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DESIGN AND DEVELOPMENT OF CONNECTING ROD BY USING REVERESE ENGINEERING

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Abstract

Reverse engineering is a way to redesign a product to create a new product which has similar functions and improvement in the ability of the original product. The approach for reverse engineering technique using Coordinate measuring machine (CMM) and design software CREO is presented. A part is physically examined with the help of coordinate measuring machine, and point cloud data of part is generated through scanning to obtain the accuracy between existing designed connecting rod and reverse engineered designed connecting rod to calculate the accuracy of prototype.

1. INTRODCTION:

Reverse engineering has been defined in many different ways. The aim of reverse engineering is to use a physical part to gather complete knowledge about the part[1]. The main process of reverse engineering is develop the shape and size of an existing model. Developing the dimesons of exiting components is done by scanning the surface and edges of the object and after scanning converting the scan surface into 3D surface solid model.[2].

Engineering is the profession involved in designing manufacturing, constructing and maintaining of products, system and structures, there are two types of engineering forward engineering and reverse engineering[4]

Forward engineering is the traditional process of moving from high level abstractions and logical designs to the physical implementation of a system[4].

1.2 Need for Reverse engineering

1 The original manufacturer no longer creates it

2 To make modifications to your manufacturing when an original CAD model is missing data.

3 When the original supplier cannot provide replacement it is used for updating and adding new features.

4 To analyze competitors products for performance a benchmarking.

5 To update obsolete materials or antiquated manufacturing process.

6 To reproduce hand crafted parts and assemblies.

7 The original CAD model is not sufficient to support modifications or current manufacturing methods,

8 To analyse the good and bad features of competitors product.

By using reverse engineering technological tool cost of product design and manufactuiring will reduce. This helps

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manufacturer to produce new product in market in short time R.E helps to known the inter relationship between the components and also develops damaged surface of the components. Three main scanning systems are

1. Pre Processing:

This includes the physical preparation of the object to scan and CAD software setup.

2. Data acquisition system:

This extracts the point line, edges and surfaces of the model.

3. Post processing:

A sterolytha graphic file format is generated which is future digitized model smoothen to enhance the 3D model.

CMM

A coordinate measuring machine is a device that measures the geometry of physical objects by sensing discrete points on the surface of the object with a probe, various types of probes are used in CMM including mechanical, optical, laser and white light.

A coordinate measuring machine uses a very sensitive electronic probe to measure a series of discrete points from the geometry of solid part. These measurements are used to confirm the parts conformance to specifications.

Stages in Reverse Engineering:

1. Scanning phase:

This phase is involved with the scanning strategy selecting the correct technique, preparing part to be scanned.

2. Point processing phase

This phase involves importing the point cloud data, reducing the noise in the data collected and reducing the number of points. A wide range of commercial software is available for point processing. The output of the point processing phase is a clean merged, point cloud data set in the most convenient format.

3. Application geometric model develop

The generation of CAD models from point data is probably the most complex ativitywth in R.E, because potent surface fitting algorithms are required to generate surface that accurately represent the 3D information described with in the point cloud data sets.

MATERIALS

The component selected for project work is connecting rod. The connecting rod creates the link between the piston and crankshaft and this transmits power. It converts the linear up and down movement of the piston into the circular motion of the crankshaft and is therefore subject to tension, compression bending and buckling. The material is used for the proposed model are high grade aluminum and micro alloyed steel.

MACHINE

In this study JATEN-QVS-4030-3D scanning machine model is used which can measure a dimension range 4000 x 300 x 200 mm.

METHODOLOGY

On the basis of mentioned objectives the following steps are taken.

1 Selection of component

2 Obtain the point cloud data and the export these cloud point data of CMM to the modeling software,

3 To prepare a CAD model

4 To prepare the inspection program

Selection of component:

The initial step is to find the suitable part for study of component assembly. At the time period, complexity, functions provided it becomes suitable for take connecting rod as a study component. So the main reason area of this paper work is studying the component and selecting the best method for developing the CAD model and error analysis

To obtain point cloud date

To obtain the point cloud data and export this cloud data for CMM to the modeling software.

To prepare a CAD model

Once the point cloud data is generated it is exported to CAD software. In this work CREO software is used, the model developed with CREO. The importing the point cloud data in the IGS file form to CREO making the CAD model with help of IGS file.

A CAD MODEL

Scanning with the help of CMM

The detailed scanning procedure is obtained from connecting rod.
Exporting the point cloud data in IGS file from CAD

Making the CAD model with the help of IGS file converting the point cloud data into CAD model consists of two stages.

In the initial stage, various points obtained by the scanning process are needed to join first. It will give us the profile of the component.

In the second stage the profile obtained from the point cloud in converted to CAD model.

To prepare the inspection program

Once the scanning process is completed, the machine is set to run in Drect computer control mode. In DCC mode the machine is used for inspection activities.

RESULTS:

s. n o	Part	Manual Measur ement (mm)	CMM Measure ment (mm)	Devia tion
1	Length	154	154.124	0.124
2	Circle A	98	98.131	0.131
3	Circle B	55	55.057	0.057
3	Circle C	40	40.1	0.1
4	Circle D	30	30.106	0.106
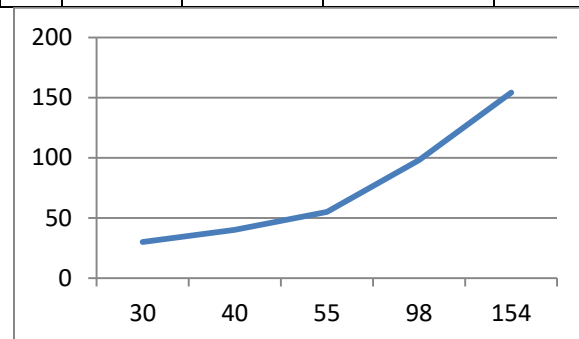
Deviation between Manual and CMM measurements

CONCLUSION

The result of this study show that reverse engineering can be used to make any existing parts or components in engineering field to making easily regenerating, so in

this paper conceder to be making connecting rod. The connecting rod is then analysed conventional method as well as using CMM. It is found that CMM scanning measurement method is best method.

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