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Qcuip: Quality Control Using Image Processing

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Abstract

Now a days industries require accurate and timely information to improve their quality and increase the production of goods. Thus digital image processing can be used in this area mainly for the detection of faulted parts or missing part. Automated visual inspection is the key factor behind all the industrial application of digital image processing. The proposed project mainly deals with analysis to find faulty industrial parts and correcting it. Automated visual inspection uses digital camera that captures image which is coming out of product line. The captured image is then fed to computer for further processing. The typical image processing task is to find the faulty piece by comparing the user requirements and manufactured product image. This proposed idea will employ verification of measurements of all the pieces that are coming out of product line. Based on the error rate modification in the design can be pursued. This proposed idea increases the speed and accuracy and avoids human errors which are common in quality testing. The proposed project overcomes the weakness in the existing system. Thus manual inspection can be replaced with the proposed idea and hence productivity can be increased.*(Abstract)*

Keywords—Edge Detection, filter, product line, statistical approach visual inspection, RGB.

I. INTRODUCTION

Today there is no field of technical endeavor left out without the impact of Digital Image Processing[2]. Digital Image Processing is a technique for analyzing and manipulation of the digital images using computers [2]. Automated visual inspection uses digital camera that captures image which is coming out the product line. The captured image is then fed to the computer for further processing. The typical image processing task is to find the faulty piece by comparing the user requirements and manufactured product image.

In many industries, quality of products is tested by using gauges. The product is fitted onto the gauge and if it the does not fit appropriately then the product is considered to be faulty.

Also in some industries, the quality testing is done by a human eye wherein human observes the shape and size of the products coming out of the product line. But in practice only a few pieces are taken and verified for dimension and orientation of the shapes. This way of performing a test manually is a tedious process and prone to human errors which reduce the quality of the products. In this study we propose to perform the quality test using Image Processing techniques. Image of every product is taken and the dimension and orientation of the shapes cut are calculated with actual dimension in drawing. This increases the speed and accuracy and avoids human errors which are common in quality testing.

II. LITERATURE SURVEY

Quality assurance and management are growing in importance in industrial development and production. The decentralized production of components by suppliers mean that tight specification have to be met to ensure problem free assembly in final production, resulting in a high quality final product. Test engineers strive to catch defects before the product is released but they always creep in and they often reappear, even with the best manual testing process. Automated product testing is the best way to increase the effectiveness, efficiency and coverage of your product testing. Typical features such as hole patterns as well as borders, sharp edges, elongated holes can be measured with Quality Control Using Image Processing (QCUIP). The full surface component measurement enables a simple good GO/NO GO statement. It also shows the deviation for a fast evaluation of processing. This means early detection of potential problems so that process can be corrected in timely manner, resulting in lower production cost and efficient quality control. Companies that implement these techniques benefit from shorter production time for products. Companies remain competitive because they help their customer to go from idea to product faster, optimize production workflow, and minimize rejects while production is running.

III. QUALITY VERIFICATION USING IMAGE PROCESSING

Digital Image Processing techniques are employed to verify almost all the products that are coming out of the product line. This is pursued by taking image of each and every product as soon as it comes under the camera. Captured image is fed to the computer for further processing. The colored image is converted to black and white image and then to binary form. This binary image is then subjected to template matching. This proposed idea of using Digital Image Processing helps to save time as the process to carry out quality testing becomes fully automated and results in increased productivity. It gives accurate results as industries carry out manufacturing on large scale. It also reduces human efforts.

IV. IMAGE CONVERSION

The captured image is a RGB image which needs to be converted into binary form. A grayscale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest[1]. First we need to convert the grayscale image to a binary image. The output image replaces all pixels in the input image with luminance greater than level with the value 1 (white) and replaces all other pixels with the value 0 (black).If the input image is not a grayscale image, convertsthe input image to grayscale, and then converts this grayscale image to binary by thresholding.

Image conversion:
```
while (true)
{
Captured frame will get stored into integer pointer
frame.
It is shown in "video".
Convert Invoked image into binary form using ,
CvInvoke.cvCvtColor(frame,frame,EmguCV.CvEnu
m.COLOR_CONVERSION.CV_BGR2RGB);

Specify threashold value for conversion of image.

CvInvoke.cvShowImage("Video", frame);
//shows rgb image in video.
   CvInvoke.cvShowImage("Binary", thresh);
//shows binary image with thresh in Binary.
   break;
}
//On key press application window will disappear.
```

This is the code used for making binary conversion of image in frame.Frame is in the integer pointer . MVSCALAR used for scaling the image to appropriate size.
CvInvoke.cvShowImage("video",frame) it shows real rgb video captured by camera.
CvInvoke.cvShowImage("Binary",thresh)   shows binary conversion of frame in video.

V. TEMPLATE MATCHING

Template matching [5] is a technique in digital image processing for finding small parts of an image which match a template image. It can be used in manufacturing as a part of quality control. The binary image is given as an input for template matching process. This image is compared pixel by pixel with the template image of an ideal product to verify the actual shape and dimension.Matches are estimated based on the intensity values of both image and template. If the templates match accurately then product will be considered as a non faulty piece.

Template Matching

In template matching ,we are selecting an ideal image and a captured image which are need for comparison.

We are comparing height and width of both image,using loop and checking for maximum matching of pixels in both images.

If images ae not same increament count2 for unmatching pixels. In this we are using threshold value as 700 for matching pixels. If count is less than that then it is considered as correct image else incorrect.We can set threshold count as per need.

Template Matching:
Get the height and width of captured image, values will be stored in i and j.
Get the maximum matching pixel of both images using
```
img1_ref = img1.GetPixel(i, j).ToString();
       img2_ref = img2.GetPixel(i, j).ToString();
```

Maintain count for maximum amount of pixel matching,
```
     if (count2 < 700)
     {
correct image;
}
 else
     { incorrect image;}
```

VI. IMPLEMENTATION

As shown in Fig1, initially the product is placed under the camera. The camera then captures the image of the product and sends it to the QCUIP system for further processing. When the QCUIP system receives the image, it coverts this image to

binary form and subjects it for template matching. The Template matching process compares this captured image with the original template already stored in the database. The appropriate results are stored in the database.

If the templates are a match then the product is considered to be quality product. And if not then the faulty area is highlighted on the image. It helps the manufacturers to easily identify the faulty products from the bulk. Thus this process helps in speeding up the quality testing.

VII. RESULTS

After partial implementation of the proposed study we have carried out image conversion that is from RGB to Binary, of our products which we are going to use for this project.

Following are the images taken after the partial implementation. These images show the RGB form of the product along with their Binary form.
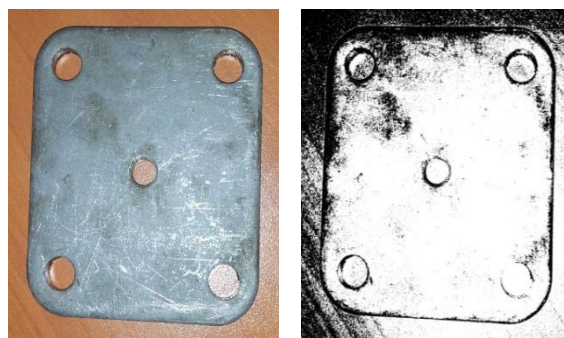

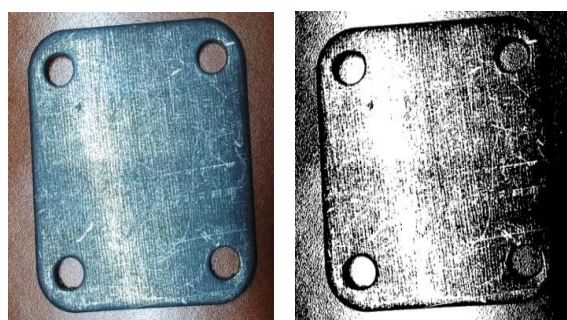Fig2 (a): Actual product used for quality control with their binary image

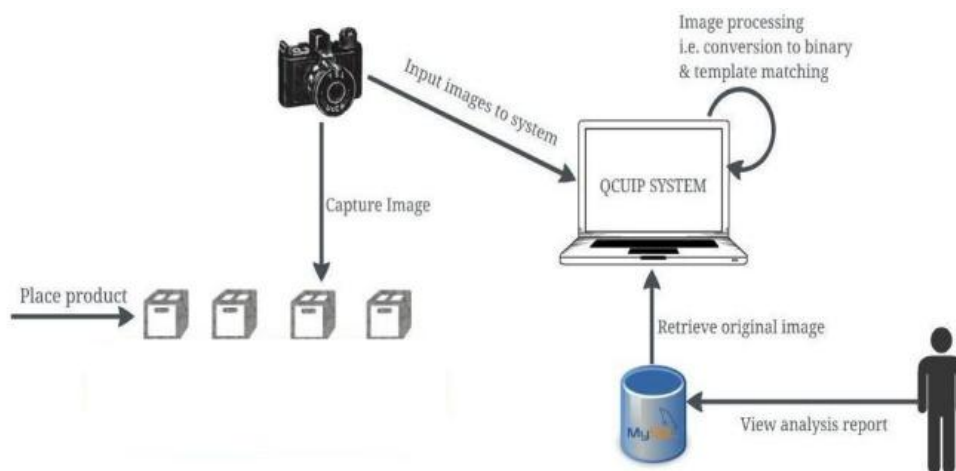Fig2 (b): Actual product used for quality control with their binary image

Fig1. Working Model

VIII. FUTURE SCOPE

This proposed idea canbe enhanced with some advanced and extra features.We can use a conveyor belt for capturing images of products that come directly out of the product line. After getting reult from system we can separate faulty produts and good products. We can also maintain count of good products as well as faulty products produced in the entire day. A daily analysis report can be generated which can be viewed by the manager as soon as the task finishes. This proposed study will be helpful in

another application like Coin sorting. We can sort the coins and count the total amount.

IX. CONCLUSION

A major area of imaging is in automated visual inspection of manufactured goods. Detecting anomalies is the major task of this proposed idea. This study proposes the detection of faulty pieces using Image Processing Techniques and overcomes the weaknesses in the existing system. This proposed idea

can also be extended to any irregular shapes of products.

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