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# GEOMETRICAL INSPECTION OF BRAZE DRILL BIT BY IMAGE PROCESSING

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**Abstract -** *Automation is very important factor from recent decades in an industry. After manufacturing product; to make decision about rejecting or accepting of lot is taken by measuring various quality parameters. To measures geometrical parameters such as dimensions of manufactured product inspection is done manually by using traditional instruments in almost all manufacturing industries. Manual inspection is time taking process, costly; sometimes it may have error and due to complicated shapes of product is very difficult. To overcome these problems product is inspected by use of image processing techniques. In this paper geometrical inspection of braze drill bit has been carried out by concentrating on the parameters of bit image object. We have used MATLAB tool and development code which overcome measurement problems of various bit parameters .To accomplish this task we have measured angle, length of image object. The experimental results have been shown in this paper.*

***Key Words*: *Braze drill bit, Measurement, Edge detection, Image Processing.***

## 1. INTRODUCTION

Image processing is one of the most increasing areas now days. By converting analog image into the digital system and using digital image processing technique it is possible to extract various features from the image [1]. For visual inspection we use the digital camera, fixed fixture and computer. The image is capture by camera, fed into the computer for further processing. Edge detection is use to simplify the analysis of images and reduce the amount of a data. The task is to find the faulty piece by comparing the user requirements. Also in some industries inspection is carried out by manually method testing is done by a human eye wherein human observes the shape and size of the products coming out of the product line. In many industries, quality of products is tested by using measuring instrument. The product is fitted onto the measuring instrument and if it the does not fit appropriately then the product considered to be faulty, is 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. This is way we can increase speed and accuracy of inspection and reduce human error which comes in manually inspection.

The purpose of this project is to develop a Geometrical inspection system to perform an on-line dimensions inspection that helps to find (out-of-tolerance) products from the production line. It is applied to inspect 2-D machined products of know tolerances.

The system design covers the following aspects to perform quality control:

- Developing an active and simple optical system to acquire images of inspected products.
- Applying image processing tools to make decision about accepting/rejecting inspected product

After transmitting images to the computer, approaches based on image processing are applied to extract their features. Back propagation neural network is used to distinguish between within and out-of-tolerance products; and consequently accept/reject the inspected product. The results will be compared, (MSE) introduced by Hassan and Diab [7].

## 2. LITERATURE SURVEY

1. **N. Yogesh Bagrecha et al.,(2014)** - 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[2].
2. **E. R. Davies, (1998)** - Checking whether the dimensions of a product are within specified tolerances and the products have the correct shapes are ordinary tasks for industrial

quality control systems. Such tasks involve characteristics of products in two or three dimensions, namely, the inspection of dimensional quality [3].

3. **Chen and Ventura (1995)** - There are several application fields where image measurements can assume a great relevance. Chen and Ventura introduced a vision-based shape recognition and analysis system of machined parts. Their work involved the development of machine vision algorithms for automated inspection of production parts. The inspection system consists of three parts in series: enhancing, recognition and analysis. The input of this system is a set of ordered boundary data extracted from the product image and the output includes the identity of this product: its position, dimension, and tolerance error. They used computer experiments to show that their technique is accurate and fast[4].
4. **R. J. Hunsicker, et al., (1994)** introduced an inspection system of screw threads for compliance with manufacturing standards. Edge detection algorithms (based on linear interpolation to the sub-pixel resolution) are applied to detect regions of interest. Each region is matched with multiple models of threads, since the dimensions and positions of the inspected threads are allowed to vary. The system has been tested on the production line and has been shown to perform better than manual measurement[5].
5. **Du et al. (2011)** introduce a method for dimension measurement of spur gears based on machine vision. The method concentrates on developing measuring methodologies and algorithms to get the gear's key parameters, such as, outside diameter, root diameter, number of teeth, and estimate the module of gear. The tools used are image segmentation, binarization processing, median filtering, and boundary tracking. An approach to measure the width and depth of keyway and to count the number of teeth is introduced. The measuring process is completed by automatically generating the dimensional drawing of object[6].

Irjet Template sample paragraph .Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

## 3. PROBLEM DEFINITION

Quality inspection for product manufacturing is one of the important aspects in almost all industries from last decades. In the past part producer uses caliper and "go" and "not go" gauges to control the various geometric parameters and some parameters are withheld due to being time consuming and in some cases due to the measurement tools limitation. This existing inspection methods which can aid in this task; however they have their own limitations as they are slow in inspection, less effective in industrial inspection. These problems cause the high percentage of parts are rejected from clients.

Machine visualization method in quality inspection increases the speed and precision of parts quality inspection. Automated monitoring of the quality of the industrial products like Gear and some parts of the car engine is nowadays done using new digital image processing techniques.

In this paper a practical and cheap machine visualization solution is presented for small and medium industries. In this method, a web cam captures images of braze drill bit and taken images are processed on MATLAB by image processing software on geometric parameters and give a results for making decision about to accept/reject part.

## 4. OBJECTIVES

1. Analysis of the existing Inspection methods and instruments.
2. Inspection of braze drill bit Geometry Including Geometrical Errors in dimensions and calculating geometric parameters with the help of Image Processing in MATLAB.
3. Consistency, repeatability, accuracy, versatility, reliability, integration of production line, speed in product inspection are the main objective
4. Make a low cost approach which is capable of high performance.

## 5. THE DEVELOPED BRAZE DRILL BIT INSPECTION TECHNIQUE

This section describes the developed visual inspection system including an optical system. Inspection is the everyday task performs on the shop floor. In which various features of the part are inspected which are very important to maintain the quality of the product. In particular, inspection can help to control the following:

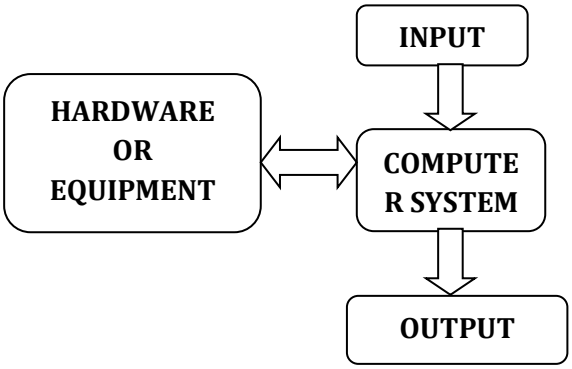
- Size of the part
- Material Quality of the part
- Fixture mounting on the machine
- Machine set-up
- Part blank quality
- Accuracy of the cutting tool
- Mounting of the cutting too
- Correct sharpening of the cutting tool

### SIZE INSPECTION

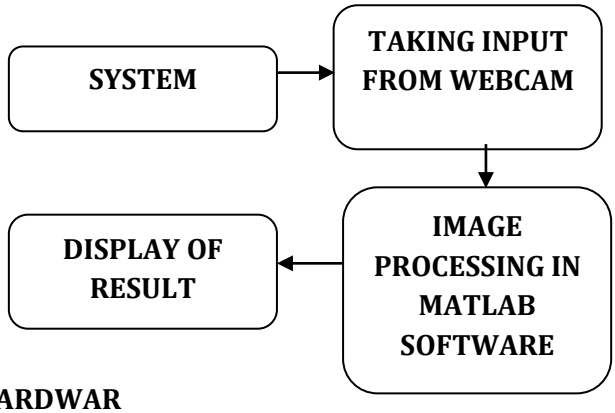
The existing method for inspecting a bit for correct dimension measurement is with the go & nogo Gauge, Height Gauge, Caliper and Bevel Protractor. This instruments are accurate and convenient to determining the dimensions of the bit,but this are the time consuming methods and require different instruments for different parametrs. So in this paper we are using Image Processing technique by concentrating on size inspection, in which we are calculating parameters such as :

1. Angle
2. Length

### SYSTEM




### FLOWCHART OF SYSTEM




### HARDWAR

A machine visualization system is composed of the following components:

1. One or more cameras for image acquisition.
2. Light source, which plays a important role in providing improved images.
3. Transferring images from camera to PC
4. PC for storing captured images
5. Software platform that responsible for image processing.

Illumination one of the most important factors in the accomplishment of projects is machine visualization and its importance in measurement applications are doubled because the lack of proper lighting creates inaccurate edges in the image and measurement gives the incorrect sizes. LED s should be used that they are arranged in the equal distance. The light intensity should be similar to all LEDs. Due to the high number of LEDs the unwanted shadows on the parts of bit are not created.

### SOFTWARE

Software is a critical part of machine visualization systems that is composed to three main stages: 1-Image acquisition 2-Image processing 3- parameter analysis.

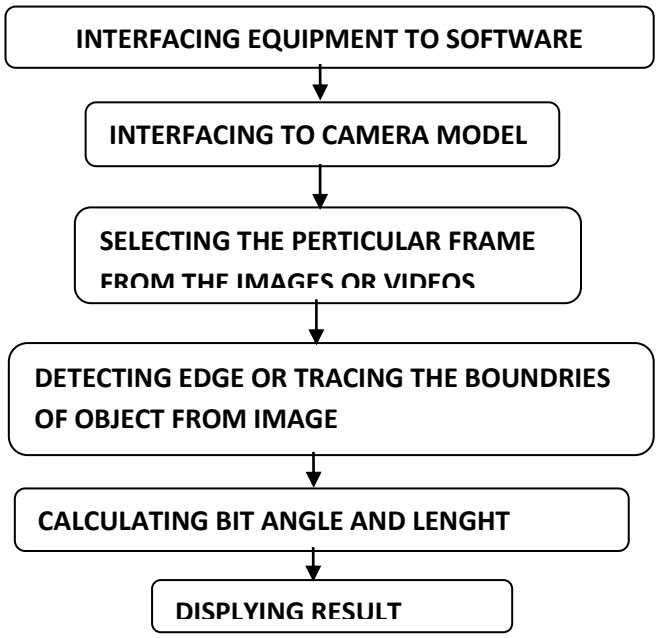
In image acquisition stage, images are moved from imaging device to PC by a program. Many of machine visualization software's have an image acquisition section that can sense the camera and camera interface and prepares images to processing section by capturing images from camera. This camera's interface is USB and an add-on component should be installed to machine visualization software to support the USB. After Installation the add-on, a streamed video can be captured by software but resolution of its images is low because the data

transfer rate is slow with USB. To take high resolution images, offline mode should be used. It means that an image is taken by camera and is kept in its memory and then it is passed to PC by an USB port.

After the image was taken, processing software processes it and extracts its parameter. The process is run in two modes: configuration and inspection. In configuration mode, a controlling process is established in several stages using a visual design environment which has many beneficial tools for image development, image translation and edge detection and so on. After configuration, software runs in the inspection mode and the desired parameter are removed from the image and finally acceptability of parts is gauged.

The RGB images have been taken by the camera is transformed to gray-scale images by software. Another difficulty in this camera is the slow images transfer rate that this limitation is due to slow speed in USB transmission interface. Considering that the rate of parts quality control is low, this problem is not a main limitation. Although in large industries that have high rates of production is a main limitation, causing percentage of controlled parts is reduced. The system can take an image and save it on PC within 3 seconds. This is a major development versus manual methods

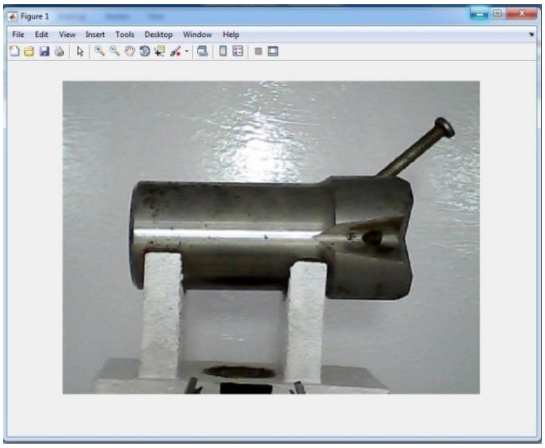
**WORKING STEPS**



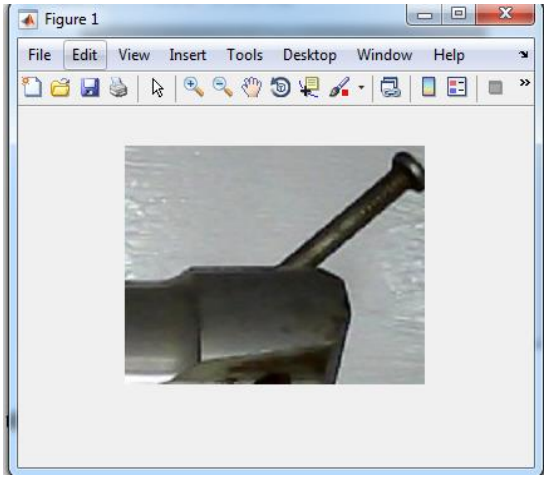

**METHODOLOGY OF ANGLE**

a) Load Image:

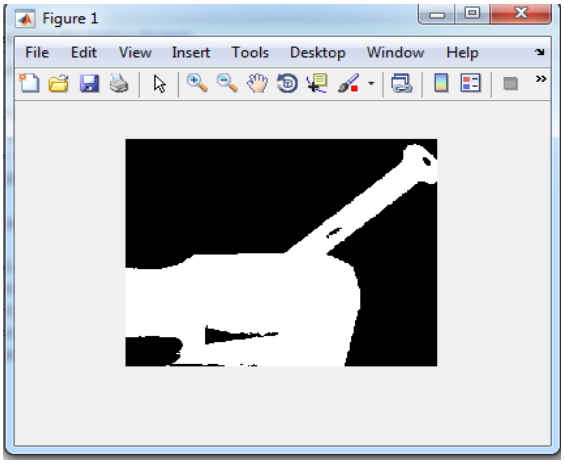
Selecting particular frame from the images or videos & Detecting edge of object from image.



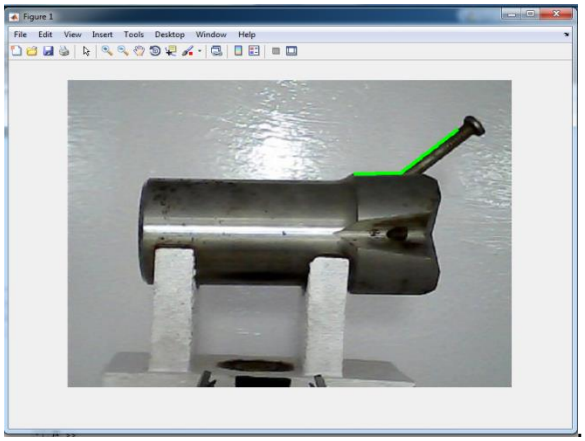
b) Extract the region of interest:




C) Threshold the image:



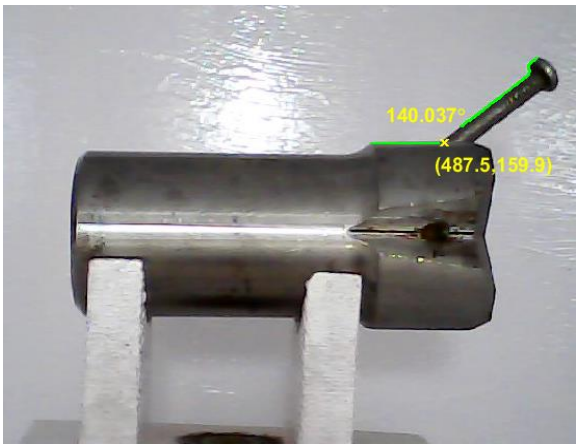
c) Trace the Boundaries:



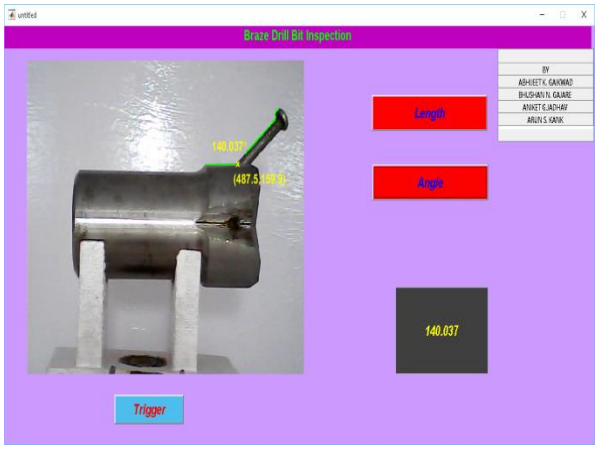
d) Find the angle of intersection:
Angle = 140.037$^{o}$ (180$^{o}$- 140.037$^{o}$ = 39.963$^{o}$)

e) Find the Point of Intersection:
Intersection = (487.5, 159.9)

f) Plot the Result:



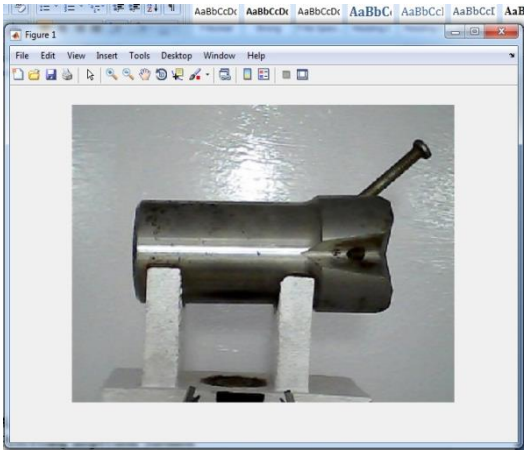

ANGLE OF GUI



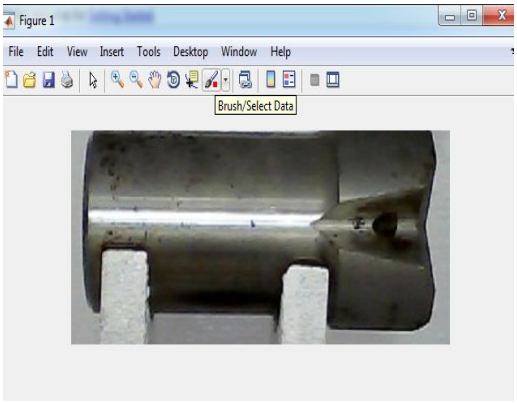

This window directly shows Angle of bit in result as showing in above is 140.037$^{o}$. There are three push buttons are provided namely as Trigger, Length and Angle. By clicking trigger button camera captures the image for processing. Then after clicking Angle push button it directly gives a result.

**Methodology of length**

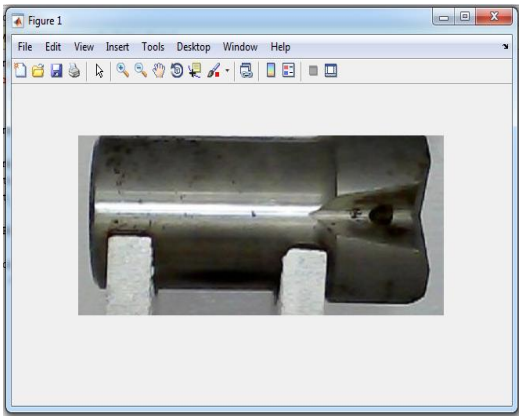
a. Load image



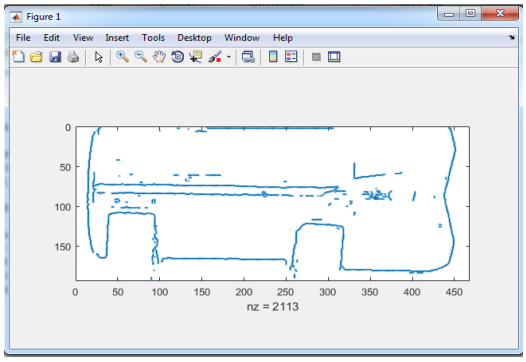
b. Extract the region of interest




c. Convert image (Gray)

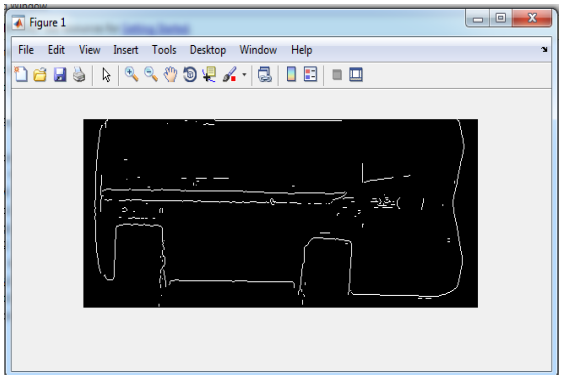


d. Edge detection

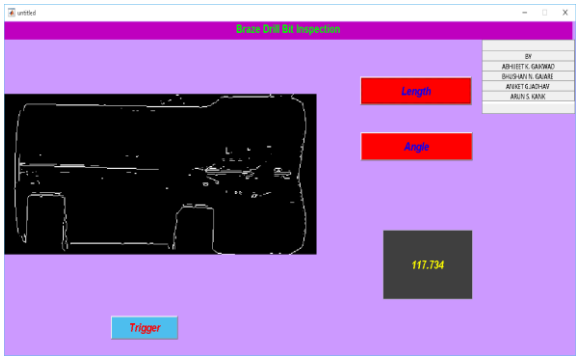



e. Multiplication Factor
Length mm= (Y* 25.923) / 96

f. Result
Length mm = 117.734 mm.




LENGTH OF GUI




This window directly shows Length of bit in result by clicking Length push button as showing in above is 117.734 mm.

## RESULT COMPARISON BY BOTH METHODS

In this paper we calculated length and angles of four holes of a braze drill bit.

Ideal values

1. Angle = 40° +- 0.5°
2. Length = 118 mm -0.40 mm

| Sr. | OUTPUT BY INDUSTRY METHOD | | OUTPUT BY IMAGE PROCESSING | |
|---|---|---|---|---|
| Parameter | ANGLE | LENGTH | ANGLE | LENGTH |
| 1 | 39.7 | 117.64 | 39.963 | 117.734 |
| 2 | 38.76 | 117.64 | 39.988 | 117.734 |
| 3 | 39.82 | 117.64 | 40.011 | 117.734 |
| 4 | 39.38 | 117.64 | 39.727 | 117.734 |

## 6. CONCLUSION

The bit parameter is measured using image processing in the MATLAB tool. This paper having four holes of which angle to be measured which are processed from developed MATLAB code, all bit image objects found having different value of angle. These have been measured through the same developed MATLAB code. In this paper each experimental work figure of same bit with different holes measured with the help of MATLAB tool by using image processing which shows different steps as given in flowchart. Finally we have carried out the experimental work results. The accuracy of the algorithm depends on camera used, size of objects, whether or not objects touching and illumination conditions.

In this study, the image processing technique and application of image processing expertise for automatic inspection. The image processing techniques are very powerful tool for automatic, fast and easier defect detection and quality control of various types of products. This proposed system can replace manual inspection of industrial product. Result will indicate product is within the dimension or not given by manufacturer. Using this automatic inspection system cost of inspection will be reduced also accuracy of inspection will increase.

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