Gear Measurement Using Image Processing in Matlab

Haque Nawaz, Himat Ali

Abstract— In this paper gear Measurement has been carried out by focusing two features of gear image object. The problems are to measure the gear features of gear image object, in the sense the measurement of the Area of the gear image object and as well the teeth of the gear will be counted. We have used Matlab tool and development code which overcome these problems and measured the area as well as teeth of the gear image object counted. To accomplish this task we have measured five different gear image objects area and counted the teeth by using image processing. The experimental results and statistics have been shown in this paper.

Keyword----Gear, Measurement, Image Processing

I. INTRODUCTION

Computer science image processing technology is gradually become a part of our daily life as it continues to get excellent results while promoting the technological advancement and development. As the key role of technology that presents gear size and measurement and guides to do research and develop more advanced computer technologies, such as DSP (digital signal processing) technology, and DIP (digital image processing) technology. We will measure the image object features easily by using these technologies. [1]

The measurement is essential task to limit the gear at specific size. By using image processing the fundamental work has been carried out to measure two things which are its most important features.

a. To measure the Area of the gear image object

b. To count the number of teeth in gear image object.

In this regard we have converted the original gear image object into grayscale, and then gray scale of original gear image goes from steps to count the teeth of the gear. It means by using programming code, we measure the gear teeth in respect of teeth counted through image processing.

II. BACKGROUND

The gears are used in machinery and we know that gear transmissions can be used to alter a machine motion property, although it ensures the modification in the motion through linear and rotary development of gear. It is an old technology and gear transmission was invented having complexity [6].

In light of gear teeth count and to measure the area of the gear object complexity of transmission. The geometry is used to

measure the gear transmissions for commercial vehicles [2]. Here it presents a technical exposure of gear basics. On the other hand, for appropriate use of gear and design of gear that is necessary to have a minimum know how about the gear. The research shows that special tooth calipers could be used to measure the Gear teeth. There are different types of gears in market according to need that can be used. It means gears have different profiles [3]. Hence these are in different size and having odd or even number of teeth. The gear may be odd teeth profile and also it may be even teeth profile. We have measured even teeth profile gears image object area and counted the teeth [3,4,5].

III. METHODOLOGY

The methodology is followed to measure the gear image object by using image processing in scientific tool Matlab. For to accomplish this task, we have developed the code by which a gear image object Area has been measured and teeth have been counted. The flow chart is given below.
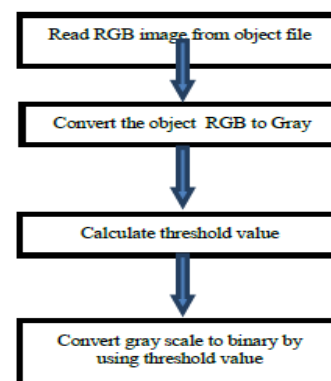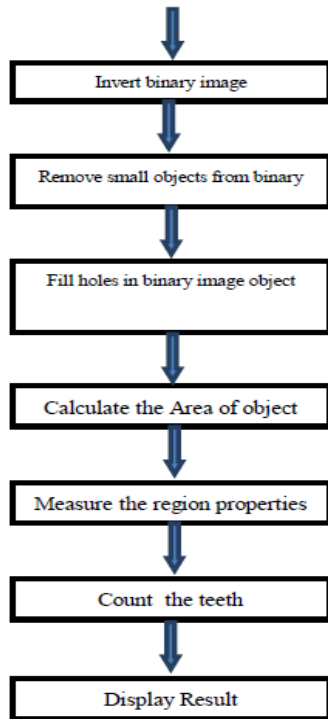
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Fig: 1. Flow chart

IV. EXPERIMENTAL WORK

In this section we have developed matlab code by using image processing, read the image original gear object and converted original gear object into gray scale image, then calculated the threshold value of gray scale image and by using threshold value we have converted the gray scale image into binary image. After this process it has removed small objects from the binary image, to overcome the holes of the object it has filled the holes of binary image object, then calculated the surface of binary image of gear object, showing the area of gear object here it is measured. The code has sequenced in this way, it has measured the properties of the image object regions, after that we have convex the polygon which are in regions, finally it is converted into regions of interest to the regions mask through which it has been highlighted the region with red and yellow lines which indicates the teeth region of a gear object. Obviously through this process it has measured the gear object area and counted the teeth by using the MATLAB tool, the five different gear objects measured by changing the name of the gear object in same developed code. It is shown in experimental work figures. The comparative results are shown in the table of experimental work results section. The above flowchart shows the process of matlab code by which we have found the area of a gear image object and counted the teeth.
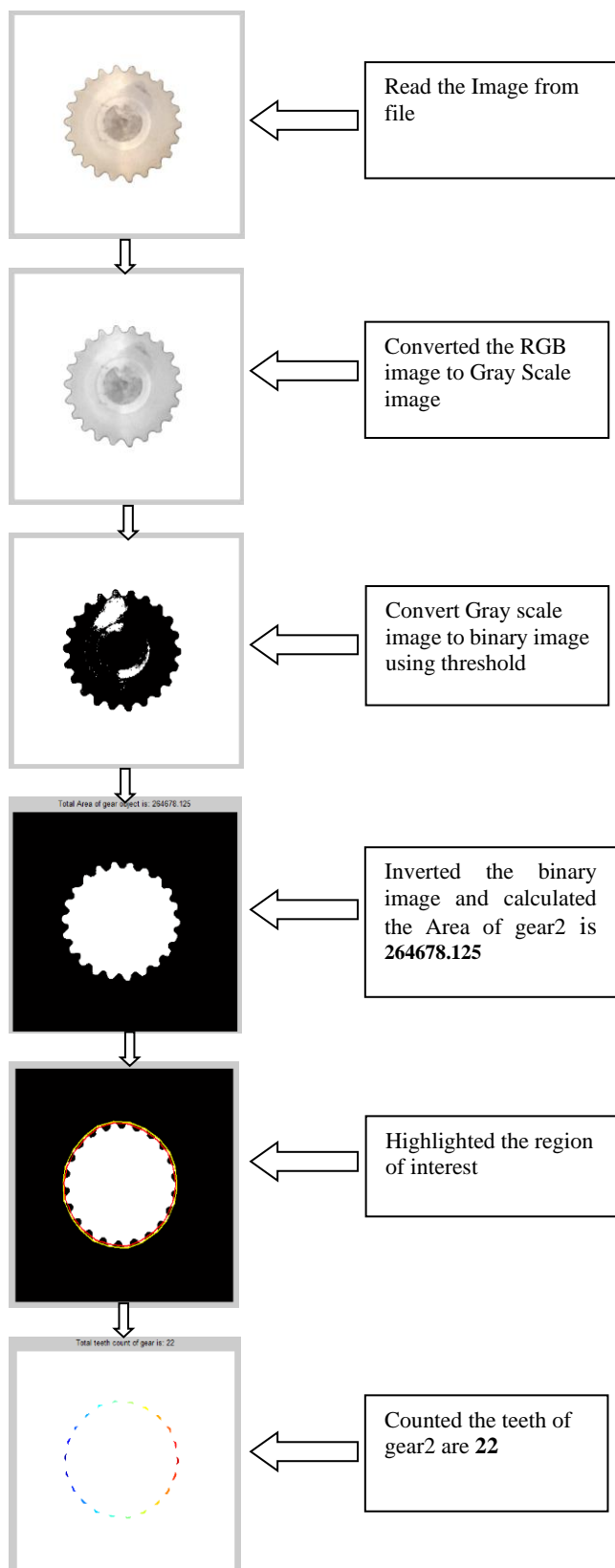
1.1 Experiment: 01, gear1.

In figure1, the origional gear1 image is read by tool and converted into grayscale then threshold it, after that the area of gear1 image calculated and highlighted the interested region for to count the teeth, then teeth of the gear1 counted as shown in below steps.
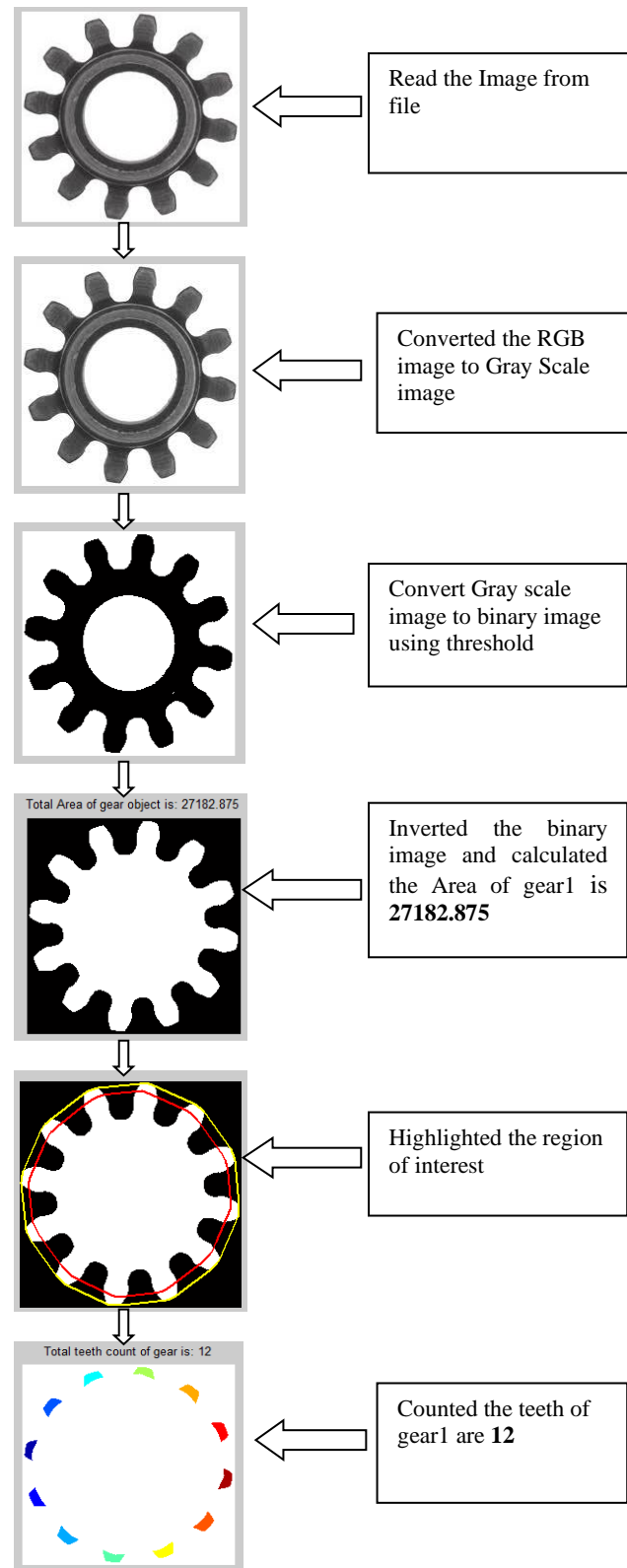
1.2 Experiment: 02, gear2.

In figure2, the origional gear2 image is read by tool and converted into grayscale then threshold it, after that the area of gear2 image calculated and highlighted the interested region for to count the teeth, then teeth of the gear2 counted as shown in below Steps.

Read the Image from file

Converted the RGB image to Gray Scale image

Convert Gray scale image to binary image using threshold

Inverted the binary image and calculated the Area of gear2 is **264678.125**

Highlighted the region of interest

Counted the teeth of gear2 are **22**

Read the Image from file

Converted the RGB image to Gray Scale image

Convert Gray scale image to binary image using threshold

Inverted the binary image and calculated the Area of gear3 is **33620**

Highlighted the region of interest

Counted the teeth of gear4 are **24**

1.3 Experiment: 03, gear3.

In figure3, the origional gear3 image is read by tool and converted into grayscale then threshold it, after that the area of gear3 image calculated and highlighted the interested region for to count the teeth, then teeth of the gear3 counted as shown in below steps.
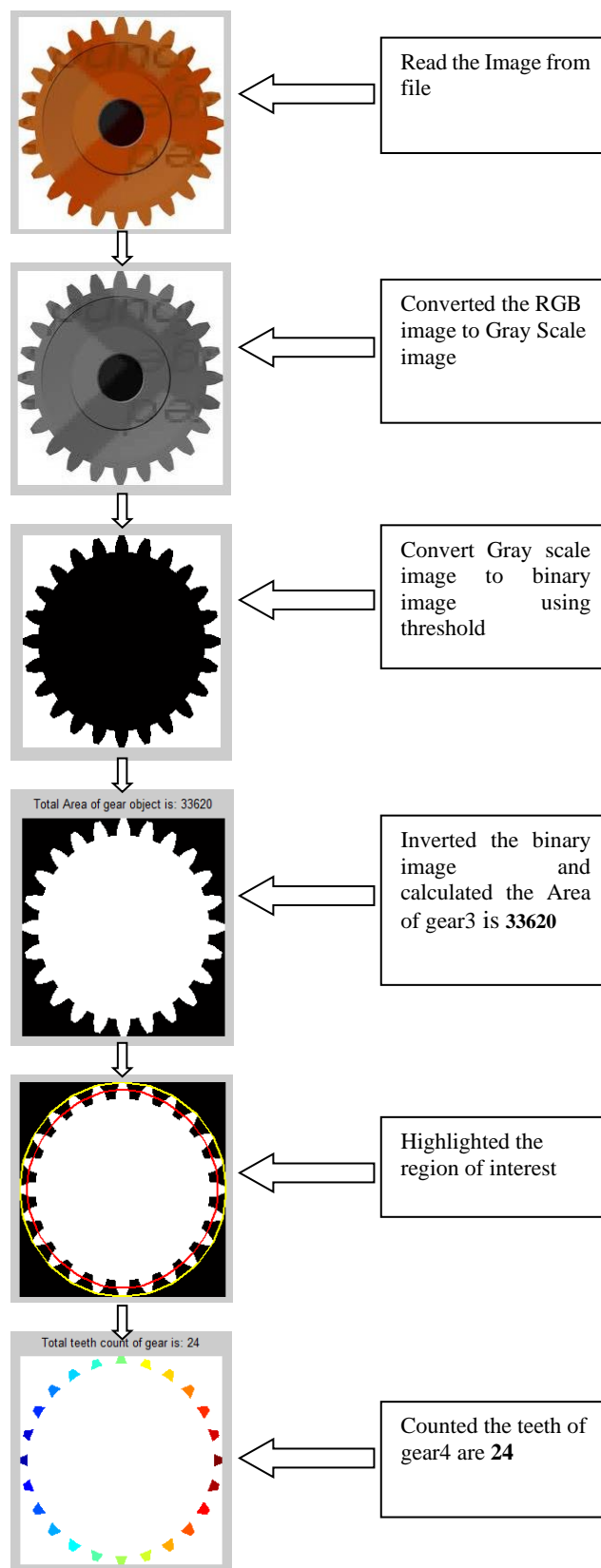
1.4 Experiment: 04, gear4.

In figure 4, the origional gear4 image is read by tool and converted into grayscale then threshold it, after that the area of gear4 image calculated and highlighted the interested region for to count the teeth, then teeth of the gear4 counted as shown in below steps.
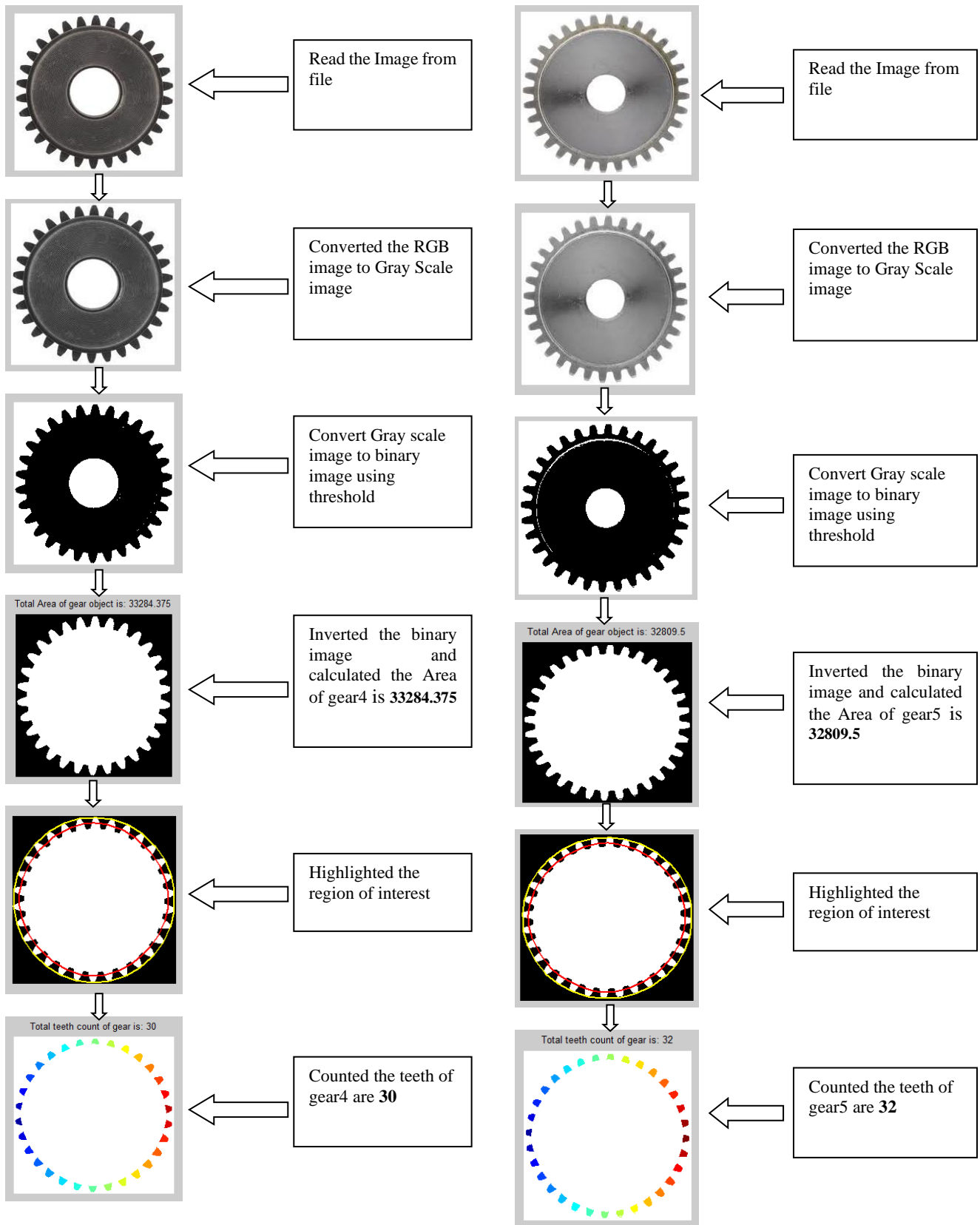
Read the Image from file

Converted the RGB image to Gray Scale image

Convert Gray scale image to binary image using threshold

Inverted the binary image and calculated the Area of gear4 is **33284.375**

Highlighted the region of interest

Counted the teeth of gear4 are **30**

Read the Image from file

Converted the RGB image to Gray Scale image

Convert Gray scale image to binary image using threshold

Inverted the binary image and calculated the Area of gear5 is **32809.5**

Highlighted the region of interest

Counted the teeth of gear5 are **32**

1.4 Experiment: 05, gear5.

In figure5, the origional gear5 image is read by tool and converted into grayscale then threshold it, after that the area of gear5 image calculated and highlighted the interested region for to count the teeth, then teeth of the gear5 counted as shown in below steps.

V. EXPERIMENTAL WORK RESULTS

The results of gear image object, gear1, gear2, gear3, gear4, and gear5, area measured and teeth counted which is shown in below table.

Experiment S.No	Name of gear Image	Area of Gear Image Object	Counted Teeth of the Gear Image Objects
01	gear1	27182.875	12
02	gear2	264678.125	22
03	gear3	33620	24
04	gear4	33284.375	30
05	gear5	32809.5	32

Table1 gear image objects experimental work results

VI. CONCLUSION

The gear Area calculated and teeth counted by using image processing in the matlab tool. This paper having the five gear image objects which are processed from developed matlab code, all gear image objects found having different value of area and varying teeth with another. These have been measured through the same developed matlab code. In this paper each experimental work figure of different gear objects measured with the help of matlab tool by using image processing which shows different steps as given flowchart. Finally we have carried out the experimental work results of five gear image objects that statistics are given in table1.

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