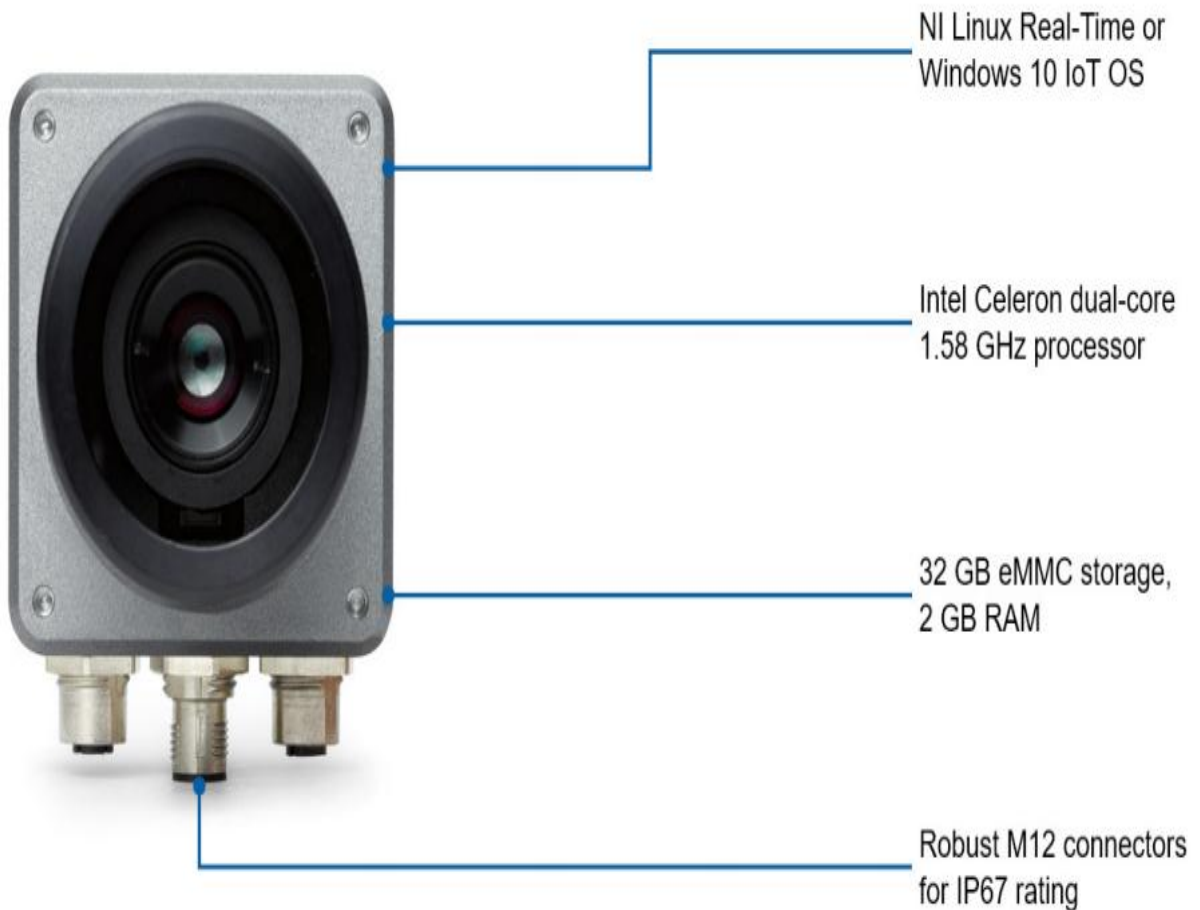
4.1 Camera

4.2.1 Technical Specifications

Table 4.1: TECHNICAL SPECIFICATIONS

	ISC-1780	ISC-1781	ISC-1782	ISC-1783
Resolution	640 x 480	1280 x 1020	1920 x 1200	2592 x 2048
Sensor (CMOS)	PYTHON 300	PYTHON 1300	PYTHON 2000	PYTHON 5000
Sensor Size	¼ in.	½ in.	¾ in.	1 in.
Frame Rate (mono)	292 fps	85 fps	45.8 fps	21 fps
Frame Rate (color)	147 fps	35 fps	19.9 fps	8.6 fps
Pixel Size	4.8 µm x 4.8 µm			
Gain Range	0–19.4 dB			
Shutter Speed	50 µs to 4.2 s (global)			
Processor	1.58 GHz N2807 dual-core Intel Celeron (2.15 GHz turbo)			
OS	Windows 10 IoT or NI Linux Real-Time			
Memory	2 GB DDR3L SDRAM			
Storage	32 GB eMMC			
HMI	VGA and USB 2.0			
IEEE 1588	Yes (software)			
I/O	4 DI (Windows) or 3 DI with 1 dedicated Safe Mode (NI Linux RT), 3 DO, 0–10 V AO			
Lighting	Dedicated 0–10 V lighting control			
Ingress Protection	IP67			
Lens	C-Mount			
Power Consumption	450 mA at 24 V DC or 10.8 W (typical)			
Operating Temperature	0 °C to 50 °C			

4.2.2 Important Camera Parts



NI Linux Real-Time or Windows 10 IoT OS In embedded system design Linux plays a large role because, open sourced, community grown and supported and it is free. Embedded software developers treat Linux as it could not be an RTOS, and over the an combine Linux with a dedicated RTOS for use in embedded applications. More recently, the PREEMPT_RT patch set, an outgrowing of the efforts around improvements to the Linux kernel, has increasingly become the recognized approach to viably achieving real-time performance with Linux. National Instruments has worked to use the PREEMPT_RT patch to create NI Linux Real-Time.

Intel Celeron dual-core 1.58 GHz processor: The Intel Celeron is a power efficient dual-core SoC for entry-level. The clock speed is in between 1.58 - 2.25 GHz and part of the Bay Trail-M platform. It contains optimized 22 nanometer low-power process (P1271) with tri-gate transistors. Performance and energy efficiency have been significantly improved when compared to previous Intel Atom CPUs

32 GB eMMC storage, 2GB RAM: Stores and the array elements in an order in an accurate manner.

Robust M12 connectors for IP67 rating: Receive and send the signals very fast and accurate data will be transferred

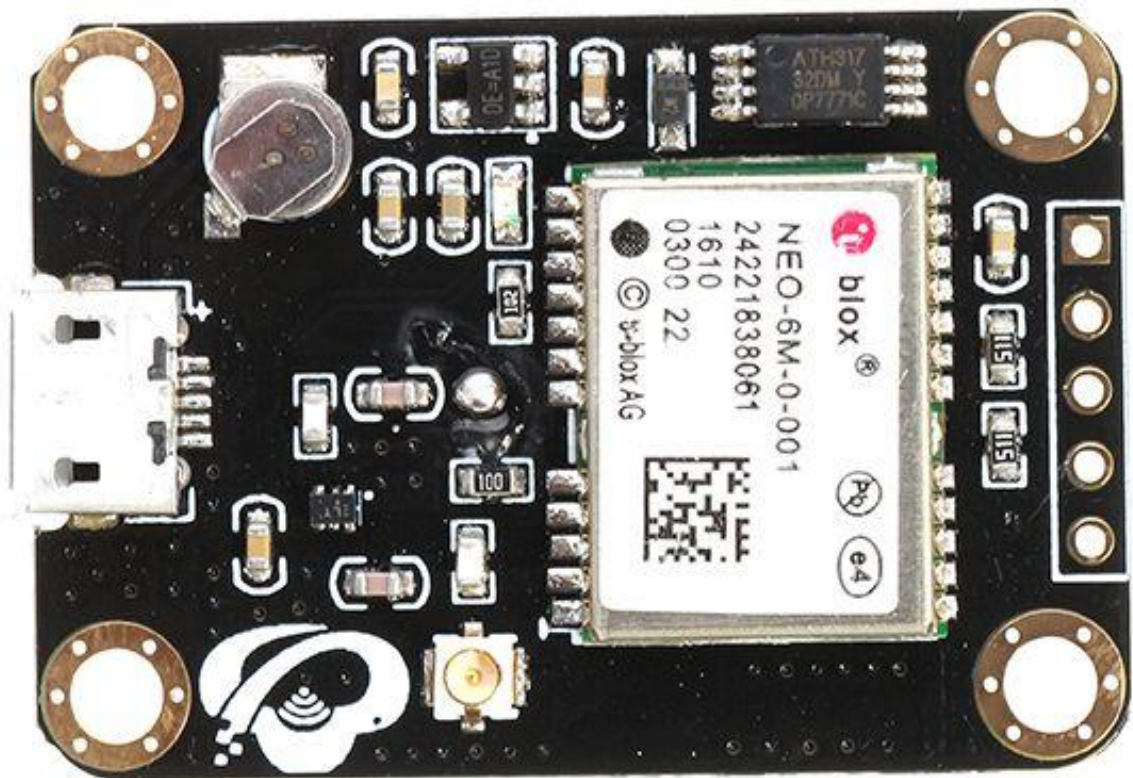
4.2.3 Some Alternative to Camera

The main use of the camera is to capture the image in the Grayscale 8-bit fashion we have an alternative to this. We can use the NI vision Assistant which will enhance the image features, filters noise, extracts colors planes, and many more.



4.2.4 Printed Circuit Board

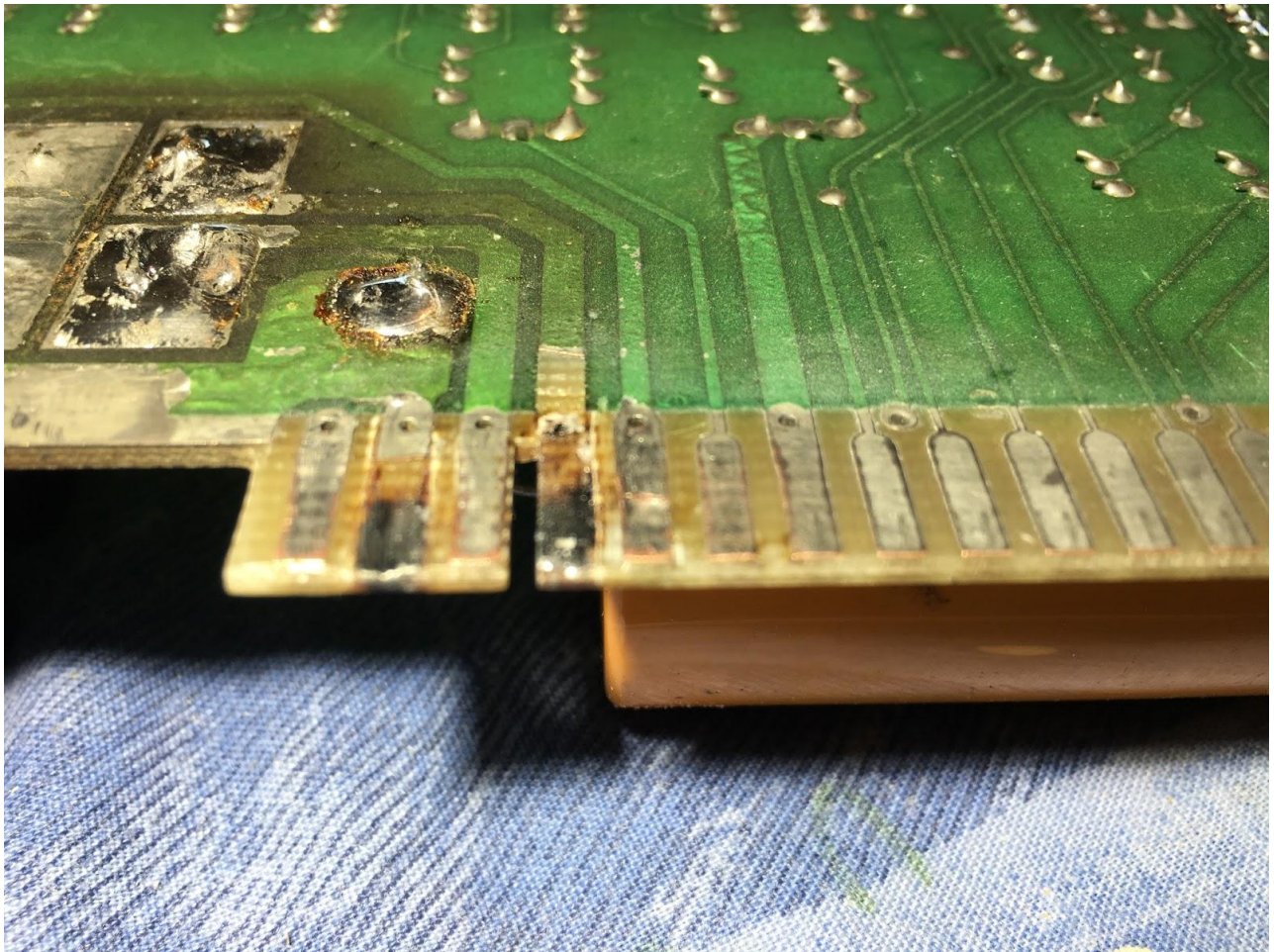
We need to verify the correct Printed Circuit Board first and then we need to Capture the image with the camera. There are many types of the defects in the Printed Circuit Board Manufacturing or Assembling the electronic components.



4.2.5 Types of defects in Printed Circuit Board:

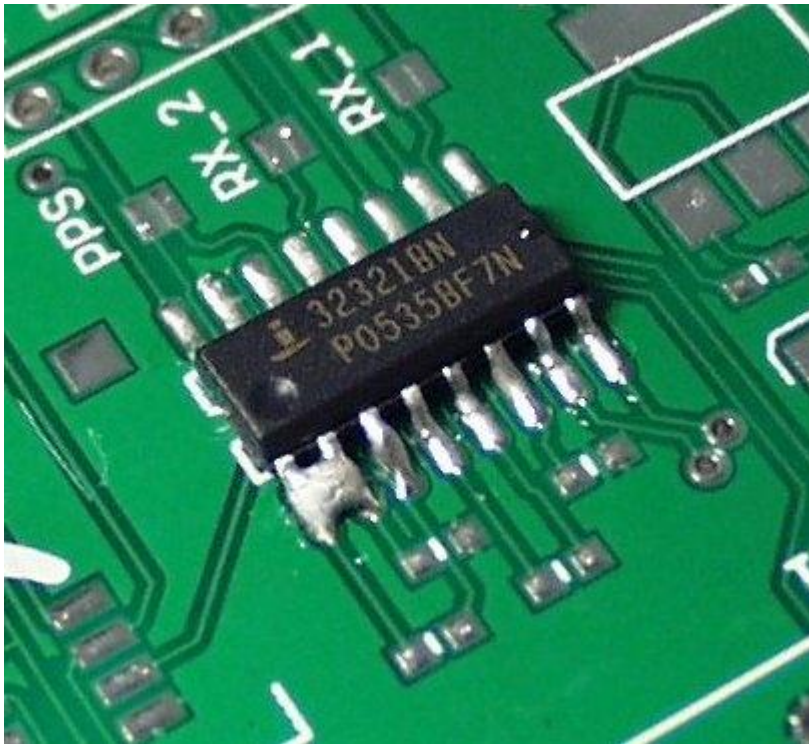
4.2.6 PCB BreakOut

The electronic components which are connect to first or single layer. The wires in routing to the pins should connect to the points. The network flow for the breakout in routing which give the wiring grid is very good. The more the breakouts the more damage and run time efficiency is very high. Even the part which is not broken and prefietly alwrite will give the bad connection and then result circuit destroying sutiation.



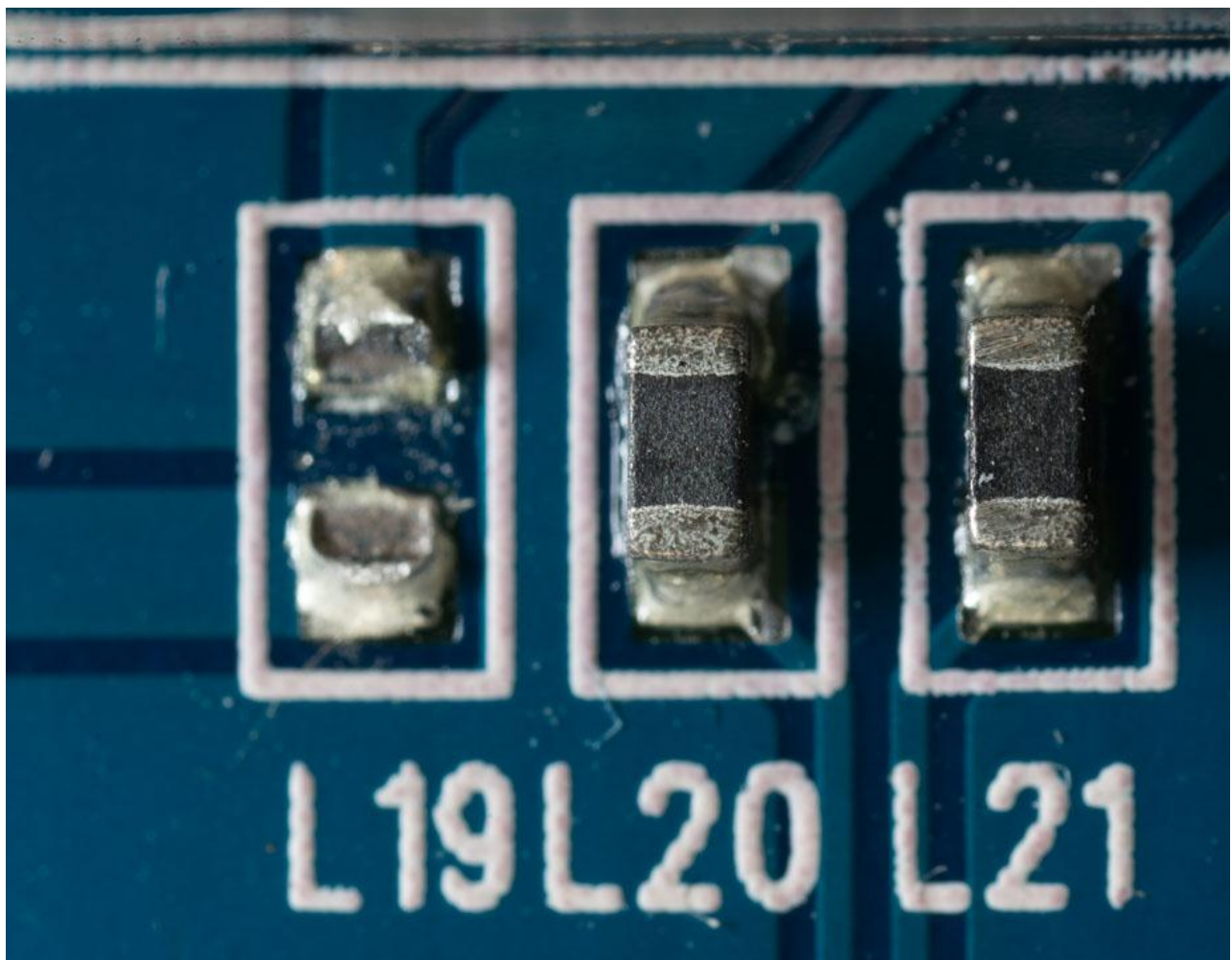
4.2.7 Open Circuit:

As like water flows high altitude Or high to low, The current will also flow in a low resistance path easily and does not high ways. There is a chance of Electro Motive Force and that will affet the heat generation. Passive component also effect by this. Small defect in the circuit like not connecting any other component makes the node as open or high resistance. The Electro motive force can will make changes in valtage and current values of the Printed circuit board.



4.2.8 Missing Component:

Requirement for the PCBs, defect quality is very high. A defect detecting techniques and the flow diagram with algorithms is going to convert into the Audio Video Interleave Technique. Since there is greate demand to the PCB inspection. Current Audio Video Interleve system cost long time for the inspecting PCBs on a each component basis.. An alternative visual inspection approach can change the color texture of the outpuk back side by the process called subtraction is presented to achive correct way for the PCB.



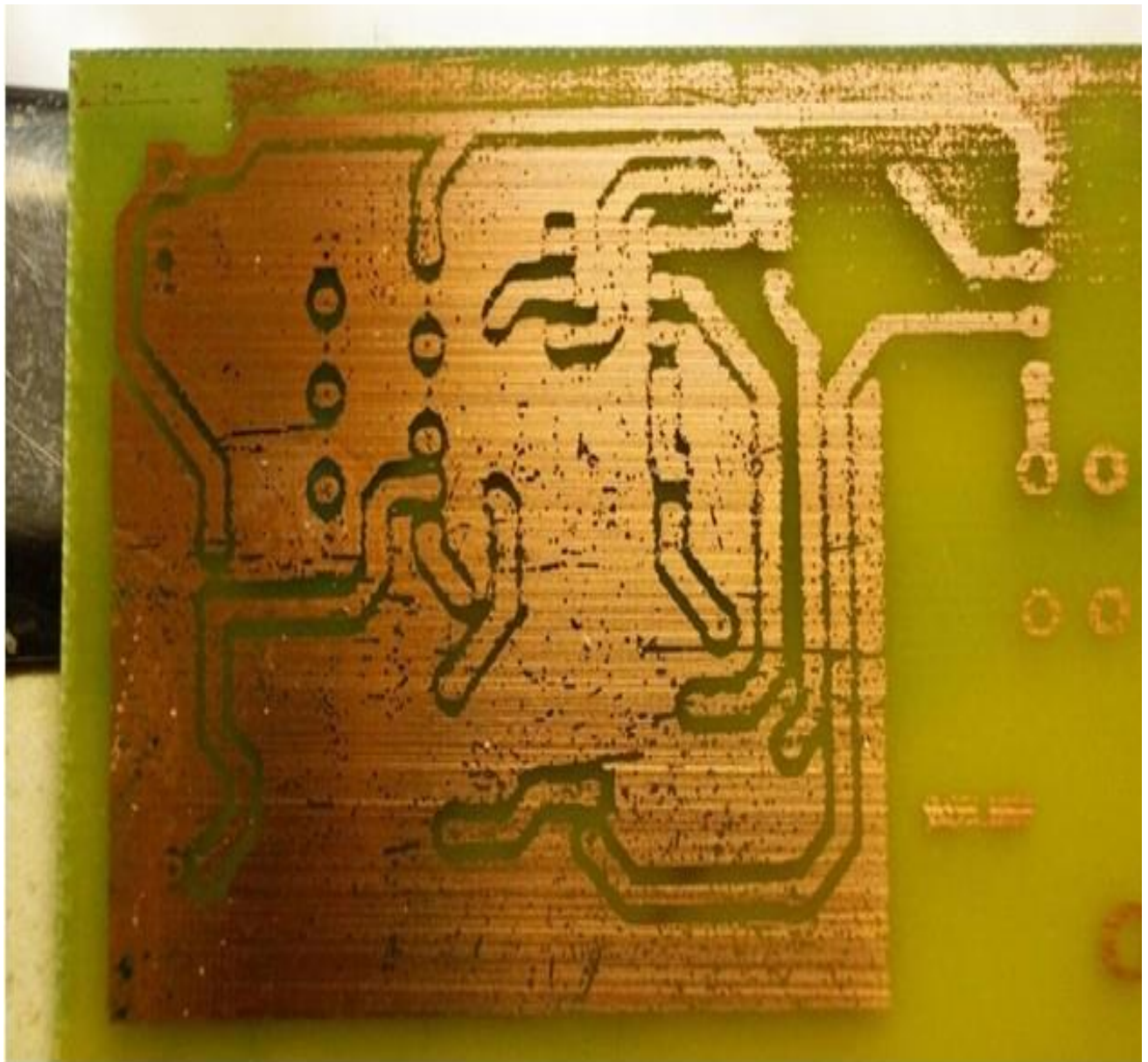
4.2.9 Pin Hole:

The maximum length and width of the PCB are vary according to the specification inches respectively. Pin holes are also called as blow holes. The main reason for the blow holes defect is more than required gassing in the process of soldering the Printed Circuit Board. Pin and blow hole forms in the time of wave soldering is completely depend on the thickness of the copper plating of the Printed circuit board. Wetness or moisture in the Board will escape through copper plating or voids in the plating. The plating in the through hole should be a minimum of 25.32 Micro Meters. The pin or blow hole term Generally used to indicate the size of the hole, pin being small. The amount of water vapor escaping and the solder solidifies.



4.2.10 Under Etch

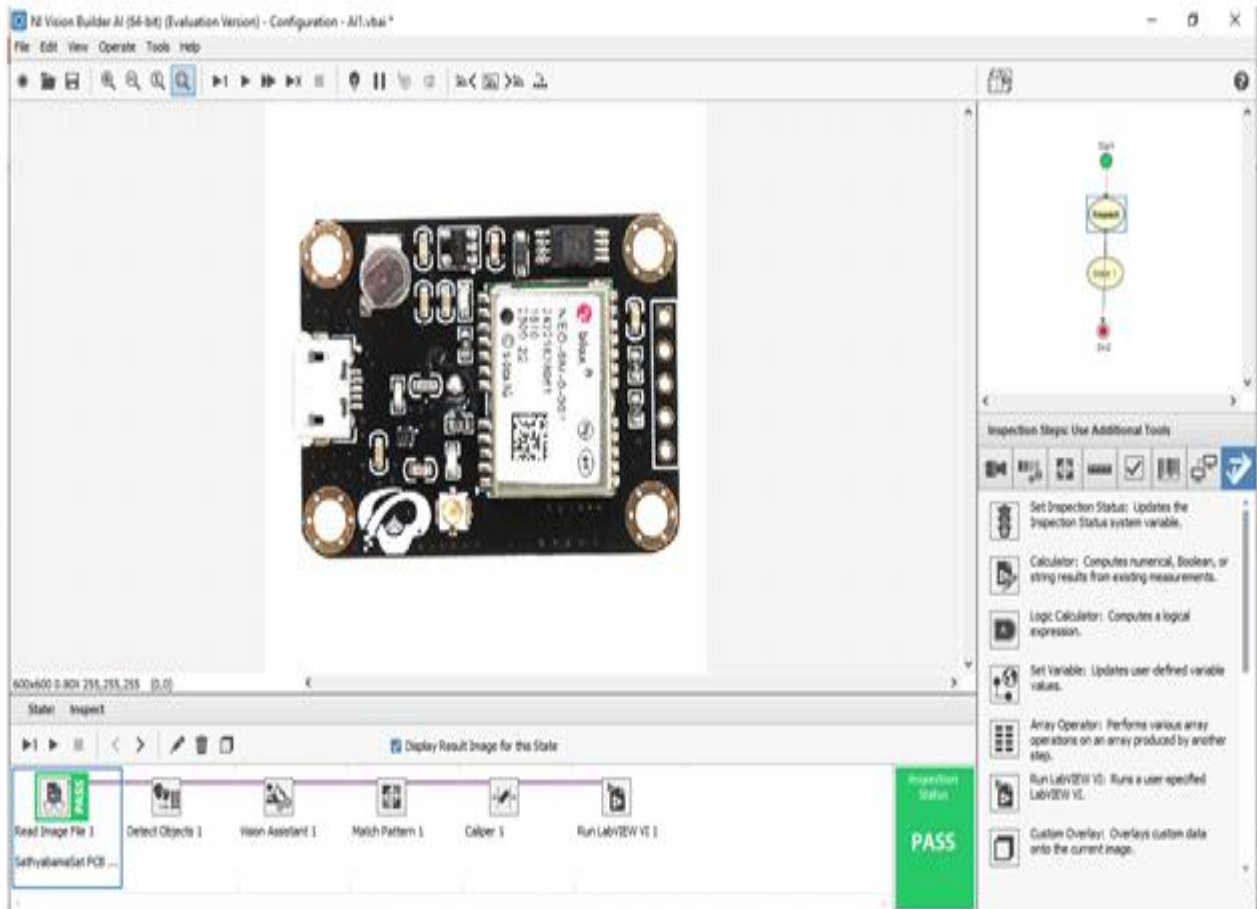
In the process of etching a Printed Circuit Board, there may be a chance to get sidewalls while etching the sideways to produce an undercut action the parameters to this occurs is known as the etch factor - defined as the ratio between the depth of the minimum and maximum. Immersion etching process usually give to a minimum etch factors.



4.2.11 LabVIEW Software Front Panel

Front Panel is used to look at the glance of the output images

FRONT PANEL



BLOCK DIAGRAM(REFERENCE)



CHAPTER 5

RESULTS AND DISCUSSIONS

RESULTS

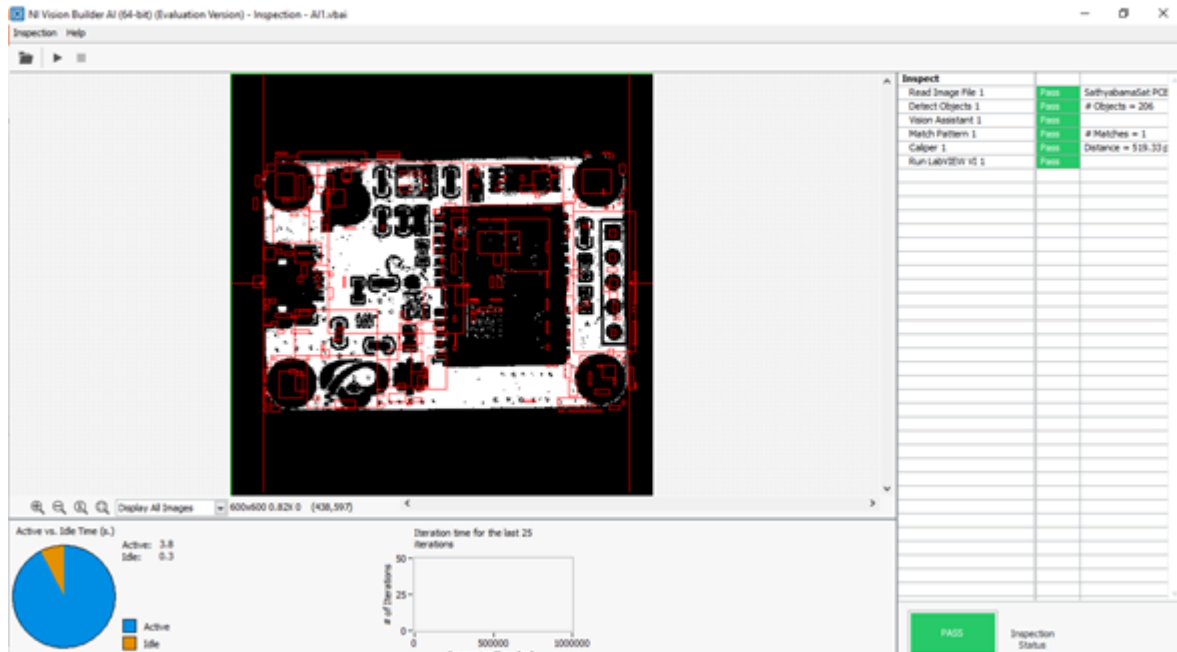


Fig 5.1 Snapshot Vision Module

- It contains transmitter and VI sensor.
- Software is free of cost.
- Execution Is simple.

CHAPTER 6

SUMMARY AND CONCLUSION

It mainly used to avoid accidents at the traffic signal by using Zigbee technology which scans the distance present between the nearest vehicles and manages their speed to avoid accidents. If there is any vehicle In front of another vehicle the vehicle will observe and detected to ultrasonic sensor and send to the microcontroller sends to the Zigbee transmitter through light and received vehicle automatically stop second vehicle .The data transfer between the two vehicle is faster because of Zigbee technology. This technology is not only used for vehicle transmission but also for the street lights for data transfer in traffic .there is no disturbance between the two signals transmission That's why this technology is good for data transfer than the other methods of data transmission .in this method gas sensor used for detecting the alcohol consumption person who is the driving. This Zigbee technology will be more become much easier for data usage because in future wi-fi can be used where the light bulb is available.

As a result of increased population, the number of accidents also increased. This is reduced to a great extent by this technology. The Zigbee helps faster transfer of data between the vehicles. This technology can also be implemented in street lights for data transfer about the traffic. As it employs visible light for communication, this is not restricted in any places. There is no interference in the signals. Hence this technology is far better than other methods of data transfer. It will allow inter access in places such as operation theaters and aircrafts where internet access is usually not allowed. If this technology can be used efficiently, we might soon have something of the kind of WI-FI hotspots wherever a light bulb is available. It will be cleaner and greener and the future of mankind will be safe. Since this technology has a vast potential, many researches are being conducted in this field. In this fast changing world as a result of increased population, the number of accidents also increased. This is reduced to a great extent by this technology. The Zigbee helps faster transfer of data between the

vehicles. This technology can also be implemented in Street lights for data transfer about the traffic. As it employs visible light for communication, this is not restricted in any places. There is no interference in the signals. Hence this technology is far better than other methods of data transfer. It will allow inter access in places such as operation theaters and aircrafts where internet access is usually not allowed. If this technology can be used efficiently, we might soon have something of the kind of WI-FI hotspots wherever a light bulb is available. It will be cleaner and greener and the future of mankind will be safe. Since this technology has a vast potential, many researches are being conducted in this field. In this method along with the distance measurement, drunkard drive indication and overtake guidance switch, the speed sensors can also be added to measure the speed of car

In this work, a mathematical analysis based on a CTMC is presented to model a vehicular crossing where traffic lights are used to convey information to vehicles passing by and waiting for the green light. A Zigbee system is proposed to be used in order to make a bandwidth-efficient system by making use of different frequencies than the ones used in cellular, Wi-Fi, and Bluetooth which are overcrowded and will experience even more traffic when 5G communication systems get deployed. Conversely, the proposed Zigbee system takes advantage of visible light already used in traffic lights and front and tail lights in vehicles. We prove the effectiveness of such systems for applications of smart cities, where information regarding traffic conditions, security, cultural, or even emergency events can be effectively conveyed to cars waiting in the red light. This data can be disseminated using small text messages to small video files. Also, we provide clear guidelines for packet sizes and data rates to be used in the Zigbee network in order to transmit data to the average number of cars that can be found in the crossing. Hence, the system administrator can use the proposed model to accurately select the system parameters for different crossings based on the traffic load at each strategic traffic light of the city. In the future work, we propose to model more complex vehicular crossings, where left/right and U-turns are allowed. Also, the case where information can be transmitted from vehicle to vehicle in motion and not only during the red light can be studied, considering the average times that cars are connected in such dynamic cases.

REFERENCES

- 1) F. Xie, A. L. Uitdenbogerd, and A. Song, "Detecting PCB component placement defects by genetic programming", in Evolutionary Computation (CEC), 2013 IEEE Congress on. IEEE, 2013, pp. 1138–1145.J
- 2) F. Xie, A. L. Uitdenbogerd, and A. Song, "Detecting PCB component placement defects by genetic programming", in International Conference on Image and Vision Computing on. IEEE, 2013, pp. 406–411
- 3) Fabiana R. Leta and Flavio F. Feliciano, "Computational System to Defects in Mounted and Bare PCB Based on Connectivity and Image Correlation", 2008.
- 4) B. Kaur, G. Kaur and A. Kaur, "Detection and Classification of Printed Circuit Boards Defects", in Open Transactions on Information Processing on May 2014.
- 5) Mohit Borthakur, Anagha Latne and Pooja Kulkarni, "A Comparative Study of Automated PCB Defect Detection Algorithms and to Propose an Optimal Approach to Improve the Technique", in International Journal of Computer Applications (0975 – 8887), on March 2015.
- 6) Jagadish.S.Jakati and Sidramayya S Matad, "PCB defect detection based on pattern matching and segmentation algorithm", in International Journal of Advanced Research in Computer and Communication Engineering on 2014, Vol 03, Issue 9.
- 7) Ms. Prachi P. Londe, Prof. Atul N. Shire, "A Review of Automatic PCB Defects Detection and Classification" in International Journal of Emerging Trends in Engineering and Development on Issue 4, Vol.1 (January 2014).
- 8) Prof. Malge P. S. Nadaf R. S. "A Survey : Automated Visual PCB Inspection Algorithm", in International Journal of Engineering Research & Technology (IJERT) on Vol. 3 Issue 1, January – 2014.
- 9) Suhasini A, Sonal D Kalro and Prathiksha B G, "PCB defect detection Using Image Subtraction Algorithm" in International Journal of Computer Science Trends and Technology on Volume 3 Issue 3, May/June 2015.

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