Design And Manufacturing of Conveyor System For Error Detection of Objects

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Abstract- *Precision measurement of gears plays a important role in gear measurement and inspection. The current gear measurement methods are either time consuming or expensive. In addition, for measuring all gear parameters there is no single measurement method is available and capable of accurately measurement while significantly reducing the measurement time. The main aim of paper is to utilize this computer vision technology for the purpose of developing a non-contact and rapid measurement system capable of measuring and inspecting most of spur gear parameters with an appropriate accuracy. A vision system has been established which is used to capture images for gears to be measured or inspected. The introduced vision system has been calibrated for metric units then it was verified by measuring two sample gears and comparing the calculated parameters with the actual values of gear parameters. In case of small gears, higher accuracy could be obtained.*

Keywords- Conveyor, Gear, Computer vision technology, Error Detection

I. INTRODUCTION

Gears are one of the most common mechanisms for transmitting power and motion. For most of the modern industrial and transport applications, gears are important and are frequently used as fundamental components. Error in the manufacture of gears causes two main problems, increased acoustic noise in operation and increased wear, both of which are sufficiently troublesome to cause concern.

For closer control over the accuracy of gears manufacture, precision measurement of gears plays a vital role. Spur gears have the majority among all types of gears in use; therefore automating the measurement process of spur gears becomes a persisting target. The deviation of an actual tooth from the design profile, the profile error, can be measured in a number of ways. The simplest way is to measure the tooth width at a number of pitches using an adapted caliper gauge, Another method is to use gauging with a moving probe, with a displacement transducer attached, which traces the design profile. Many mechanical probe gear inspection systems are available but these systems are not suitable for inspection of smaller gears. Some attempts have been made to develop smaller probes capable of measurement of small mechanical elements Alternatives are to use a coordinate measurement machine to measure the actual profile, or rolling the gear across a stationary probe. The current methods of spur gear measurement are either time consuming or expensive.

II. PROBLEM STATEMENT

When we manufacture a lot of gear at a time it is not possible to check a dimension and profile of each and every gear. To overcome this type of problem due to sampling process we need to check all gear parameter like pitch, addendum, dedendum, pitch circle diameter of each and every gear. Thus this process is difficult manually so we need to design a mechanism containing a flat belt conveyor, camera which detects whether there is error or no error.

III. LITERATURE REVIEW

There are some papers available on Design and Manufacturing of Conveyor System for Error Detection of objects which having information about error detection of different mechanical components.

Amandeep Mavi, Mandeep Kaur[1] studied a identify Defects in Gears Using Digital Image Processing. Gear defects are a major reason for poor quality and of embarrassment for manufacturers. Inspection processes done on these industries are mostly manual and time consuming. To reduce error on identifying gear defects requires more automotive and accurate inspection process. Considering this lacking, this research implements a Gear Defect Recognizer which uses computer vision methodology with the combination of local there holding 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

defective gear as an output. Balkishan Banodiya,Vijay Kumar Karma[2] studied a Measurement Of Transmission Error In Spur Gears. The power transmission by the gears is mostly used in the industries, automobile gearbox, robotics office automation, etc. and this is possible mostly by the gearing. Gearing is one of the most critical components in mechanical power transmission systems. Transmission error is to be one of the main contributors to noise and vibration in gear set. This paper aim is to know about the gear "Transmission error". A transmission error is considered to be an important excitation mechanism for gear noise and vibration. The definition of a transmission error is "the difference between the actual position of the output gear and the position it would occupy if the gear drive were perfectly conjugate". The gear transmission error that widely occurs in the actual gear system which arise because of irregular shape tool geometry imperfect mounting misalignment of two gears and so on. The influence of transmission error cannot be determined by investigating the gearsonly.B.Venkatesh ,V.Kamala,A.M.K.Prasad [3]studied a Design, Modeling and Manufacturing of Helical Gear. Marine engines are among heavy duty machineries, which need to be taken care of in the best way during prototype development stages. These engines are operated at very high speeds which induce large stresses and deflections in the gears as well as in other rotating components. Haque Nawaz, Himat Ali,[4] studied a Gear Measurement Using Image Processing in Matlab. 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. Hariprakash Sr,[5] studied a Involutes Gear Profile Error Detector. This project work titled Involutes Gear Profile Error Detector By Using Dial Gauge The aim of the project is to check the error detection by applying the basic principle of involutes generation. Usually when the gears have any defects it produces more vibration. In order to rectify the vibration we have planned to design and fabricate the involutes gear profile error detector. R. M. Jadeja, D. M. Chauhan[6] studied a Review On Design, Analysis And Manufacturing Of Spiral Bevel Gear. This review paper gives a detailed approach to spiral bevel gear design, analysis and manufacturing. Key design parameters are investigated in accord with industry standards and recommended practices for use. A final gear design is proposed and analyzed to show that proper margins of safety have been included in the design. In this report we try to cover some of the methods of analytical method of designing a spiral bevel gear, and FEM approach, and prediction of crack in gear teeth. Using simulator setup experimental result can be derives and necessary changes can be acceptable.

IV. MATERIAL SELECTION AND DESIGN PARAMETERS

Table:1 Component Material

Sr. No.	Name of Component	Material
1	Shaft	Mild steel
2	Base	Cast Iron
3	Conveyor Belt	Leather

A. Conveyor Belt

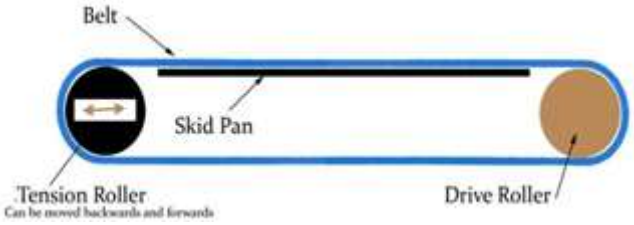

Fig: Conveyor belt

Conveyor belts are used in a wide variety of material transport applications such as manufacturing, food processing, and heavy industry. Belts - are the most common type of conveyors and are very versatile. The belt consists of one or more layers of material. An under layer-to provide linear strength and shape called a carcass (polyester, nylon and cotton) An over layer called the cover. (rubber or plastic compounds)Flat belts are used to transmit power from one shaft to another. They are generally classified as either small woven endless belts or higher power flat belts. The woven endless belts are especially useful where minimum vibration is required at the driven pulley due to semi-elastic material used in construction. The higher power flat belts are often useful because they eliminate the need to high belt tension used to grip pulleys, which in turn reduces the load on the shaft bearings. The material used for high power flat belts is sticky yet abrasion-resistant rubber compounds.

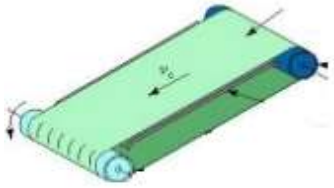

Fig: Flat Belt

Flat belts are used to transmit power from one shaft to another. They are generally classified as either small woven endless belts or higher power flat belts. The woven endless belts are especially useful where minimum vibration is required at the driven pulley due to semi-elastic material used in construction. The higher power flat belts are often useful because they eliminate the need to high belt tension used to grip pulleys, which in turn reduces the load on the shaft bearings. The material used for high power flat belts is sticky yet abrasion-resistant rubber compounds.

B. DC Motor

Fig: DC Motor

Every DC motor has six basic parts axle, rotor (armature), stator, commutator, field magnet(s), and brushes. In most common DC motors (and all that beamers will see), the external magnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor (together with the axle and attached commutator) rotates with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator with the rotor inside the stator (field) magnets.

C. Pulley

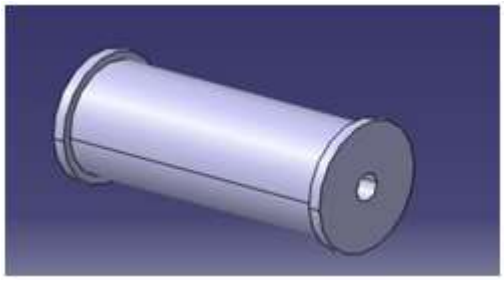

Fig: Pulley

A conveyor pulley is a mechanical device used to change the direction of the belt in a conveyor system, to drive the belt, and to tension the belt .Modern pulleys are made of rolled shells with flexible end disks and locking assemblies. Conveyor belt pulleys vary in diameter and width on different applications. The diameter of the pulley must be large enough to prevent ply separation of the belt composition due to flexing over small pulleys. The pulley diameter is thus a function of the number of belt plies and material construction. Therefore, the standard rule is that the diameter of the drive head pulley should not be smaller than 125 times the number of plies in the belt. Pulleys are made up of several components including the shell, end disk, hub, shaft and locking assembly. The end disk and hub may be on piece. The locking assembly may also be replaced with a hub and bushing on lower tension pulleys.

V. WORKING PRINCIPLE

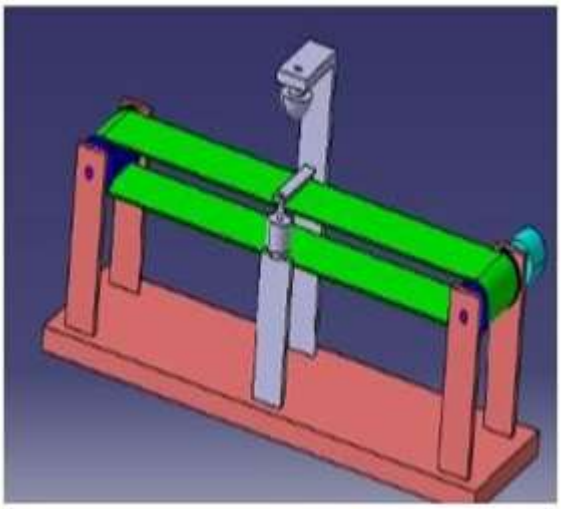

Fig: Working of Error Detection System

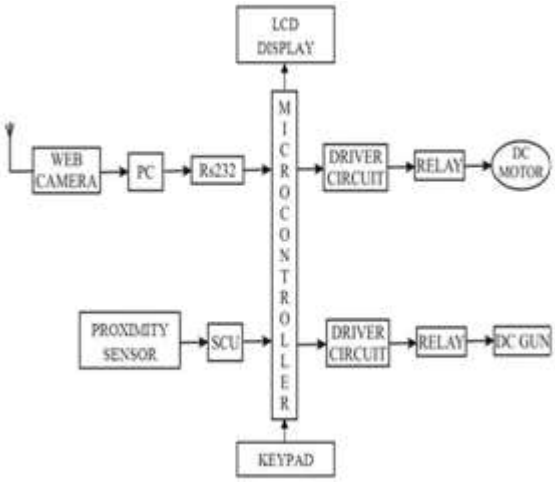

Fig: Working of Error Detection System

PC is the main unit of the project. The I/O devices are connected across the parallel port of PC. Image processing is any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or, a set of characteristics or parameters related to the image. Most image-

processing techniques involve treating the image as a signal and applying standard signal-processing techniques to it.

When we press the start key, the Geneva conveyor gets started. Two rollers are mounted according to the required distance the belt is mounted on the rollers on which the materials are placed. The rollers shaft is coupled with the Geneva drive. The Geneva drives shaft is coupled with the motor shaft hence when power is supplied to the motor rollers rotate with a certain time delay according to the Geneva drive and the belt moves along the rollers.Thus material handling is carried out. With help of the Geneva drive the time delay can be achieved. The proximity sensor is used to count the rotation of the Geneva and it can stop after particular rotation. Once it is detected the Geneva conveyor stops and the material is measured by the camera fixed at the top of the setup. The measured dimension is sent to the computer and the selected piece is collected in a separate tray and the rejected piece is collected in another tray with the help of dc gun. A pushing plate is mounted in front of the dc gun with help of hinge and spring arrangement. When the dc gun extends it pushes the plate hence the work piece in front is also pushed and collected in the tray. When the dc gun is retracted the plate also comes back to its position with help of spring.

VI. DESIGN CALCULATIONS FOR BELT

Design calculation for belt conveyor given below;

Conveying belt length (L) = 540 mm

Width of the belt (W) = 90 mm

Conveyor belt material density Material flexible plastic for our prototype, ρ = 0.330 * 103 kg/m3

Belt Capacity(B.C) is the product of speed and belt cross sectional area.

Generally, belt capacity B.C (kg/sec) is given as:

$$B.C = 3.6\ A\ V\ \rho$$

Where,

A= belt sectional area (m2)
ρ = material density (kg/m3) ,
V= belt speed (m/s).
Typical belt speed in general use (in meter per seconds) V=0.018m/s

Material used for Belt is Flexible Plastic.

Density of plastic (ρ) is 0.33* 103 kg/m3.
Area of Belt = 0.048600 m2

$$B.C=3.6*A*V*\rho$$

B.C = 1.03 Kg/sec

VII. CONCLUSION

The paper give the overall detail for manufacturing an error detection system by using conveyer belt and analyze the faults and defects in various mechanical parts by using image processing.

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