Reverse Engineering Using 3D CAD Software

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Introduction

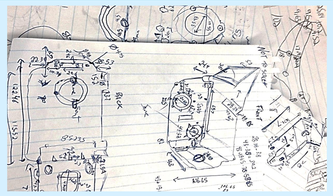
- Reverse Engineering is the process of analyzing the components of a mechanism, and how they work together, in order to gain information about its design.
- CAD (Computer Aided Design) is the use of computers to help in the design process.
- SolidWorks is a 3D CAD modelling software that can then be used to create a virtual copy of the mechanism after dimensions have been measured.
- Many suppliers provide CAD models of common pieces that can then be implemented into the virtual design process.
  - Details have been left out due to the confidential nature of the project.

Purpose

- To create a 3D model of a mechanism that can be incorporated into future designs.

Methods

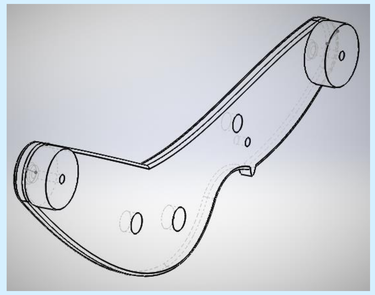
- To start, each piece of the mechanism is measured using a caliper, and a rough draft is sketched using the dimensions.



- There are many tools in SolidWorks that are used to replicate the mechanism. Some of these include:
  - Extruded Boss/Base: This is used to convert 2D sketches into 3D models.
  - Extruded Cut: After a sketch has been extruded, this tool is used to remove materials on a linear level.
  - Revolved Boss/Base: Similar to Extruded Boss/ Base except it creates material around an axis.
  - Revolved Cut: This is similar to Extruded Cut, except that it removes materials around an axis.
  - Spline: This tool eliminates the use of multiple lines and arches and creates a smoother product.

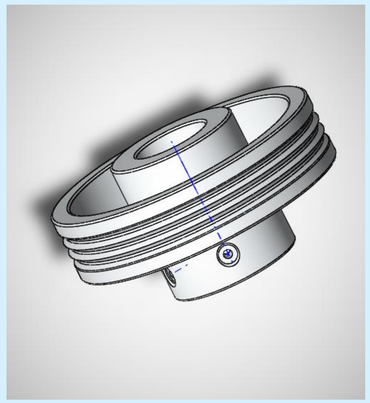
Results

- A total of forty-seven pieces were modelled.
- The majority of these pieces were then assembled in a manner to mimic the motion of the machine.



- Figure 1: the spline tool was used to create the curved edges of the piece to realistically mimic the physical piece.

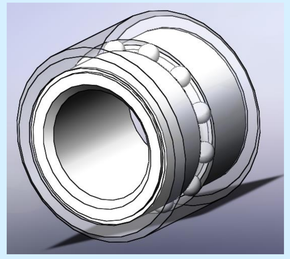
- Figure 2: Revolved Cut was used to create the ridges along the axis shown. Extruded Cut was used to add the cylindrical hole through the pulley. Hole Wizard was used to add the screw holes at the base of the pulley.



- Figure 3: The sweep tool was used to create the revolved blue piece around the centre of the wheel. This piece has also been rendered with Photo view 360 to see what it would look like in production.

Results Cont'd

- In addition to manually dimensioning and creating each piece, CAD files of standard parts were used to mimic the mechanism.
- Each CAD piece must be specifically chosen to fit the manually modelled pieces in order to be assembled.



- Figure 4: CAD file of a ball bearing.

Conclusions

- Forty-seven pieces were modelled to completion to be incorporated into future designs.
- In addition to creating pieces and assembling them, SolidWorks was also used to detect and modify interference between parts.
- Additional pieces will need to be modelled and assembled in the future to complete the mechanism for future production.

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