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Automatic Washer Fault Detection using Pattern Recognition

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Abstract- In last few years industries are facing a major problem in field of testing their final finished produce especially in the field of automobiles. Efficiency of the vehicles is affected when the parts are not tested properly. Hence the selection and rejection of this automobile part for the further implementation of automotive is needed. We are presenting our research paper on developing intelligence in machine so as to make machine to do accurate analysis and on the basis of this analysis machine is able to take accurate and correct decision regarding sorting of defective and non defective washers. Neural network technique which is part of pattern recognition is used to implement artificial intelligence in the machine. These technique is synthesized using MATLAB. hence we are providing the most promising solution for fast and accurate sorting technique for washers.

I. INTRODUCTION

Petrol is one of the non renewable resource which is required in our day to day life and is becoming extinct. There are various reasons why petrol is becoming extinct one of which is improper manufacturing of some parts of vehicles engine which can cause loss of petrol either by increasing its consumption or by leaking. also companies which are manufacturing automotive parts(washer) face a lot of problems and bear losses of about 20

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.

II. 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.

III. SYSTEM ARCHITECTURE

In system block diagram shown above microcontroller is used for controlling operations. It controls operation of DC motor which in turn rotates the disc on which object is placed. High resolution camera is used to capture the images and these images are provided to pc which uses MATLAB and compares the image captured by camera with the standard image and therefore detects fault using image processing. The decision whether or not the washer is defective is taken using neural networks which is part of pattern recognition. When object is placed on the disc it is sensed by IR sensor and image is captured. LCD display is used for displaying the number of defective washers, number of tested washers and number of non defective washers.

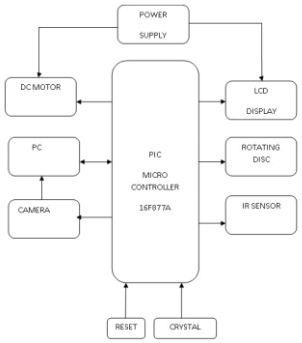

Fig. 1. System Block Diagram.

IV. METHODOLOGY

This design is being assigned two methodologies namely hardware methodology and software methodology.Hardware methodology consist of conveyer bet with glass disc and software methodology consists flow of our testing procedure

A. Hardware Methodology: Belt conveyor with Glass Disc

The belt conveyor is an endless belt moving over two end pulleys at fixed positions and used for transporting material horizontally or at an incline up or down. The main components of a belt conveyor are:

1. The belt that forms the moving and supporting surface on which the conveyed material rides. It is the tractive element. The belt should be selected considering the material to be transported.
2. The idlers, which form the supports for the carrying and return stands of the belt.
3. The pulleys that support and move the belt and controls its tension.
4. The drive that imparts power to one or more pulleys to move the belt and its loads.
5. The structure that supports and maintains the alignments of the idlers and pulleys and support the driving machinery.

B. Software Methodology

Software methodology includes flow of testing procedure as shown in figure below.

1. Start
2. Initialization of system
3. Capture image of object
4. Send captured image to pc
5. Extract feature of image
6. Image processing of object is done using matlab
7. Mat lab recognize image of object and matches it with the predefined dimensions of objects image and take decision whether the object is faulty or not
8. If the pattern is matched defect is not found
9. If pattern not correct then defect is found and process is repeated for another washer
10. End .

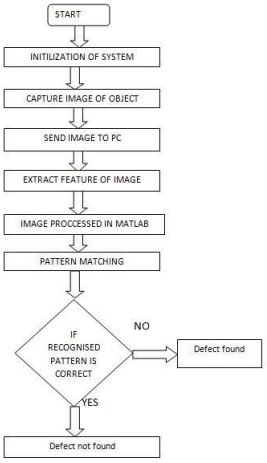

Fig. 2. Software Methodology flowchart

V. PATTERN RECOGNITION AND CLASSIFICATION

Pattern recognition is one of the most difficult problems in image processing especially in very noisy conditions. Arse-nault et al. in 1988 have developed a technique to improve the performance of ANN in pattern recognition and classification. The superior performance is achieved by introducing an invari-ant into the network by changing the interconnection between layers of the network, or by means of some pre-processing of the input data.

PATTERN RECOGNITION MODELS

Approach	Representation	Recognition function	Typical criterion
Template matching	Samples, pixels, curves	Correlation, distance measure	Classification error
Statistical	Features	Discriminant function	Classification error
Syntactic or structural	Primitives	Rules, grammar	Acceptance error
Neural networks	Samples, pixels, features	Network function	Mean square error

Fig. 3. Pattern recognition model.

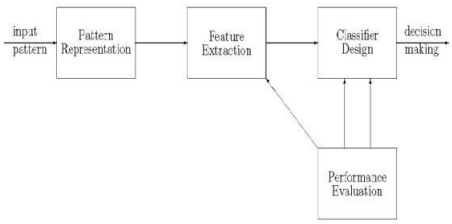

Fig. 4. Pattern recognition block digram.

A. Proposed neural network architecture

Based on the above, a novel neural architecture of a multisensor classification problem, have been proposed. This have been proposed. The first hidden layer consists of a committee of neurons, the first-level committee, to check the constraints on data. The results of such checks are managed by the output neuron of the subnet, which resembles a vote taking unit (VTU). The output neurons of the sensorrelated subnets resemble the members of a second-level-committee, each member of which is an expert in the analysis of the data from a single sensor element. Again, the output unit of the TLN is regarded as the VTU of this committee, combining the judgements provided by the sensor-related committees.

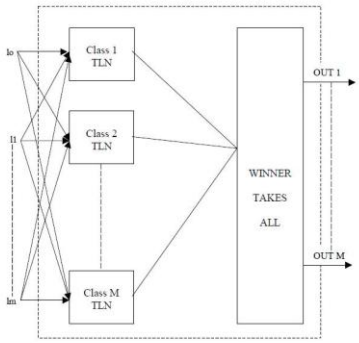

Fig. 5. Winer-takes algorithm

VI. SIMULATION RESULTS

Fig. 6. Original Image.

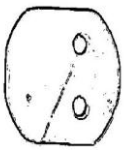

Fig. 7. Fault Detected image

neural architecture geometry is shown in Fig. 5. In this neural architecture, for each class, a TLN with two hidden levels

VII. CONCLUSION

Thus the image processing in MATLAB and pattern recognition gives more accurate method of detecting fault in the automobile part(washer) than manual checking and testing. 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 which is a 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 washer is tested and fault is diagnosed using image processing techniques such as image processing and neural network which is part of pattern recognition.

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