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Detection of Defects in Plastic Gears Using Image Processing

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***Abstract*– Gear defects are major reason for poor quality and embarrassment for manufactures. Inspection processes done on these industries are mostly manual and time consuming. To reduce error on identifying gear defects require more automotive and accurate inspection process. Considering this lacking, this search implements a gear defect recognizer which uses computer vision methodology with the combination of local threshold to identify possible defects. The recognizer identifies the gear defects within economical cost and produces less error prone inspection system in real time. In order to generate data set, primarily the recognizer captures digital gear images by image acquisition device and converts the RGB images into binary images by restoration process and local threshold techniques. Later the outputs of the processed image are the area of the faulty portion and compute the possible defective and non-defective gear as an output.**

Keywords— defect detection, image processing, computer vision.

I. INTRODUCTION

All plastic industries aim to produce various competitive plastic products. The competition enhancement depends mainly on productivity and quality of the plastic produced by each industry. In this sector, there have been an enlarge amount of losses due to defective products. Most defects arising in the production process are still detected by human inspection. The work of inspectors is very tedious and time consuming. The identification rate is about 70%. In addition, the effectiveness of visual inspection decreases quickly with fatigue. Digital image processing techniques have been increasingly applied to plastic gear samples for analyzing the product. As the technological progress is happening the products are now extensively made using plastic material especially in robotics which needs to be ultra light weight and modular in nature plastic components like gears, As per industry statistics we have found that gears are made up of plastic material High-density polyethylene (HDPE) which is prone to various kinds of defects when manufacturing using image processing. Therefore we suggest a fully robust system taking advantage of image processing techniques (Image segmentation, Non smooth corner detection etc) must be explored to build an economical solution to provide Total Quality Management in manufacturing units which would allow an eco-system of continuous monitoring and improvement there by reducing the cost.

II. LITERATURE SURVEY

Amandeep Mavi, Mandeep Kaur[1] – Identify defects in Plastic Gears using digital Image Processing. In this paper, an attempt is made to study different types of defects in plastic gears. The paper suggest a fully robust system taking advantage of image processing techniques (Image segmentation, Non smooth corner detection etc).

Michaeli et. al. [2] gives a study of the various algorithms focuses on the inspection of plastic material exhibiting irregular texture. He uses the local binary pattern operator for texture feature extraction.

Tremaine et. al [3] in this paper we were able to understand how mould and die when not working properly, might give rise to the surface defects in plastic product.

Tomislav Petkovi´cy et. al. [4]made an attempt to classify various defects encountered in production of molded plastic products by taking advantages of image processing .This paper basically discusses the relevance of doing shape analysis for identifying surface defects in plastic product.

Sivabalan et. al.[5] this paper made an attempt to identify defects, by using visual inspection system in fabric. Various techniques of feature extraction and segmentation are used to identify the defects in grey level digital images.

III. PROBLEM DEFINITION

1. Gear defects are a major reason for poor quality and of embarrassment for manufacturers.
2. The work of inspectors is very tedious and time consuming.
3. The identification rate is about 70% and keeps deteriorating with time.
4. Therefore we suggest a fully robust system taking advantage of image processing techniques (Image segmentation, Non smooth corner detection etc.) must be explored to build an economical solution to provide Total Quality Management in manufacturing units

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IV. PROPOSED SYSTEM

In our proposed system, the most important key point is the decision tree processing in order to achieve the threshold value. As we know that there have been different types of color gear images and also different types of defects in gears, so local threshold was used based on decision tree process. We have identified the threshold value (T) at greater than 120 and less than 60. Due to different threshold values to different pattern of faults of gears, we generalize a specific threshold value (t) for all types of gears. Base on the threshold value achieved from the decision tree, grayscale image is converted into binary image.

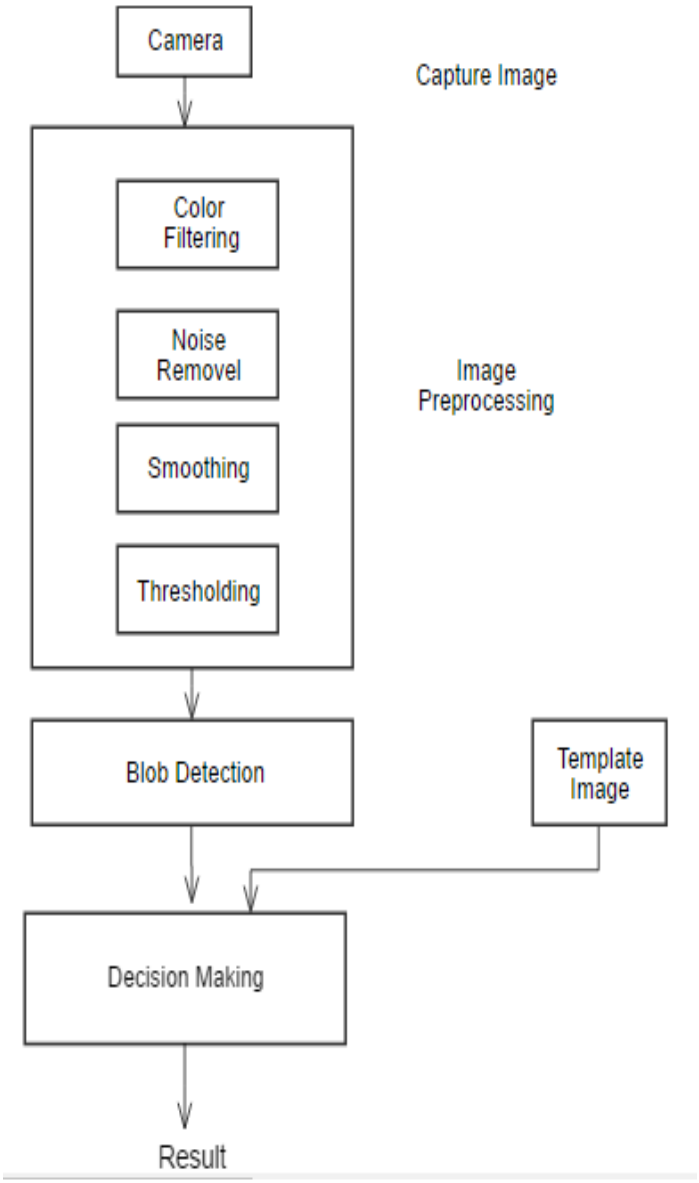

Fig.1: Flow chart of proposed system

V. RESULT & DISCUSSION

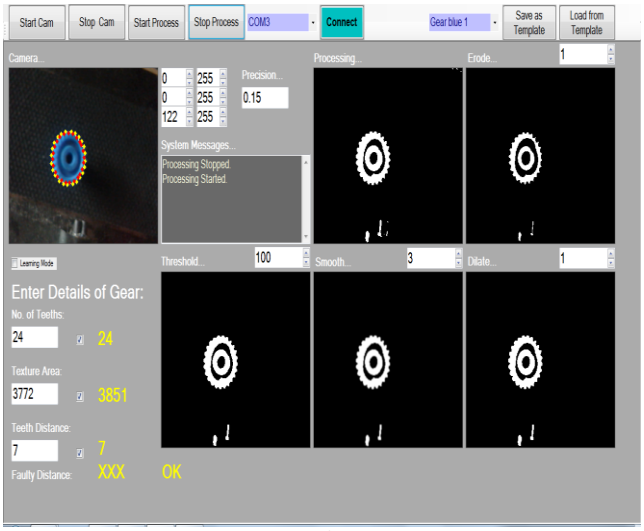

Fig 2: Non defective Gear

Fig 2: Broken teeth defective Gear

Fig 2: Texture defective Gear

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VI. CONCLUSION

Here using image processing techniques our system has efficiently detected various types of defects present in plastic gears, which mainly occurs in gear manufacturing process. We have been able to identify defects such as missing number of teeth, surface defects and count the average teeth distance and detect any defects if there is any gap between two teeth of a gear. By using range bound threshold and convexity hull algorithm which can work on both colour and grey scale images of the gears.
Thus automation of gear defect process improves system efficiency & achieving consistency by reducing manual efforts & processing time.

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