Abstract

This paper presents an efficient implementation of Image Processing technique for measurement of dimension of object in Turbine system. The proposed work makes use of the Matlab software for the said work. Using the image acquisition technique in the Matlab software, the images are taken and various operations are performed for the given object (here Water Pump Pulley). These images taken operate on Water Pump Pulley (WPP) - 44 & 905a for the different parameters of the object. This model designed for the automation of the measurements processes for WPP 44 & 905a. The same can be implemented for the automation of other objects with required code in the Matlab.

1. Introduction

Water Pump Pulley (WPP) 905a & 44 is now made using alloys. It is compatible for plus Turbo/Auto model developed in 1985-92 with turbo auto system. This Turbo/Auto is very much important system so gauging of this product is required and cross check is perform by quality assessment department for each product after manufacturing. Quality assurance is the planned and systematic set of activities that ensures the products conform to requirements, standards, and
procedures. The customers would prefer to wait slightly longer for a quality of product but wait shouldn't so long. The real challenge is to deliver successful product not just once, but again and again to make your product successful with high quality of standard. Futurism has years of experience on managing software engineering and quality assessment team. But the quality assessment department needs to be fast.

2. Existing system and Its Drawbacks

Industry has a lot of manually operated processes. Being specific about the industry we dealing, the parameters testing of the product (job being developed) is completely a manual process. Being a matter of quality and precision, there is no chance for any human error to be introduced in the parameters being measured or calculated.

The measurements are carried out by the labour using traditional measuring methods such as:

a.) Vernier calliper,
b.) Snap gauge
c.) Air plug gauge
d.) Thread ring gauge
e.) Pressure gauge ….etc.

These methods are precise but involve risk of human errors which depend on the skill of labour used. Any minute error in the measurement may result into some major problems in working of the main machine. And after 10 number of tests every time quality assessment department have to check their standard settings. This is going to affect the overall performance, which will affect production of industry. Quality assessment of current production is done manually which is time consuming takes 4-5mins for completion of each object which directly affects the productivity of the industry, and to overcome current problems we can do the atomization of the system by using image processing which will increase the productivity and gives reduction in man power.

System designed is very specific for the Water Pump Pulley and for taking images for the same. Based on pulley’s it will check for the dimensions of each and every work object kept for inspection. And it will give the results regarding faulty object being kept for inspection.

3. Scope

The goal of this project is to develop a technique which will cancel all the manual process of measurement and give accurate results. This will ease the industry officials from the strenuous techniques of measurement for each and every job. This will surely reduce the work load.

Below figures, gives the idea about which most important parameters are need to test while doing quality testing required in the object.

![Figure 3.1: Top View of Water Pump Pulley](image-url)
In figure 3.1 and figure 3.2 all parameters will be measured using image processing. As it is real time processing it is very useful in industry.

The advantages of this project to the industry are:

a.) accuracy in measurement
b.) Reduction in time dedicated to every job manufactured
c.) Increases the yield.
d.) Machines work consistently
e.) Defects are reduced
f.) Machine vision works tirelessly

Machine works the work that complies with the standards required for the industry.

4. Flow Chart

![Flow Chart Image]
For the Water Pump Pulley 903a & 44 above figure is shows the brief view of flow diagram

- 1st Object is placed with precise angle under camera and light source in such a way that getting of accurate image which will provide to Matlab.
- Using Matlab, Image Acquisition of an object is taking & that image will store in Raw/JPEG/BMP format.
- Using Image Processing step Contrast or Brightness or de-blurring is adjusted.
- In Segmentation, segmentation of image is to be done in small sub images.
- Feature extraction gives information about Shape, size & other parameters of an object
- And at classification state sorting of object is done into weather provided object is faulty or not.
- Knowledge base provides the standard information of an object like standard values of each parameter that will need to be calculated. So it provides support and information to each and every step.

5. Implementation Method

There are two methods which is useful for Quality testing of water pump pulley 905a & 44,

I. Circular Hough Transform
II. Edge detection and Pixel to Pixel Mapping

5.1 Circular Hough Transform

This Circular Hough Transform method is used to calculate the diameter of circles which are present at top side of object. A commonly faced problem in computer vision is determining the location, number or orientation of a particular object in an image. One problem could, for instance, be to determine the straight roads on an aerial photo; this problem can be solved using Hough transform for lines. Often the objects of interest have other shapes than lines, it could be parabolas, circles or ellipses or any other arbitrary shape. The general Hough transform can be used on any kind of shape, although the complexity of the transformation increases with the number of parameters needed to describe the shape.

5.2 Edge detection and Pixel to Pixel Mapping

a) Edge detection

Edge detection is a terminology in image processing and computer vision, particularly in the areas of feature detection and feature extraction, to refer to algorithms which aim at identifying points in a digital image at which the image brightness changes sharply or more formally has discontinuities.

The purpose of detecting sharp changes in image brightness is to capture important events and changes in properties of the world.

b) Pixel to Pixel Mapping

This technique applicable to devices with native fixed pixels, such as LCD monitors and plasma displays. A monitor that has been set to 1:1 pixel mapping will display an input source without scaling it, such that each pixel received is mapped to a single native pixel on the monitor. This technique avoids loss of sharpness due to scaling artifacts and normally avoids
incorrect aspect ratio due to stretching. If the input resolution is less than the monitor's native resolution, this will result in black borders around the image (e.g. letterboxing or window boxing).

6. Advantage

- The very basic need for atomization is to ease the human being from tedious work. This software based system serves the same purpose.
- It generates almost accurate and timely results for the application being used.
- This is nothing but the Machine Vision used for the inspection.
- It can tirelessly perform without complaining.
- It is highly efficient compared to the human labour as their counterpart.
- As the time necessary for every work piece to be measured is reduced, can surely increase the production yield.
- Doesn’t require continuous attention for inspection. Once started, it can operate for hours without even bothering the human labour associated with the given task.
- The Water pump pulley dimensions need to be accurate at micron level.
- The production is done nearly equal to this.
- This minute measurements are possible only with the software technique being implemented.

7. Conclusion

This paper is a work to tells development to test the quality parameters of a Water Pump Pulley(WPP-44 & 905a). This paper provides information about steps involved in the Quality testing of WPP-44 & 905a objects.

References

[1] Sirisak Liangwongsan, Boonraung Marungsri, Ratchadaporn Oonsivilai, Anant Oonsivilai publishe paper on "Extracted Circle Hough Transform and Circle Defect Detection Algorithm". Published by World Academy of Science, Engineering and Technology 60 in 2011
[3] Sathish Kumar and S. Kuti on "Edge detection of angiogram images using the classical image processing techniques" Published in Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya Univ., Kanchipuram.