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AUTOMATED SUPERVISION OF PCB CIRCUITS USING MVI

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Abstract: Machine vision (MV) is the technology and methods used to provide imaging-based automatic inspection and analysis for such applications as automatic inspection, process control, and robot guidance in industry. The scope of MV is broad. MV is related to, though distinct from, computer vision. In this paper, the investigator has discussed the camera which is used in the development of hardware and software. The problem is completely industry based, that is automatic inspection of PCB for missing component. The hardware developed is working accurately in accordance with the software.

Keywords: Power quality monitoring, power quality software, power quality improvement.

I. INTRODUCTION - MVI

Machine vision intelligence (MVI) is the capacity of a Computer to "see" and "take appropriate decision". A machine-vision framework utilizes one or more camcorders, simple to-computerized transformation (ADC), and advanced sign processing software (DSP etc). The subsequent information goes to a PC or robot controller. Two critical determinations in any vision framework are the affectability and the determination. Affectability is the capacity of a machine to see in faint light, or to distinguish feeble motivations at imperceptible wavelengths [1],[2],[3]. Determination is the degree to which a machine can separate between items. When all is said in done, the better the determination, the more restricted the field of vision. Affectability and determination are associated. Every single other variable held steady, expanding the affectability diminishes the determination, and enhancing the determination lessens the affectability[4],[5],[6].

Machine vision is used in various industrial and medical applications like Electronic component analysis, Signature identification, Optical character recognition, Handwriting recognition, Object recognition, Pattern recognition, Materials inspection, Currency inspection, Medical image analysis, security system etc[7],[8]. In this paper the investigator discusses the software which itself detects the missing component of the PCB and also indicates which component is missing.

II. JABRONICS Smart Camera

The investigator has used Zebronics HD smart camera to develop the hardware. The specifications of the camera are as follows:

Resolution	:	160x120, 176x144, 320x176, 320x240, 352x288, 432x240, 544x288, 640x360, 640x480, 752x416, 800x448, 800x600, 864x480, 960x544, 960x720, 1024x576, 1184x656, 1280x720
• Max.frame rate	:	30fps
• Interface	:	USB1.1 & USB2.0
• Product dimension	:	5.8*7.3*4.4 cm (W*D*H)
• Net. weight	:	80g

System Requirements

• CPU	:	Intel Pentium4 2.4GHz or above
• OS	:	Windows 7/ Vista / XP (above sp2)
• HDD	:	Min.200MB
• Directx	:	Above 9.0c

III. TOOLS AND SOFTWARES USED

NI VISION BUILDER

Vision Builder AI gives us an easy way to configure, benchmark, and deploy a system that addresses vision applications from pattern matching to code reading and presence detection to precision alignment and classification. An interactive menu-driven development environment replaces the complexities of programming, making the development and maintenance process simple without sacrificing performance or range of functionality.

IV. PROBLEM FORMULATION

The investigator after going through a large number of literatures divulges the following inferences:

- All the pcb manufacturing/Electrical & Electronic manufacturing company, after completion of the process manually check the PCB if all the components are present or not
- If any component will be missing, then it will be send back again for rectification.
- Almost all of these PCB industries do this process manually.
- As the production of complete PCB is very large (in the range of thousand and lakhs pieces per month), therefore huge manpower and time it takes to check all pcb.
- Generally it takes 5-20 minutes to check each PCB depending upon its complexity.

V. METHODOLOGY USED

The work will be executed by following the steps mentioned below sequentially:

- Development of Complete PCB prototype designing using Multisim for DC motor control circuit.
- Hardware of the same will be developed on many same pcb circuits
- Proper camera will be used to inspect the complete PCB
- Photograph will be taken through that camera
- Image processing coding will be done on the image obtained from the camera
- Algorithm for machine visioning will be developed
- Machine vision intelligence coding will be developed using lab view and its vision toolkit
- Then it will be tested again for the accuracy
- It will be validated using the same hardware developed
- After satisfactory result documentation will be done

VI. SOFTWARE AND HARDWARE DEVELOPED FOR PCB SUPERVISION

In fig 1.1, the software developed is shown whereas in Fig. 1.2 the real time hardware is shown.

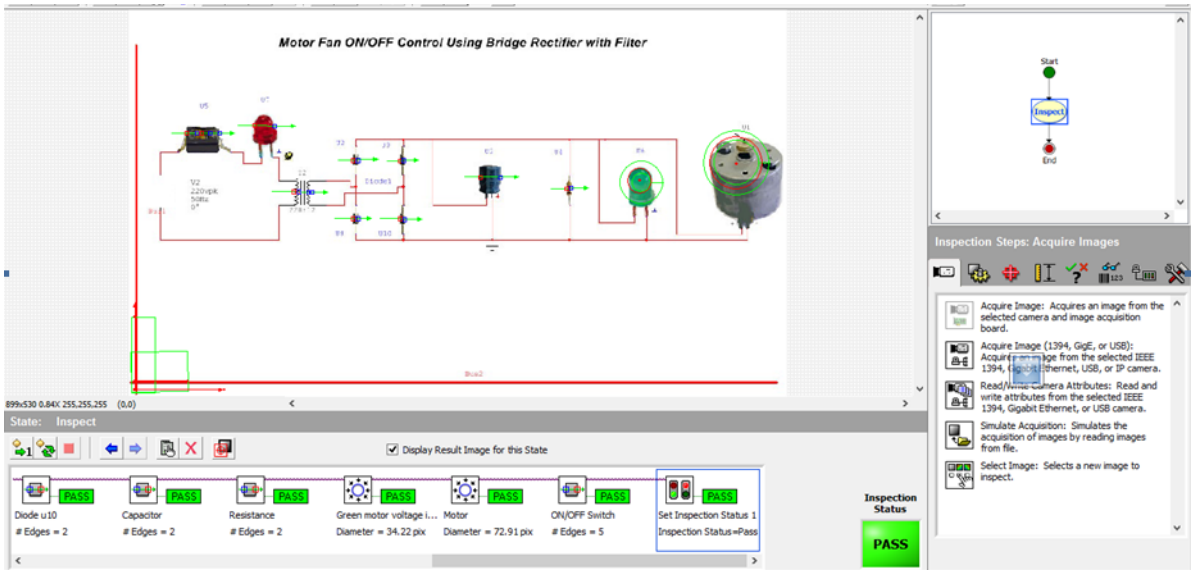

Fig. 1 Software Testing for PCB

Fig. 1 shows the photograph of the software when all components are present. From the fig. It is clear that the software has passed the hardware and it validates the software for all components present.

Fig. 2 Hardware Developed

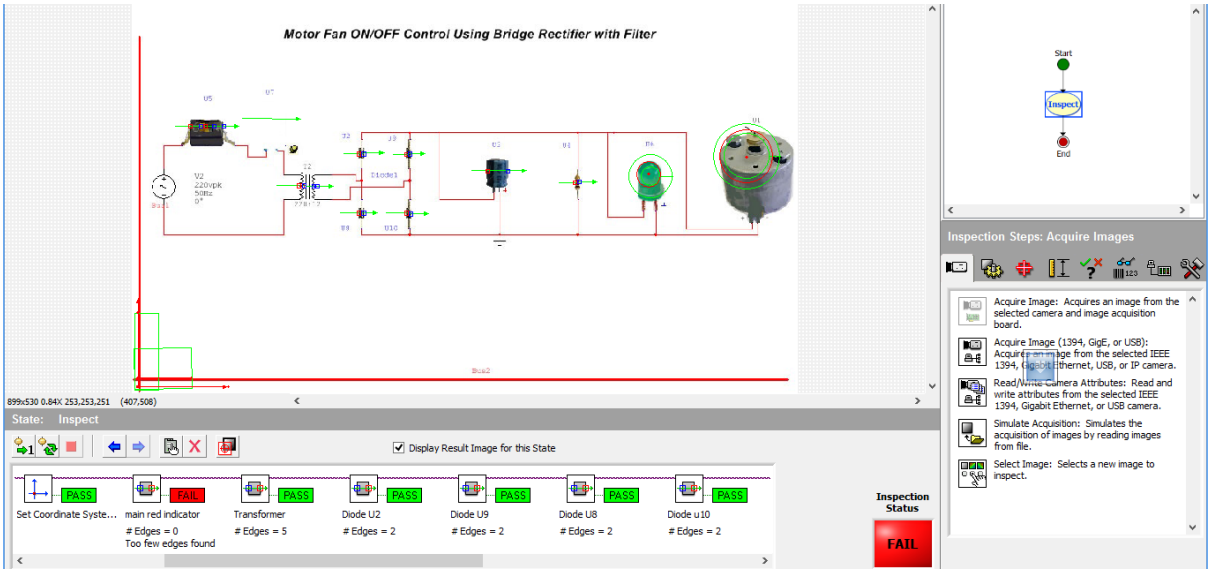

Fig. 3 Red LED Missing on PCB

In the fig 3, photograph of the circuit is given when main red indicator is missing. The software developed has detected the same and hence validated for Main red indicator missing condition.

In this way the software checks each element of the hardware and passes if all components are present. If any missing component is there, then the software detects it and shows it.

CONCLUSION

This is highly beneficial software for PCB industry and will definitely save lot of time and money. It not only speeds up the process but also increases the accuracy.

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