Geometrical Inspection of Brazed Drill Bit Using Image Processing

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ABSTRACT: Automation is very important factor in an industry which manufactures product in mass quantity. After manufacturing product; to make decision of rejecting or accepting is taken by measuring quality parameters. To measure quality parameters such as dimensions and features of manufactured product inspection is done manually in almost manufacturing industries. Manual assessment is time consuming, costly, sometimes inaccurate and manual assessment for complicated shapes is very difficult. To overcome these problems quality control and quality management for sensitive industrial product is feasible by use of image processing techniques. In this study, 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 length and diameters of image object.

Keywords: Image processing, Quality control, Edge detection, Brazed drill bit

1. NTRODUCTION:

Traditional measurement is used to check and control dimensions computability. Although it is the common and simple means, however, there are several disadvantages including its long time consuming, inconsistent results between operators (lack of reproducibility), besides human error and fatigue (unrepeatability). Increasing customer requirements regarding better quality products and lower costs are challenges that should be resolved. Automated 100 % inspection can be economically used to satisfy such customer requirements. The visual inspection systems have received considerable industry attention in the recent years. They can be easily embedded in the production process to carry out on line inspection. On line inspection offers many advantages such as increasing inspection speed, accuracy, reliability, reproducibility and repeatability. Although there are many different applications in industrial visual system, however there is no universal system for visual inspection, but almost each application has its unique developed system.

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In industries, measurement of production facilities is usually done in two ways, contact and contactless. In the contact measurement approach, the operations are done entirely visually and the amount of error is quite large. The Performance of this method is very low, especially in areas requiring precise measurement. In the non-contact measurement approach, these operations are accomplished through one or more cameras and an image processing technique. In contact type measurement, CMM (Co- ordinate Measuring Machine) is used which involves toilsome task. Also, small scale industry cannot afford to buy CMM. This study involves alternative solution which is convenient and cost efficient.
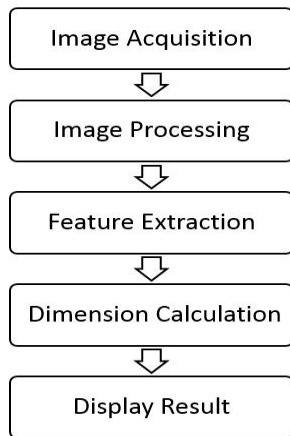
2. LITERATURE REVIEW:

Sr. No.	Author and year	Work	Algorithms	Parameter
1	John Canny (1986)	Computational approach to edge detection	Future synthesis, Gaussian Operator	Edge points and profile
2	E.R. Davies (1996)	Inspection of dimensional quality	Sobel and Prewitt operators	Edge detection
3	Mitra Basu (2002)	Survey on Gaussian based edge detection method	Gaussian Filter	Edge detection
4	Suzana and Zeljko (2006)	Color and surface effect detection in ceramic tiles	Canny edge detection	Threshold and minimum distance
5	D. Lu and Q. Weng (2007)	Survey on techniques for improving image Classification performance	Remote sensing, classification process	Remote sensing and GIS
6	N. Yogesh Bagrecha (2014)	Automated visual inspection of manufactured goods	Template matching	Edge detection

3. METHODOLOGY:

Image Acquisition: Webcam is used to acquire the product image then the images are stored in the computer. Image Pre-Processing: After the acquired images have been stored, the image pre-processing algorithm is executed through MATLAB software, which includes three steps:

1) Convert the image from RGB image to grey-level image using MATLAB function "Rgb2gray".

2) Function "imbinarize" is used to convert the grey image into a binary image.

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┌─────────────────────┐
│  Image Acquisition  │
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┌─────────────────────┐
│  Image Processing   │
└─────────────────────┘
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┌─────────────────────┐
│  Feature Extraction │
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┌─────────────────────┐
│ Dimension Calculation│
└─────────────────────┘
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┌─────────────────────┐
│   Display Result    │
└─────────────────────┘
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Fig.1: Block diagram of geometrical inspection.

3) The filtering is done using morphological operations; the number of pixels added or removed from the objects in an image depends on the size and shape of the structuring element (SE) used to process the image (Rafael C. Gonzalez and Richard E. Woods, 2002). The filtration is done by removing all connected components (noise) that have fewer than 30 pixels using the MATLAB function (bwareaopen). Afterwards another morphological operation closing is implemented using (imclose) function to perform morphological closing on the image. Feature Extraction: The steps for extracting dimensions are image inversion and segmentation.

1) Image inversion: It means the change binary of image value '0' and '1' into '1' and '0'. It is a necessary step, because the image of the character is wanted not to be the image of background.

2) Segmentation: The segmentation of an image into required geometrical shape from the background is implemented. Figure (9) shows the result of the first segmentation using MATLAB software. Dimension Calculation:

1) Conversion factor: Starting in 2015b, distances in pixel are independent of the screen resolution on Windows system, a pixel is (1/96) the of an inch.
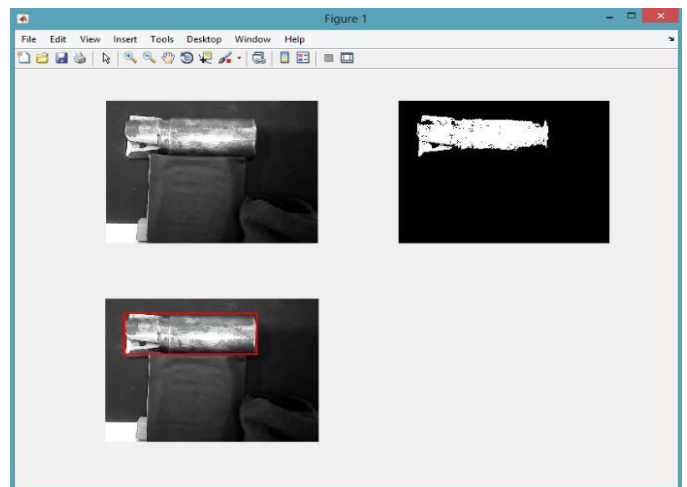
2) Actual dimension: The values calculated in pixels are multiplied with the conversion factor to get the values in metric units. Display Result: The dimensions measured, i.e. the length and diameter of drill bit are displayed using GUI windowing MATLAB.

Fig 2 : Experimental Setup

Fig 3 : Experimental Setup

Fig 4 : Length outputs

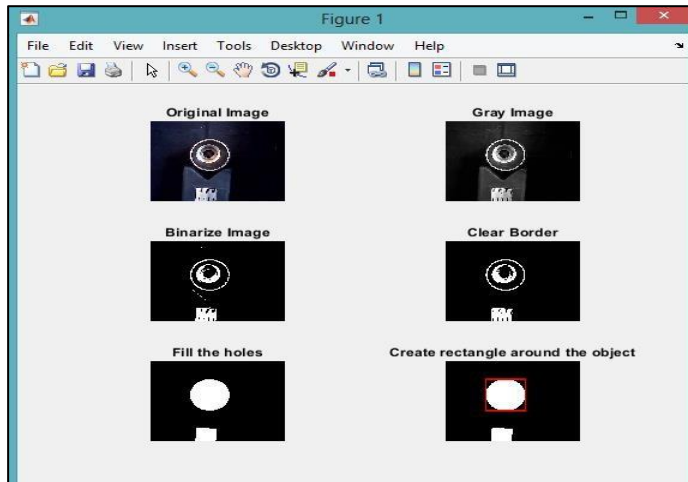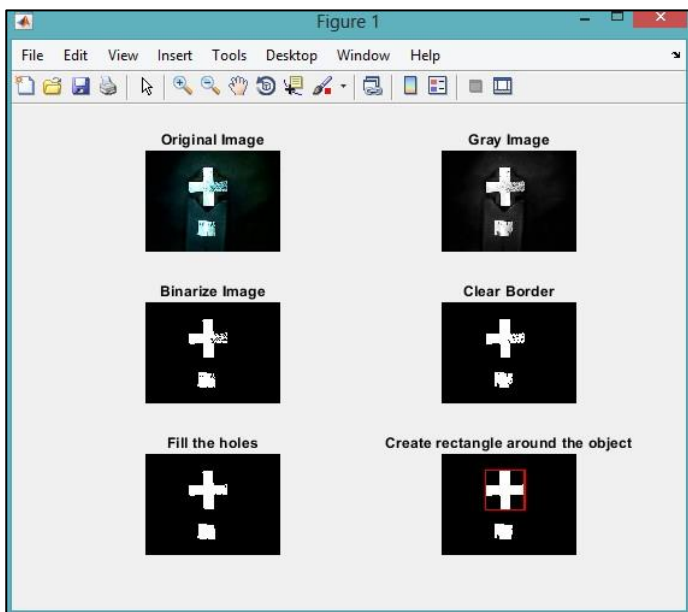**Fig 5 : Rear diameter output**
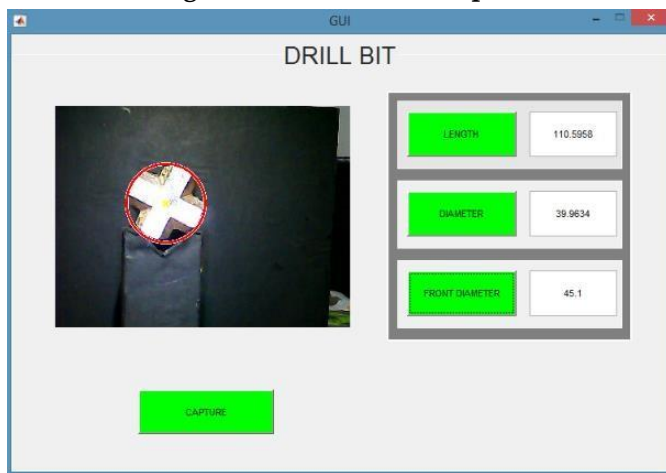

Fig 6 : Front diameter output

Fig.7 GUI output

4. RESULTS:

The developed program is tested under different conditions such as lighting conditions, camera focus and distance between object and camera. After 18 trails, the variable parameters were fixed and following results were achieved.

PARAMETERS	OUTPUT		
	DESIRED	MANUAL METHOD	IMAGE PROCESSING
FRONT DIAMETER	45	44.9	44.974
LENGTH	110	110.1	109.965
REAR DIAMETER	40	39.8	39.953

(All dimensions are in mm)

5. FUTURE SCOPES:

This proposed idea can be 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 result from system we can separate faulty products 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.

6. CONCLUSIONS:

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.

7. ACKNOWLEDGMENT:

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