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ISM I

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Reverse Engineering

Research Assessment 5

Date: 10/13

Subject: 3D Scanning

Works Cited:

Michaeli, Jennifer, et al. "Error Aggregation in the Re-Engineering Process from 3D Scanning to 3D Printing." Hindawi, 25 Aug. 2017, www.hindawi.com/.

Assessment:

Throughout this article the author evaluates the various accuracies, inaccuracies, and drawbacks associated with reverse engineering. The author describes how a 57-tooth spur gear was used in an experiment to find out if manually measured parts were more or less accurate than those produced by 3D scanning. The author also evaluated how accurate each of the models were to the original CAD file and how accurate each part was after being manufactured through additive FDM manufacturing. In order to manually measure the gear, precise calipers (accurate to 0.0005 in) were used to measure the tooth depth, diameter, thickness, and distance. This was compared with 3D scanning a part through the process of taking several pictures as the gear model was rotated on a flat platform. After stitching the pictures together using CAD software, the model was generated using several polygons. Both models were cleaned through the process

of finding the mean values of each point on the gear and using them to create a CAD model. The standard deviation was also calculated for each model. The part was then printed using a high-end Stratasys printer and measured for its dimensions as well. The results of the experiment show that the 3D scanning process was typically less accurate than the use of calipers and manual measurement, but when combined with the manual measurement, it surpassed both methods used in terms of accuracy. Of course, these values were not 100% accurate as there was still the human factor which could have skewed the results.

The information presented throughout this article and the results of the experiment are useful in my ISM journey as I study the field of 3D printing as it evaluates how accurate 3D printing can be while also addressing a previous question I had on whether the redesigning of parts was truly worth it for the benefit of rapid prototyping using 3D printers. The introduction of 3D scanning has brought light to a new method of modeling things rather than the typical caliper method which I had been used to. The information presented in the article also showcased how important tolerances and preciseness can be in the field of engineering and how the different instruments used can change the accuracy of a part. After reading this article, I now know more about the engineering field as a whole, and more in the specific field of 3D modeling and 3D printing.

This article was able to add on to my previous information of the accuracy of 3D printed parts by focusing more on the modeling side of the parts rather than the actual manufacturing side of the parts. This article, combined with previous articles, helps to form one big picture on the two halves of engineering: the design half and the production half while also being beneficial in confirming my suspicions about the accuracy related to the modeling and production sides of

3D printing. With this article being published extremely recently (only 9 days prior), I now have up-to-date info on the subject of 3D printing rather than possibly outdated info from a year or longer ago. While this article was quite helpful in providing an insight on the accuracy factor when dealing with the difficulties of manufacturing, it did not really expand on the actual 3D printing process used in the experiment to test for the modeled parts' accuracy. When I begin to brainstorm an idea for an original work, I will be sure to use the information presented in this article about 3D scanning and possibly other modeling techniques. This article has also broadened my horizons of CAD modeling as I am now also interested in the 3D scanning aspect of CAD modeling and how that can transfer over to the 3D printing manufacturing side.

Annotated Article:

http://scrible.com/s/gEIg6