

Ring Gear for High Torque Applications

Created by NYIT Robotics

Introduction

When creating a lift that can raise two arms and a claw capable of rotating, there is a high load placed on the motors. To compensate for the increased load, a planetary gear can be used to provide high torque while maintaining a compact design. The ring gear is crucial to a planetary gear build and provides an efficient path to guide the system on.

Part Application

A ring gear would be mounted to the robot arm and allow for the movement of several smaller gears (planets) within its inner gear ring. These planet gears would in turn rotate around a center gear (sun) allowing for the increased torque necessary to lift the arms and rotating mechanism.

3D Modeling Software

Autodesk Inventor 2016 was used to design the ring gear necessary. The ring gear design was a manipulation of a 60-toothed high strength gear. We took the model of the 60-toothed gear provided in the Vex parts library and inverted its structure. The center of the gear was removed, and the positions of the teeth were reflected across the circumference of the original gear.

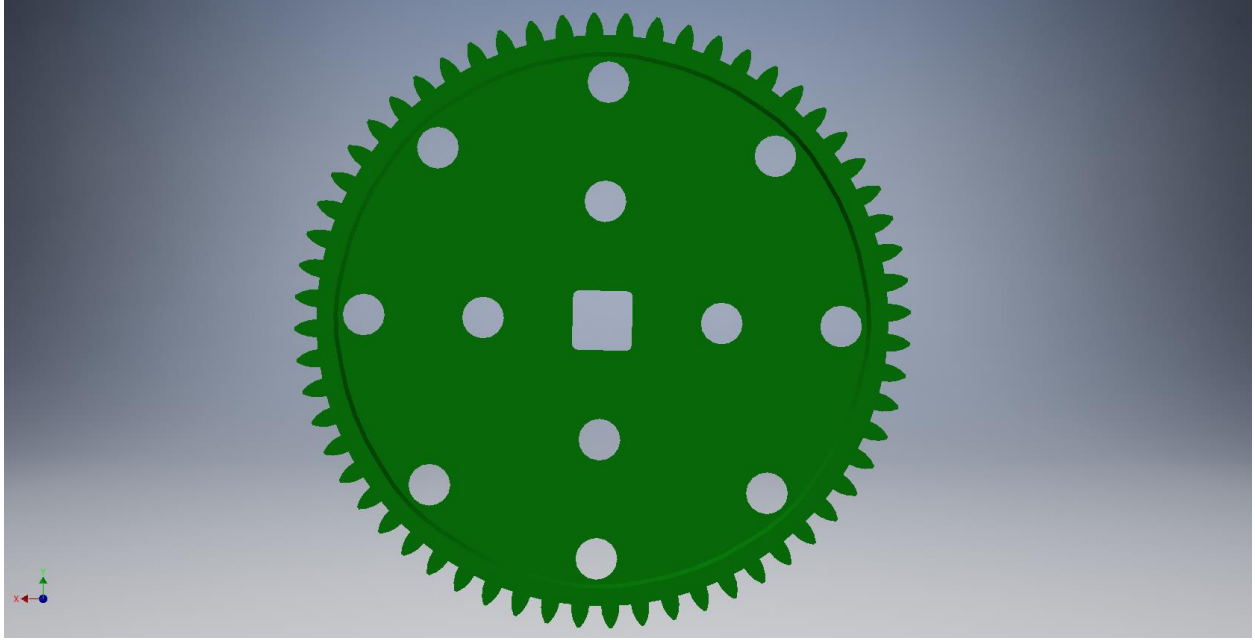
Design Process

This ring gear was inspired by this years Vex robotics challenge, turning point. In order to raise, rotate, and place a cap on a post, we needed a lift that could exceed a height of 34 inches and rotate the cap to our desired color indicator. Based on the research we conducted we reached the conclusion that a planetary gear system could possibly generate enough torque to lift the increased weight.

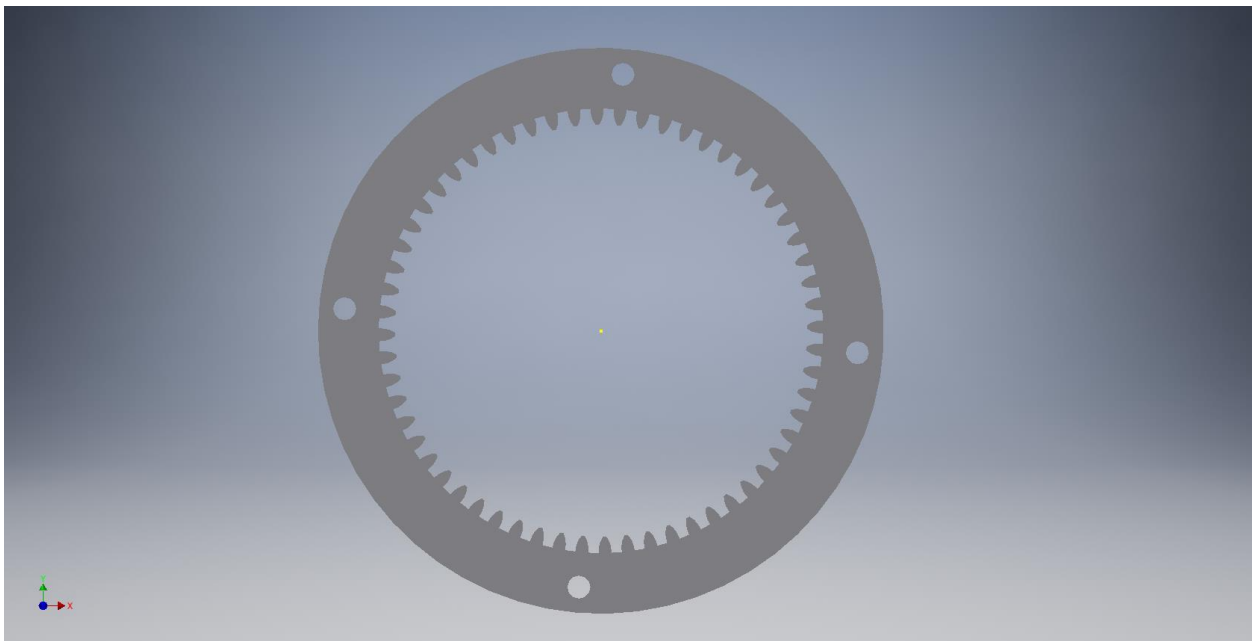
Conclusion

Once mounted on our robot we noticed a significant increase in the distance the arms were able to move and the amount of time we could push the motors before a stall. The use of the Autodesk Inventor software was crucial to the improvement of our build. Through our research we gained the knowledge on how a planetary gear system functions but by using the software we were able to further visualize how we could implement the system with our specific robot design.

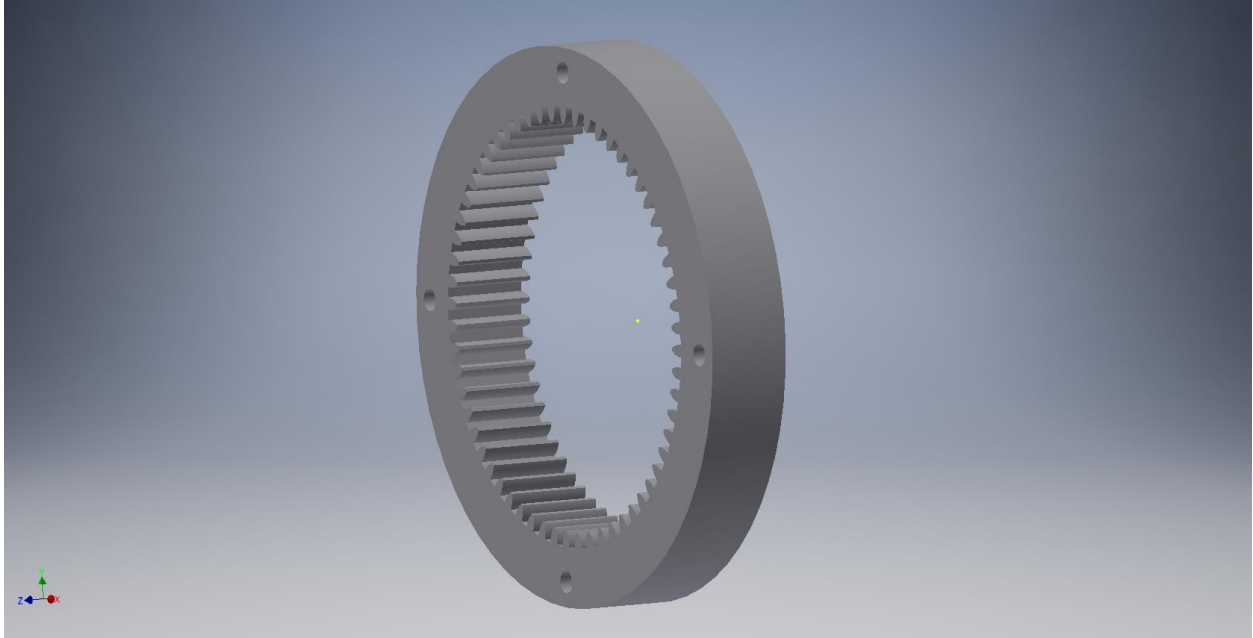
Designing parts with 3D software played a major role in reducing the amount of time spent prototyping and resources taken away from other members of the team. This software is valuable not only in our current design but in future designs in which complicated mechanisms aren't easily conceptualized or required parts aren't readily available.



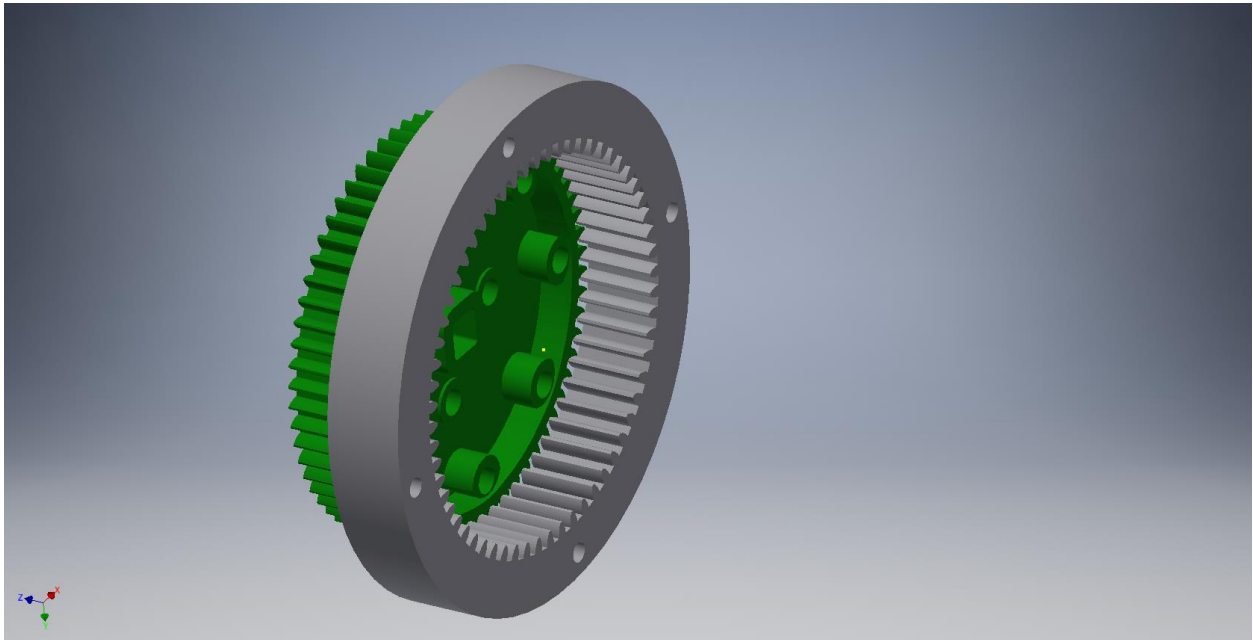
1) High Strength 60-Toothed gear



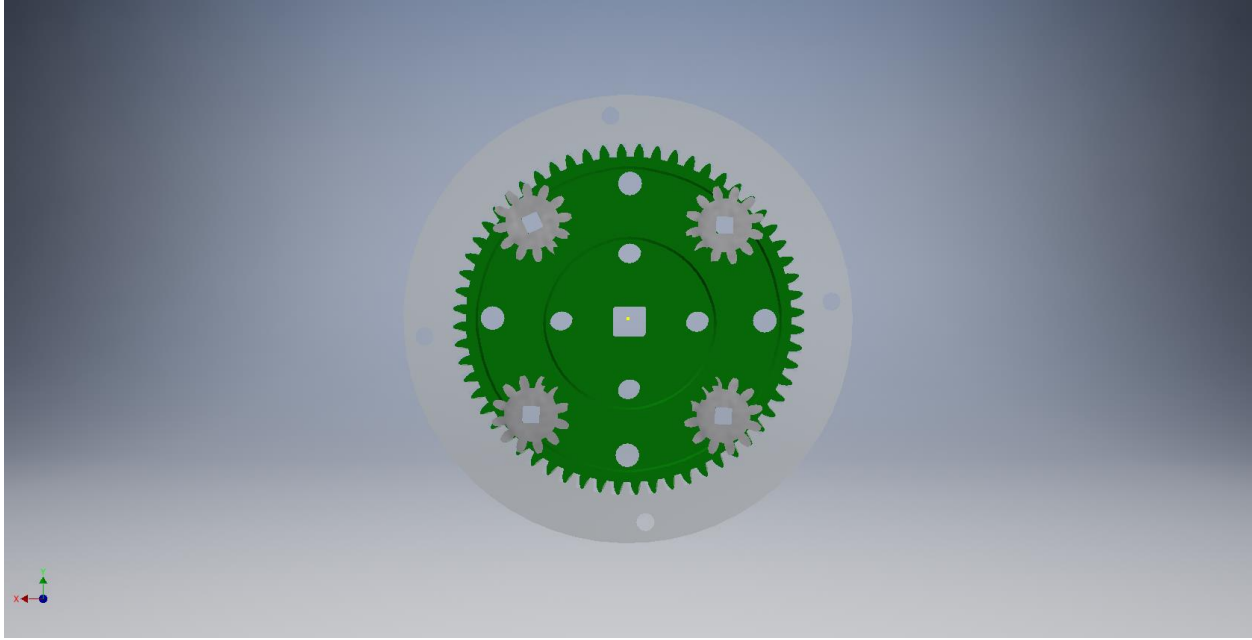
2) 60-Toothed Ring Gear



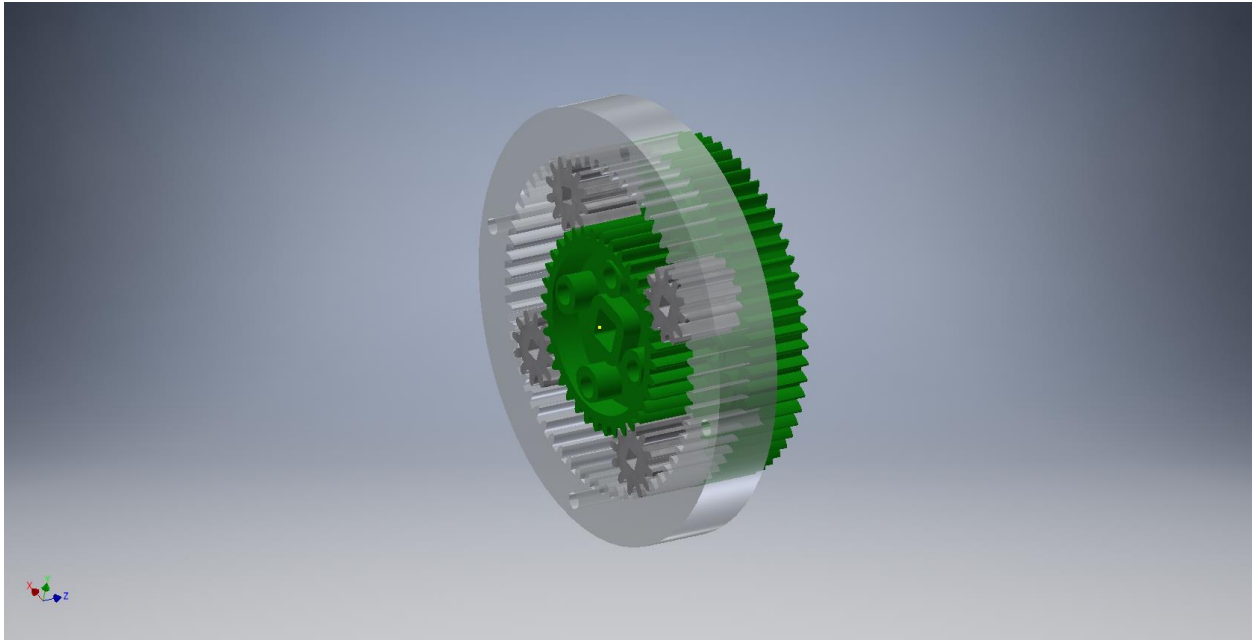
3) 60-Toothed Ring Gear Isometric View



4) 60-Toothed Ring and High Strength Gear Isometric View



5) Planetary Gear Assembly



6) Planetary Gear assembly Isometric View, Ring Gear with increased transparency.