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Image Processing Method for Gear Measurement

[1]Akshay. S. Patil, [2]Mr. V. P. Gaikwad
[1]M.Tech Student, [2]Associate Professor
[1,2]Dept. of Mechanical Engineering, D.K.T.E. Society's Textile & Engineering Institute, Ichalkaranji.

Abstract-- The gear plays necessary and important role in transmission device. The gear quality includes a direct impact on performance of mechanical product. Therefore, manufacturing industry in need of a system to meet their quality assurance requirements specially when they have to produce quality and price components. So, inspection of parameters becomes very difficult and time consuming process. In recent years computer image vision technology has become one of the effective technique to measure the gear parameters. The image process technique capture the image through camera and then send to image processor for judgement and measurement so quality assurance process become simple and quick.

Keywords-- *Quality assurance computer vision, Automation, Preciseness measuring.*

I. INTRODUCTION

As we all know that technology is developing day by day and really quick. In some recent years options are changing in manufacturing industries to check their product parameters are correct or not. This is possible by changing or updating old techniques to exact level and to get accurate output results. Image processing technique is best answer to them. (1)

The gear is placed on the platform, below the photographic camera that captures image, interprets the signals to digital data and sends it to computer by image acquisition system. In addition to this, the printer is employed because the output device from which gear profile measured image within the kind of text. Because of the uncertainty in illumination in geared image acquisition, that of light source is employed for acquire the higher performance. The light source is kept at the top, in order to that every gear is able to obtain uniform illumination. Before the image acquisition, the regulation of environmental parameters ought to done in step with lighting conditions. The camera is installed with lighting, it has auto-focus function which is able to improve the image quality. Image acquisition card is put in within the computer's motherboard, it interprets the signal to computer. After that, the software compares the image with standard image and displays accept or reject. (2)

A number of different methods:

Search-

Consists of a vision software tool that locates objects by comparing a grey level model of the object of interest in the input image. It is based on a technique known as template matching, which means that the vision system scans the input image for a match to the object template that has been stored in memory. When a match is located it measures the object X, Y position and orientation. It also calculates a correlation of shape score which is a measure of how close the match is. It uses a full range of grey-scale values which makes it more reliable by providing more pattern data.

Contour Finder-

It is a vision software tool that locates objects by finding their outlines or contours in the input image. It also requires that the user first train a model of the object to be located. Unlike search, it stores a model that represents the positions of all edge points in the object. It then compares the edge points of the model with the one of the image to locate the final location. This tool is suited for applications in which the surface or texture of the object can vary from part to part. This tool also handles light changes that are not uniform across the camera field of view. Contour Finder is based on the Hough Transform which is a method for locating patterns among groups of edge points. The edge pixels are detected and its magnitude and direction are calculated.

Inspect-

Inspect provides information about the size, position and connectivity of objects in an image. It is the basis of many inspection, guidance and sorting applications. It is useful for applications in which the objects vary greatly in size, shape or orientation. This tool is not very suitable for objects which contain the same level of grey as the background because it bases its decision, about what is part of the object or not, on the grey level. The information provided by inspect can be used in order to sort or classify objects according to their size, shape and position.

Caliper-

The caliper Tool is a vision tool which can be used to find an edge pair within an image. If the edge pair is found within the image a result is produced, which details the position, edges contrast, edges separation, edges polarity and score of the edge pair. This tool is based on detection techniques which enables it to locate correct pairs of edges despite complex or confusing data in the image background. The Caliper finds the edges of interest by scoring each located edge based on geometric constraints specified by the operator. Parameters include polarity or direction of the edge, position of the edge pair, distance between the edge pair and difference in grey value on either side of an edge.

Golden Template Comparison-

The Golden Template Comparison (GTC) is a vision tool which can compare the image with another similar

image, and identify any differences between the two. The result of a comparison is a binary image which contains the areas of the images which are significantly different. This image can be subsequently analyzed using other vision tools such as the Blob Tool. GTC provides reliable high speed detection and classification of defects within scenes that contain complex, grey-scale imagery. While simple images might be adequately inspected using blob analysis technique, GTC is designed to address applications in which the vision system must identify defects within complicated grey-scale patterns.

Scene angle finder-

This tool measures the angular orientation of an object. It does so by determining the direction of dominant edges in an image. Importantly, it does not require pre-trained models. Thus, it is a valuable first step in any alignment and guidance applications. The developer can determine the object's orientation and then correct for angular deviations before running a model-based search to precisely measure X, Y position. Scene angle finder works on any image that contains strong parallel and perpendicular edges.

Polar co-ordinate vision-

The polar co-ordinate vision tools enable the developer to access image information using polar co-ordinates. These tools can directly measure the angle of complex objects. They can also prepare polar images for further analysis by other vision tools. Such capability is very useful for applications in which the relevant information is arranged in circular form.

II. LITERATURE REVIEW

Manting Luo (2018) mentioned regarding non-contact measurement of small module gears exploitation optical coherence tomography (OCT). In this, gear image captured and compered with standard gear concluded that, by using contact measurement tough to measure gear with tiny module however OCT solved that issue of visual and microscopic measurement and increases measurement preciseness.

M. N. Dhavalikar (2018) did experimental investigation on geometric verification of gears using image processing technique. Gear classification are often finished use of imaging devices, for this camera and scanner are used. This paper planned a preprocessing technique as per sort of gear parameter and MATLAB algorithm read image with the help of image processing. So measurement of gear becomes simple with none compromise for accuracy.

Ruiling Lui (2016) did analysis on gear quality inspection system supported camera vision technology. In this surface detection and manual inspection are pricey and fever correct. This drawback solved by using camera vision technology, thus preciseness and speed of dimension measurement meet as per demand. This paper develops a gear quality inspection device which mixes defect detection and dimension measurement in one system.

Jian Li (2015) centered on measurement system of gear parameters based on machine vision. In this image preprocessing, image segmentation and image analysis takes place. Also, centre detection algorithm need to detect the edge of gear. This experiment shown simple structure, stable, reliable and performs with good speed and high preciseness. So, it achieves good results in production industry.

Wencheng Wang (2014) mentioned on image based system for measuring work pieces. In traditional method tough to measure tiny size and irregular form workpieces and only one third inspection is finished. This problem is solved by using image processing. In this image taken by camera for image process and filtration, concluded that by using this system only one employee is needed to operate equipment setup that reduces labor cost.

Himat Ali (2014) did research on gear measurement using image processing in matlab. In this, five different gears image taken to calculate area and number of teeth by using image processing. This paper conclude that, the area of gears and teeth counted by using image processing in matlab tool shows totally different values because of different shape and size of various gears.

Mandeep Kaur (2012) did research on identifying defects in gears using digital image processing. This paper recognized captured digital images of gear by image acquisition device and convert RGB (Red Green Blue) images to binary images by restoration process and threshold techniques, over that gear parameters value deformed than threshold value then gear became not appropriate for any applications.

Ji Tao (2011) focused on design technique for gear parameter analyzing. In traditional method, gravity and median methods are used to detect edge of gear but it requires point to point record to detect fringe of gear thus it becomes time intense. To solve that problem, this paper present a system for captured image from CCD (charged couple device) camera. This paper concluded that this technique is non-contact very easy to implement and has importance in production.

M. A. Younes (2005) did experiment on automatic measurement of spur gear using laser light. In this tooth thickness, pitch and flank profile measurement takes place using lase light source and its results compared with results obtained by using other measurement techniques Concluded that, this method is independent on gear size and shows less time than the manual inspection. The developed system is east, cheap and automatic.

J. P. Oakley (1995) mentioned regarding the accuracy of image analysis methods in spur gear metrology. This paper represented spur gear inspection system for measurements made by using CCTV video camera and image analysis software, concluded that choice of

camera and frame store system is very important once designing an image analysis metrology system to extend accuracy.

III. DISCUSSION

Above are the few papers which discuss the non-contact measurement of gear parameters. In earlier stage, the measurement finalised with the help of master gear however it needs more time and also get less accuracy due to human errors. So, traditional method cannot acquire enough data. And other methods related to edge detection however have their own limitations. So, real time inspection using manual is inadequate and non-consistent.

CONCLUSION

From above literature survey get basic knowledge of gear measurement parameters. So, to measure the multiple dimensions quickly and accurately more efficient vision system is required which may simply take the images of gear and measure the parameters of gear and can show the accurate results of measurement.

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