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"Selection of Proper Fixed Size Square Washer using Image Processing Approach"

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Abstract: In this paper a real time vision based system is proposed to identify the defect in the square washer. The entire frame work is based on the Arduino board and MATLAB. The images of square washer are taken from camera which is placed on top of conveyor belt. This images are processed in MATLAB. To extract the feature of washer area, height & width of washer is calculated and also area of hole is calculated. SVM is implemented for the classification of faulty and not faulty washers. The classified output is given to the Arduino board which will control the rotation of motor (motor is connected to conveyor belt) in clockwise / anticlockwise direction depending on not faulty / faulty washers. An LCD display is used for displaying status of washer. This paper attempts to study the defect detection technique on computer vision (MATLAB) platform which implements an industry assembly line using image processing.

Keywords: Conveyor Belt, Arduino, MATLAB (MATrix LABoratory), SVM (Support vector machine).

I. INTRODUCTION

Quality for any product in industry is very important factor. Visual inspection or monitor in industry is a difficult task and the accuracy is also not so good. Manual monitoring is very time consuming for the product to identify the defect and also the accuracy factor of the product will also degrade. Basically quality control is to avoid the defects in the product. Traditionally, visual inspection and quality control are performed by the experts in the industry, but they also need proper training and skills to identify the defect in the product [1].Machines can do better job than humans. Quality is basically fulfilling the specification or customer requirement, without any defect. A product is of high in quality if it is functioning as expected and reliable. The items with highest possible quality is defined by Quality control. In some countries they already have implemented systems that automatically identify the defect in the product to increase quality of their product. The customer first check the quality of the product to increase productivity of any product in the market and then depending on the quality of product, the maximum number of product are sold. So the machine vision control is better to increase the quality of the product and also the productivity in the market.

Today, in the industry defective products detection by visual control is a very tuff task and it should be examined through machine vision control which will be more accurate then vision control [1]. Image processing is one of the important techniques which is used widely day-by-day. The digital image can be used in machine vision in many applications. Computers automatically extract the various features from the digital using many different algorithms. One of the most important applications on digital image is classification and detection of various types of defects in image. In industrial products the inspection after production is required for each product. So it is important work is to classify the products on the packaging line based on the type of defects and to select the defected product depend on criteria for the manufacturer. The system for defect detection is carried out in many different kinds of surfaces for example defect detection in Textile Fabricant, crack beams and Radiograhic weldment images. Thresholding or edge detection method is occupied to detect defects in non-textured surfaces such as sheet steel, glass panels and some uniform web materials.

In ceramic tile defect detection it automatically detects the defected material and monitors the defects in the tiles. The various types of defects in the ceramic tiles can be spots, cracks, scratches, and blobs which detected through the defect classification algorithm [3]. Recently the conveyor belt systems are not only used in mining industries but also applied in power plant, production industries, cement industries, food factories, and power plant, etc. A conveyor belt is widely used option in most of the manufacturing industrial applications wherever there is need for complete assembly line automation [4]. For industrial sorting process, determining real time and highly accurate characteristics of minute objects in a rapid flowing stream would open new directions.

II. BLOCK DIAGRAM

The fig.1 shows block diagram of a system. The basic theme of this project is, square washer is placed on conveyor are sensed, selected and sorted depending on

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their size. For this, camera is used as input sensor; camera is placed at the top of the conveyor belt, and will be connected to PC by USB. The camera will take a snap and it will feed to PC for further processing. In PC MATLAB is used for processing, depending on this data will be given to Arduino board. The Arduino board which will control the rotation of motor (motor is connected to conveyor belt) in clockwise / anticlockwise direction depending on correct / faulty washers. An LCD display is used for displaying status of washer.

The conveyor belt will sort out the correct and faulty square washer depending on its size. The Arduino is good platform for this application. It is the software and hardware also; using both the above system is developed. Thus the real time, continuous defect detection can be done. This project is build on conveyor belt for proper distribution of fixed size square washer using image processing technique in MATLAB on the basis of size of the washer. The present paper relates a method for classifying and sorting fixed size square washer.

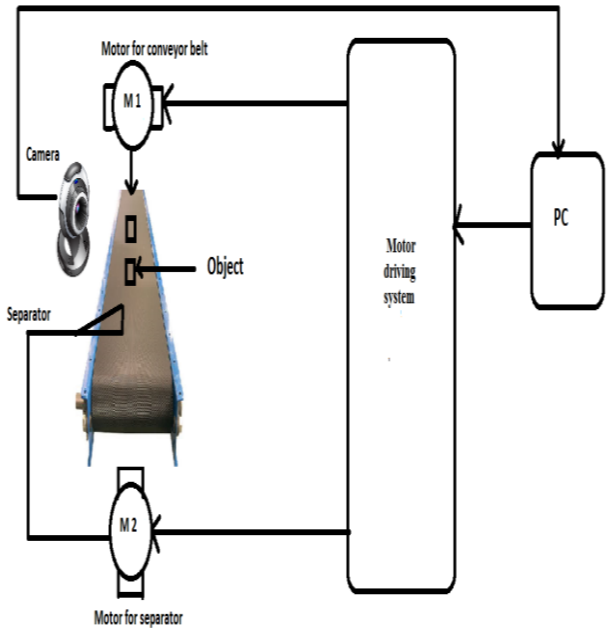

Fig 1 Block diagram

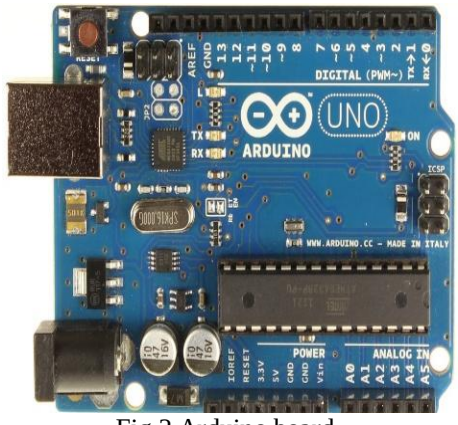

Fig 2 Arduino board

The Arduino is basically used for interfacing between the conveyor belt and MATLAB software. The classified data from MATLAB is given to Arduino board then the Arduino will control the rotation of motor (motor is connected to conveyor belt) in clockwise / anticlockwise direction depending on correct / faulty washers.

The camera used in this case will be overhead camera; it will take the snapshot of the square washer for defect detection purpose. The image captured by the camera will be processed by image processing using MATLAB. The images are captured under proper light intensity condition. The camera used in this case is Logitech.
Conveyor belt is used to separate the good and faulty washers at either end of the belt. according to the classification of the SVM classifier. The dimensions of the conveyor belt is 60*29.5 cm.The DC motor is used in this proposed system to rotate the conveyor belt. L293D is a typical 16 pin Motor driver or Motor driver IC. With the help of this IC according to the results the DC motor of the Conveyor belt will rotate in clockwise or anticlockwise direction.The LCD display is used for displaying the status of the washer whether it is good or faulty washer.

III. FLOWCHART

MATrix LABoratory is the abbreviation of MATLAB. MATLAB contains various high performance computation and visualization software packages. It is also a interactive environment which includes hundreds of built- in functions for technical animation, computation and graphics which provides tractability with its own sophisticated programming language. Image capturing and processing have been used widely in diverse applications, such in medical and surveillance applications.

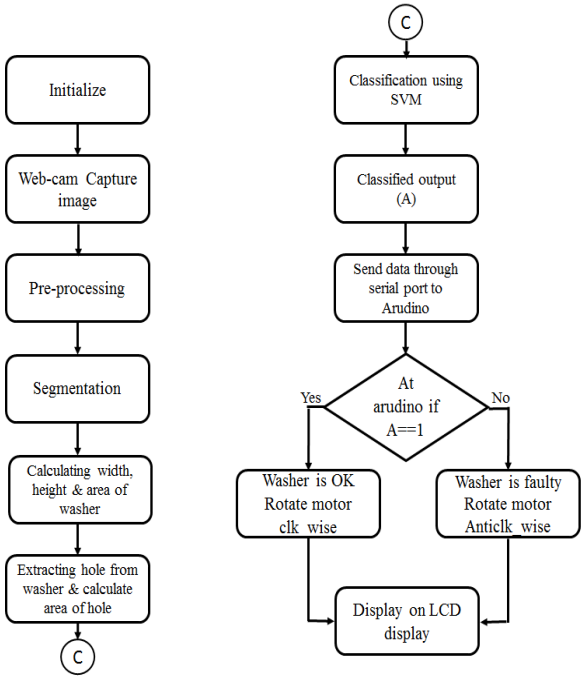

Fig 3 flowchart

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The proposed system uses MATLAB in conjunction with Arduino for digital image processing to classify square washer on the basis of physical characterization.

The first step of algorithm is to initialize to the system, then web-cam takes snapshot of the washer. After that the MATLAB software will process the image according to the algorithm. The captured image will further segmented to separate the object from the background of the conveyor belt. The next step is calculating the area of the square washer by filling the hole of washer so we get a complete area of only washer. When we get the area of complete washer the further step is calculating the width and height of the washer. Once we get this information the next step of the algorithm is calculating the area of the hole, for calculating the area of hole, the area of washer is subtracted by segmented image of washer. The washers are classified using SVM classifier and if else condition .Finally decision making is done whether the washer is faulty or not. This classification data is send to the Arduino board through serial port cable according to it the motor will rotate in clockwise or anticlockwise direction and displays the message on the LCD display whether the washer is faulty or ok.

IV. RESULTS

We have considered in all 10 washers for analysis. Out of which two washer is of correct dimension, and remaining eight washers are of incorrect dimensions (faulty).

- If washer is faulty

(a)

- If washer is ok

(b)

Fig 4(a ,b)

As shown in the table below out of total ten washers two washers are not faulty and remaining eight washers are faulty in hole and sides dimensions. Thus the overall accuracy of the proposed system is 90%.

Table no-1 Experimental results

Sr. no.	Dimension in cm	Washer	No. of Events	Correctly Identified	Accuracy
1	3 x 3cm	Fault in hole	5	5	100
2	3.1 x 3.4cm	Fault in size	5	4	80
3	3 x 3.5cm	Fault in size	5	4	80
4	3.1 x 2.9cm	Fault in size & hole	5	5	100
5	3 x 3cm	Fault in hole	5	4	80
6	3 x 3cm	ok	5	5	100
7	3 x 3cm	Fault in hole	5	3	60
8	3 x 3cm	ok	5	5	100
9	2.4 x 3.1cm	Fault in size	5	5	100
10	2.4 x 3.1cm	Fault in size	5	5	100
Overall Accuracy of the system					90

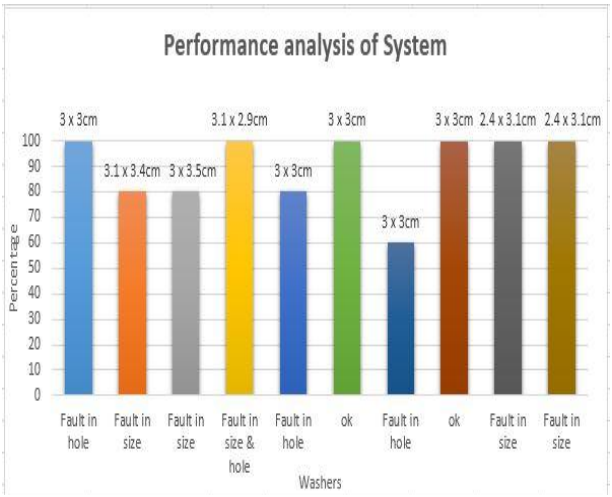

Fig 5 Performance analysis

V. CONCULSION

The proposed system involves hardware and software part .software part is done in MATLAB where the captured images are pre -processed. The images are taken under good condition of light intensity. To extract the features of washer, height, width and area is calculated. SVM is used for classification of good and faulty washers. Hardware part involves Arduino, battery, LCD display and conveyor belt assembled with a DC motor. Based on the output obtained from the SVM, Arduino will rotates the motor in clockwise or anticlockwise direction and displays the respective message on the LCD display. Thus the good and faulty washers are separated at either end of conveyor belt. It is implemented for real time application.

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BIOGRAPHIES

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