

# Design a System to Detect Metals Using Raspberry PI and Image Processing Technique

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**ABSTRACT:** This project aims in detecting fault metal with incorrect dimension while passing through the conveyor belt. This process takes place automatically and results in selection and rejection of metal pieces. The main component used in this project is Raspberry pi along with the Raspberry camera. With the help of image processing technique the dimensions of each and every metal piece are checked automatically. If the metal pieces contain the proper dimension which is being mentioned then selection of metal piece take place or else it is rejected. As this process take place automatically the efficiency becomes high and time consumption is very low.

**KEYWORDS:** Raspberry pi , Image processing , Conveyor belt , Metal pieces.

## I.INTRODUCTION

Machine vision using image processing algorithms is one of the fastest growing and widely used technologies in the area of manufacturing and quality control due to the increasing quality demands of manufacturers and customers. Machine vision utilizes industrial image processing by the use of cameras mounted on production lines and cells in order to visually inspect products in the real-time without operator intervention.

The issue of Quality Control in metal object is an important aspect of today's highly competitive Industry. The quality of the end product can be improved by inspecting the product at each manufacturing stage in product online. However, manual inspection of end products slows down the entire process as it becomes costly, difficult, time consuming and also may impact the effectiveness of human labour due to the hazardous atmosphere of the industry. Therefore, the process of inspection is also to be automated and inspection results should be feedback to the upstream manufacturing process for improvement of product quality. However, the Inspection system should be designed to be an efficient composition of human intelligence and experience along with the fastness of a machine. Machine Vision can be used very effectively to find out the fault in the metal object in the real-time industrial manufacturing process It is common to distinguish the binarization algorithm between global and local methods. The global algorithms calculate one threshold for the entire image while the local thresholding algorithms calculate different threshold values depending on the local regions of the image. For the purpose of finding out the defects, binarization is carried out by different thresholding techniques.

Thresholding is an important technique for image segmentation and machine vision applications, this thresholding technique has been widely used in the industry for automated visual inspection of the defects. The technique is often referred to a contrast sensing in them a chine vision industry. Because of its wide applicability too there area so image processing and applications, there is a considerable body of work on automatic

thresholding to draw from. Global thresholdings elects a single threshold value from the histogram of the entire image. Local thresholding uses localized gray-level information to choose multiple threshold values each is optimized for a small region in the image.

Global thresholding is simpler and easier to implement but its result relies on good (uniform) illumination. Local thresholding methods can deal with non-uniform illumination but they are complicated and slow. For automated visual inspection applications, where non-uniform illumination is usually not an issue due to controlled lighting conditions, global thresholding is commonly used for its simplicity and speed.

Among the global thresholding techniques, the Sahoo et al.(1988) study concluded that the Otsu method (Otsu, 1979) was one of the better threshold selection methods for general real world images with respect to uniformity and shape measures [3]. This method selects threshold values that maximize the between-class variances of the histogram. The Otsu method is optimal for thresholding large objects from the background; in other words, it is good for thresholding a histogram with bimodal multimodal distribution. The Otsu method, however, fails if the histogram is unimodal or close to unimodal.

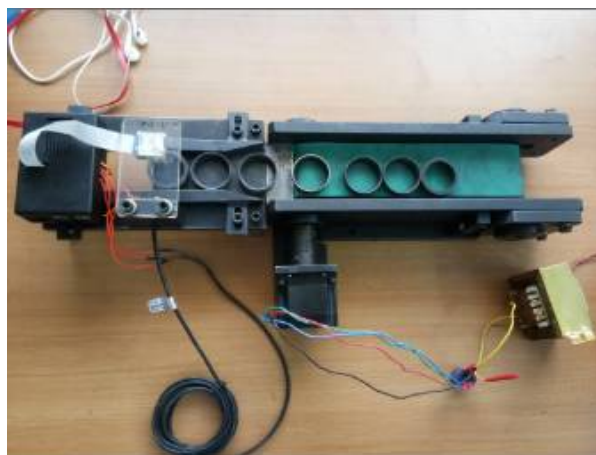


Fig1: Conveyor belt setup

## II. RELATED WORK

Research has been carried out for automatic fault detection and classification for metals by using enhanced Gabor filters, this technique is inspired by fault finding in textile materials by Gabor filters. This automated classification method helps to acquire knowledge about the pattern of the defect within a very short period of time and so that the defected metal may not be mixed with the fresh metal.

The defect region such as crack and shrinkage of the metal surface image is detected by binarization using iterative thresholding technique. The experimental results are carried out by using the real-time metal surface images and satisfactory performance is achieved by the proposed the defect detection technique. The real-time the defected color metal surface images are used in this approach. In order to identify the defects, the input color image is transferred to gray scale. Then the binarization technique is applied using iterative thresholding, in which the defect region is differentiated from the non-defected region. Experimental results prove that the presented the defect detection approach using iterative thresholding technique provides promising performance for the real-time color metal surface images.

The valley-emphasis method which is a revised version of the Otsu method, to automatically select the optimal

threshold value for the defected detection applications is proposed. The method selects threshold value that has small a probability of occurrence and also maximizes the between group variance in the gray-level histogram.

The small probability of occurrence requirement ensures that the resulting threshold value will always be a value that resides in the valley of two peaks, the bottom rim of a single peak. Therefore, the valley-emphasis method is able to select optimal threshold values for both bimodal and unimodal distributions. This is essential for the defect detection applications because the defects range from now the defects through small and large the defects. They have demonstrated the effectiveness of the proposed method on various the defect detection applications such as contamination inspection, ceramic body the defect detection, and metal sheets scratch inspection. The experiment results suggest that valley emphasis method is effective for selecting threshold values for the defect detection applications. The proposed method is simple and fast.

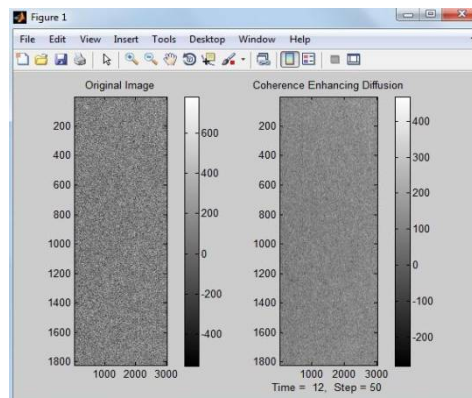


Fig2: Checking the black colour capacity

### III. EXISTING SYSTEM

In the existing system these images a dreamily subjected to two different operations in the proposed analysis system. The first step is to pre-process and the second step is to identify the edges. The image of the metal surface has many features that need to be treated as such and all the information present in the image are analyzed. In order to automatically detect the crack using LDA algorithm and diffusion method and also using the texture classification and segmentation are analyzed. In the LDA focusing on Linear Discriminant Analysis (LDA), the method proposed in this paper finds the most discriminative set of image processing operations to increase training samples. We represent an image processing applied to an image  $x$  by a matrix  $G$  (called generating matrix) to generate a new training sample  $x'$  represented by  $x'=Gx$ . This equation is similar to those in which they have formulated transformation between two images. In the existing system implement the concept as Fractional Wavelet Transform. The proposed transform not only inherits the advantages of multiresolution analysis of the WT-Wavelet Transform, but also has the capability of signal representations in the fractional domain which is similar to the FRWT. Compared with the existing FRWT, the novel FRWT can offer signal representations in the time-fractional-frequency plane. Besides, it has explicit physical interpretation, low computational complexity and usefulness for practical applications.

Comparing with existing techniques, different thresholds are selected to control the scales of defects that make it more flexible to meet various requirements. By using proper parameters we are able to locate most of defects from the radiographic image at a desired scale, however, in practice it still is a difficult problem to tell "false" defects from "true". To ensure low deformation of profile region corroded surfaces were covered with an epoxy resin before cutting and mounting with phenolic resin for mechanical polishing. A representative number of 1260-960-8bit digital images.

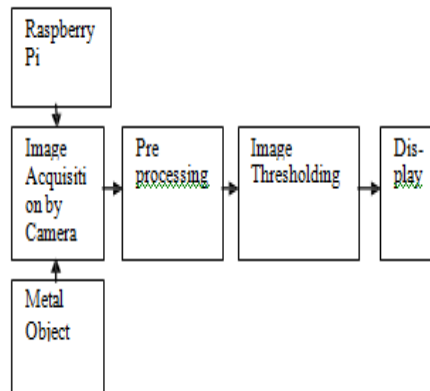


Fig3 Existing detection model

#### IV. PROPOSED SYSTEM

Images of the metal objects will be taken in the real time by pi camera or it can be taken with any camera compatible with raspberry pi as results in the real time are required. Raspberry pi is a single board, credit card size computer which is used in the place of CPU to minimize the hardware cost and size. The camera can be easily interfaced with the raspberry pi as it has a USB ports. Here pi camera of resolutions 5mp is used to capture the image. With the help of the image processing technique the dimensions of each and every metal piece are checked automatically.

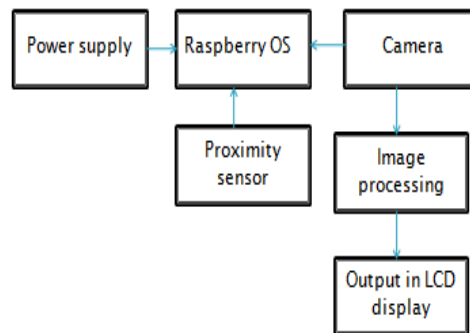


Fig 4 Proposed detection model

#### V. RESULT

In order to evaluate the performance of the surface the defects detection system, experiments are carried out using the real-time metal surface images and applying different image thresholding techniques. Image of the metal object is taken in the real-time by the Pi Camera. The proposed the defect detection system is processed by converting the color image into gray scale image. Then the gray scale image is then processed by different thresholding techniques to find out the surface faults. If the metals have the required values of black capacity then the metal piece (ball bearing) will be “accepted” and if the metal piece is less than the required values then the piece will be “rejected”.



human expert from quality inspection. Use of Raspberry Pi over CPU will minimize the system overall cost.

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