

Faulty Gear Identification in Automobile industries using Watershed Segmentation

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Abstract - In previous years industries faced a major problem in testing their final finished products especially in the field of automobiles; it reduces the efficiency of the vehicles when the parts are not tested efficiently. Yet the selection and rejection of this automobile part for the further implementation in automobiles is needed. To overcome this, industries started using mechanical instruments to test these automobile parts they are known as go, no-go instruments. Each object has a separate instruments as per its measurements specifications if it get fitted in the respective instrument exactly then that finished product has no defects. If that object doesn't get fitted in the respective instruments then that finished product is said to have the defect and it has to be rejected. The disadvantage faced by this technique is that the measuring instruments gets wears, so as using this wearer instrument for further testing its accuracy is lost. Elimination of this 0.1% of error of the small automobile parts can cause major accidents in case of large heavy vehicles and more over the life of the vehicle is reduced.

I. INTRODUCTION

Worldwide, around 1.2 million people died as a result of accidents in 2012. This represents an average of 3,242 persons dying each day around the world. In addition to these deaths, around 50 million people globally are estimated to be injured or disabled every year. Projections indicate that these figures will increase by about 65% over the next 20 years. Road accidents are currently world's eleventh leading cause of death, but by 2020, it will become third, behind deaths linked to heart disease and mental illness. In United States alone, around 6.2 million traffic accidents occur due to automobile crashes in 2012. And about 1million accidents occur due to the poor working of automobile parts. These accidents accounted for 42,636 deaths and 2,788,000 nonfatal injuries. Thus in some countries image processing technique came into the existence for testing the faults in the automobile parts. This uses a camera to capture the image of the products. Standard image of the product is fed to the pc. By using suitable programming techniques the standard image is compared with the real time image. If the real time image doesn't matches the standard image then it is said to have a fault. However this technique too have a by using suitable programming techniques the standard image is compared with the real time image. If the real time image doesn't matches the standard image then it is said to have a fault.

However this technique too have a disadvantage that it could find only the 2D faults and individual device set up is required for each objects. This project overcomes all the above disadvantages and hence it is a 3D fault detection for multiple products in a single device set up using upcoming technology, artificial neural network. Various researches are being carried out for the proper identification selection, and rejection of damaged parts.

II. OUTLINE

To overcome the disadvantages of the testing process in automobile industries image processing is being used to test the faults in the objects. The project "Test automation in automobile parts using image processing" is used to overcome the difficulties faced in the field of testing and fault detection in automobile industries. The major problem in the existing system is that it can be used only for fault detection in two dimensional image processing. Another major disadvantage is that separate device set up is needed for individual objects which increases the cost of production and reduces accuracy.

This project is used to find the three dimensional faults in an object by simply adjusting the position of the camera and conveyor belt design. Two cameras can be used to get the three dimensional image of the object. To get the rear image of the object transparent layer is made in the conveyor belt design. In order to process multiple objects in a single device set up upcoming technology known as artificial neural network is used which takes the decision automatically according to the real time image and standard image. In automobile industries- motor current signature analysis has been successfully used in induction machines for broken rotor bars fault diagnosis. The method however does not always achieve good results when the load torque is not constant.

III. AUTOMATIC FAULT DETECTION

In the science and engineering of automobile parts manufacturing, the testing and fault detection plays major role. In the past few years, the fault detection is carried out by comparing the real time image of automobile jobs with the standard image of that object already stored.

However, it consumes more time because it compares multiple images, recently some new transformations are used to detect fault without comparison. Hence the proposed system is analysis of the image and identifying the fault using the image processing technique combined with matlab. Moreover the analysis of these images is going to be done in three-dimension.

The images of the automobile parts carried out in the conveyor is captured as video and it is converted into snaps using matlab some adaptive techniques and some transformations are being used to analyze the real time image of the automobile parts. If any fault is identified the fault will be displayed in output screen of the matlab. The fault is taken out in terms of values from pc, using this value the pushing element separates the faulted piece from the process. The block diagram of the proposed system is shown below

A. Description of Fault Identifier

The block diagram consists of conveyor belt, camera, microcontroller, pc, serial interface, pushing element. The final product is made to run in the conveyer belt and the product image is captured by two cameras for 3D image processing and the real time image is captured and compared with the standard image using MATLAB program which is fed in the pc. This program analyzes the real time image and it compares the image with the standard image if it don't match then the product has defect then it has to be separated from the correct final product using pushing element. The output of the pc is given to the microcontroller and it is used to operate the motor.

B. Fault Job carrier

A special design of the conveyor belt is needed for the three dimensional fault detection. The transparent glass material is kept at the middle of the belt so that the rear image of the object can be captured using the camera fixed at the bottom of the conveyor belt.

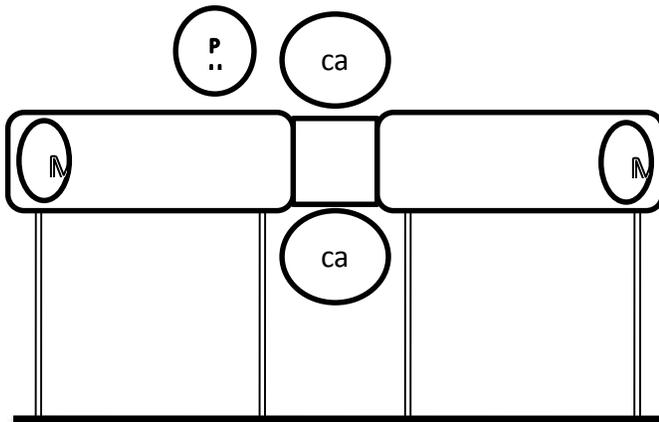


Fig 4.1. Proposed gear fault detection and rejection

IV.SIMULATION RESULTS

A. Original Image



Fig 5.1. Thrust washer



Fig 5.2.Ford Gear

B. Gray Scale Images



Fig 5.3.Thrust washer



Fig 5.4. Ford gear

C. Hough Transform Images



Fig 5.5. Thrust Washer

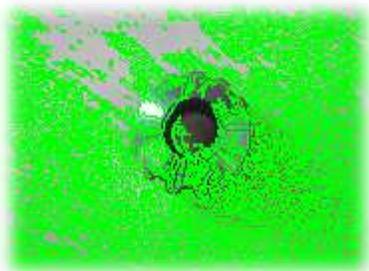


Fig 5.6.Ford Gear

D. Sobel Transform Images

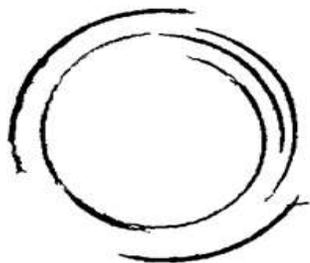


Fig 5.7.Thrust Washer

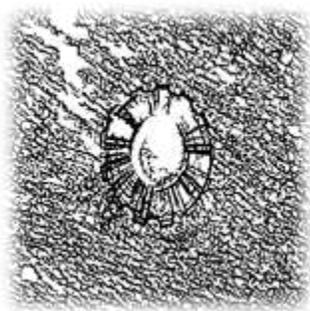


Fig 5.8.Ford Gear

E. Output Images with no fault



Fig 5.9.Original Image



Fig 5.10.Threshold Image

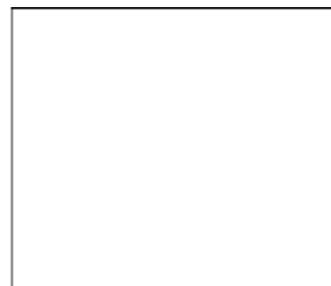


Fig 5.11.Output screen (if no fault)

F. Output images with fault



Fig 5.12.Original Image



Fig 5.13.Threshold image

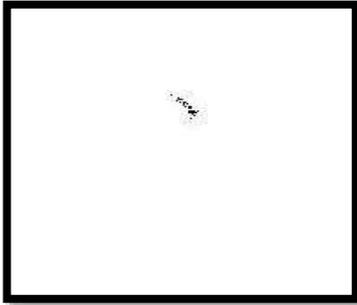


Fig 5.14.Output screen (if fault is present)

V. CONCLUSION

Thus the image segmentation by thresholding gives more accurate method of detecting fault in the automobile parts than the watershed transformation. The program is suited for any job that is coming on the real time so it is less time consuming .if there is no fault detected the output will be zero so that the objects moves to the other side of the conveyor if the fault is detected the output will be some numerical value .This value is sent to the microcontroller through RS232 AND MAX 232, which controls the pushing element and thus the object is rejected from the conveyor if it has a fault in it.

Thus the automobile parts are tested and fault is diagnosed using image processing techniques such as image segmentation and threshold.

VI. FUTURE ENHANCEMENTS

The three dimensional view of the jobs can be captured so that the fault can be diagnosed on all the sides .since it is not possible to calibrate more than one camera at a time a in matlab ,a robotic arrangement can be made to rotate the object to 360degree so that a 3dimensional view can be made.

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