BEVEL GEAR ADAPTER

Make it Real CAD Challenge.

PUPR Robotics

Change Up:2020-2021

Polytechnic University of Puerto Rico, San Juan

VexU Competition Division

Bevel Gear Adapter

Introduction

In Vex Robotics Competition Motors are very powerful for the new V5 System but they are very limited. Middle school and High School can only use 8 in a robot. It's very difficult to do different types of systems with very limited amount of motors. This new v5 motors are big and for the limited space that we have it is difficult to make some components. That's why we created our own Bevel Gear Adapters, and they are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. The reason that we call them Bevel Gear adapters is because we didn't wanted to make the entire Bevel gear in 3d printed part for this reason we wanted a strong shaft holder so we decided to have the original gears into the 3d printed Bevel Gears Adapter for more strength and it won't break. In **figure 1** you will see all the bevel gear adapters with all the original gears made by vex. In **figure 2** you will see one bevel gear adapter being set for use.

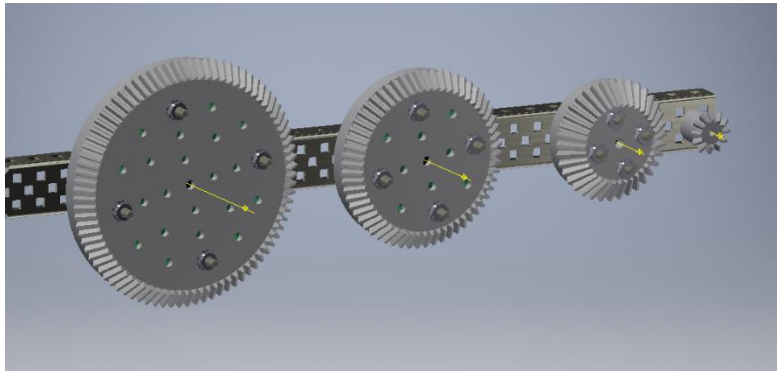


Figure 1: Render of all Bevel Gear adapters with 12-tooth gear, 36-tooth gear, 60-tooth gear, and 84-tooth gear.

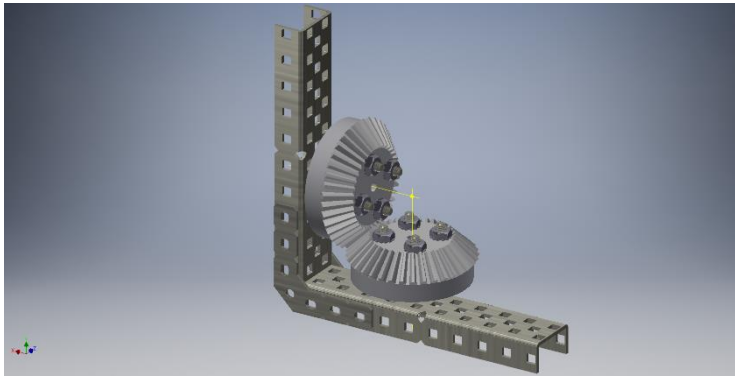
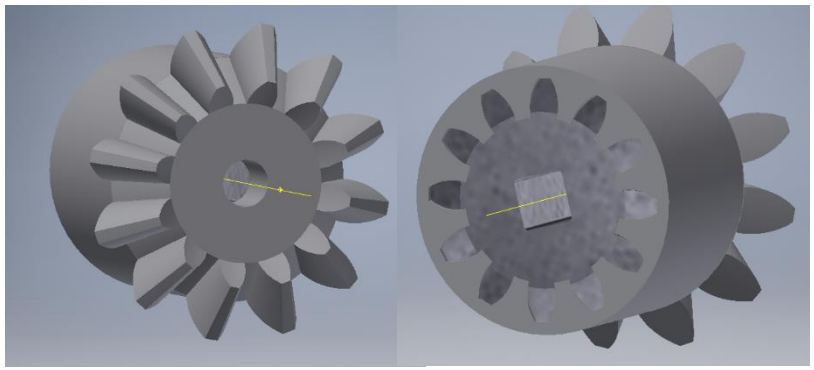


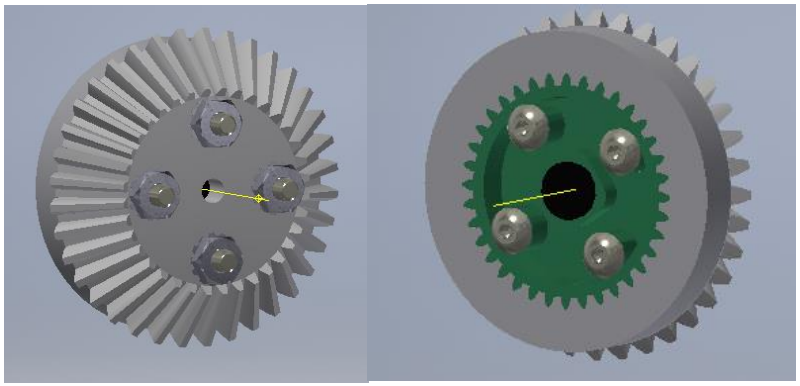
Figure 2: Bevel Gear adapter with the 36-tooth gear in its original position to be used with one motor.

Bevel Gear Adapter

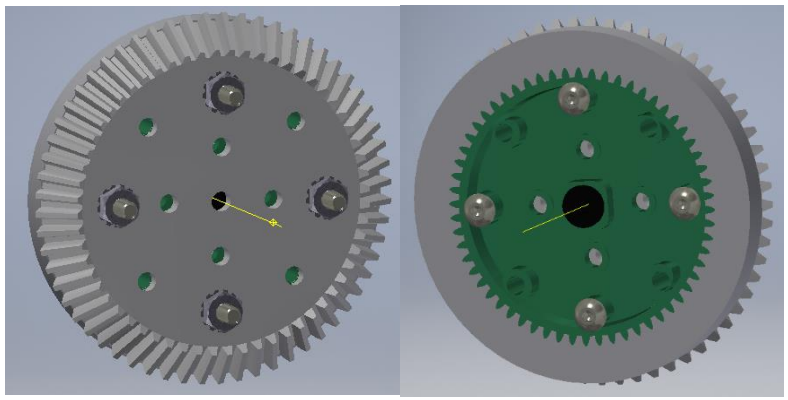
Introduction continuation



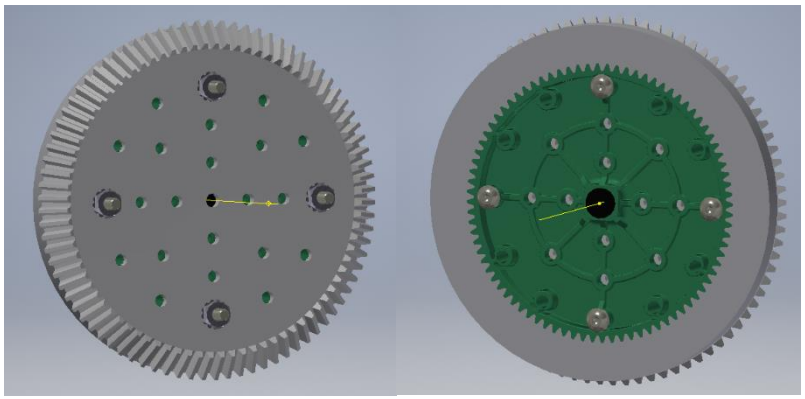
12-Tooth Gear with 12-tooth Bevel Gear Adapter front and back.



36-Tooth Gear with 36-tooth Bevel Gear Adapter front and back.



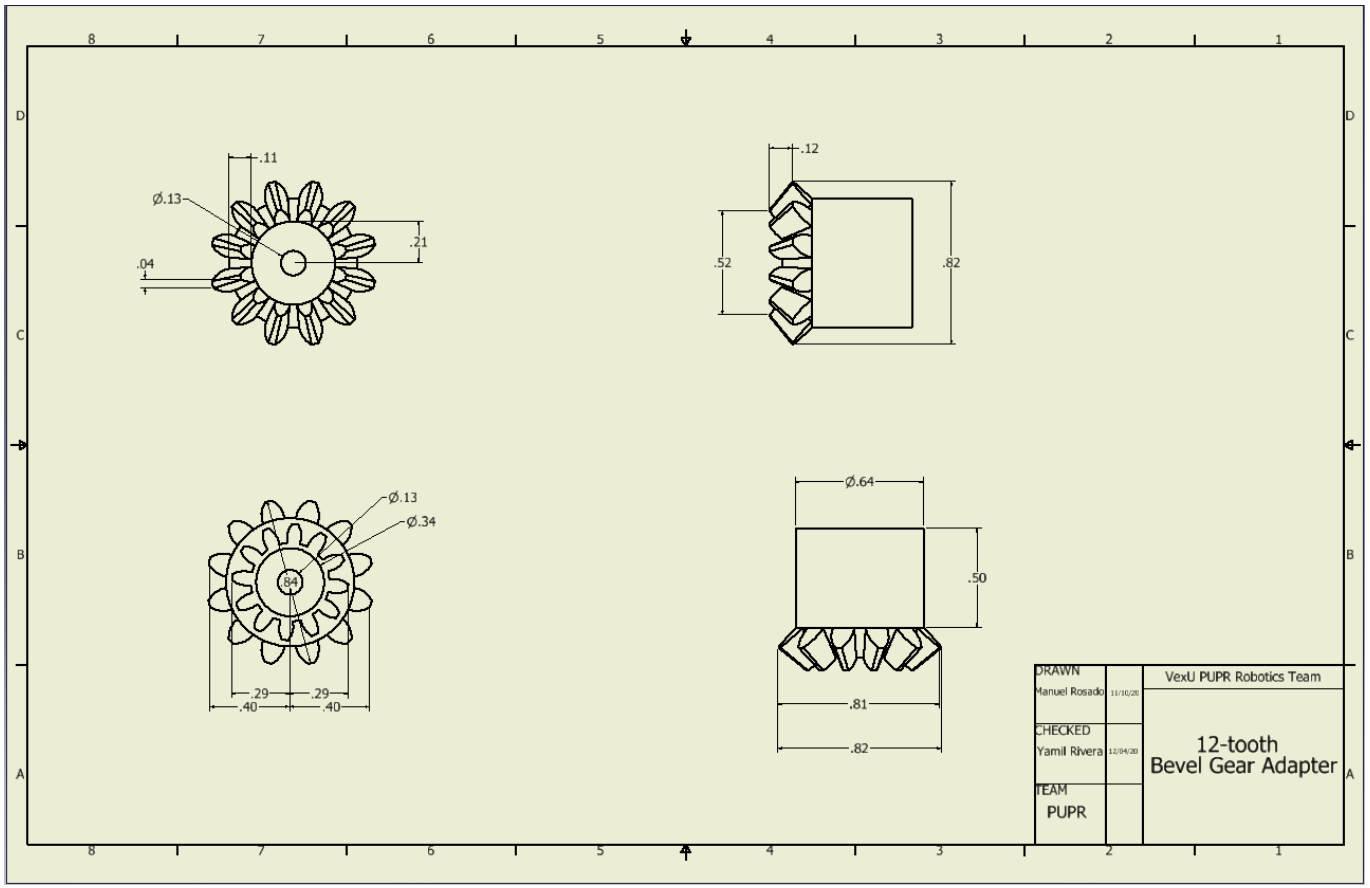
60-Tooth Gear with 60-tooth Bevel Gear Adapter front and back.



84-Tooth Gear with 84-tooth Bevel Gear Adapter front and back.

Bevel Gear Adapter

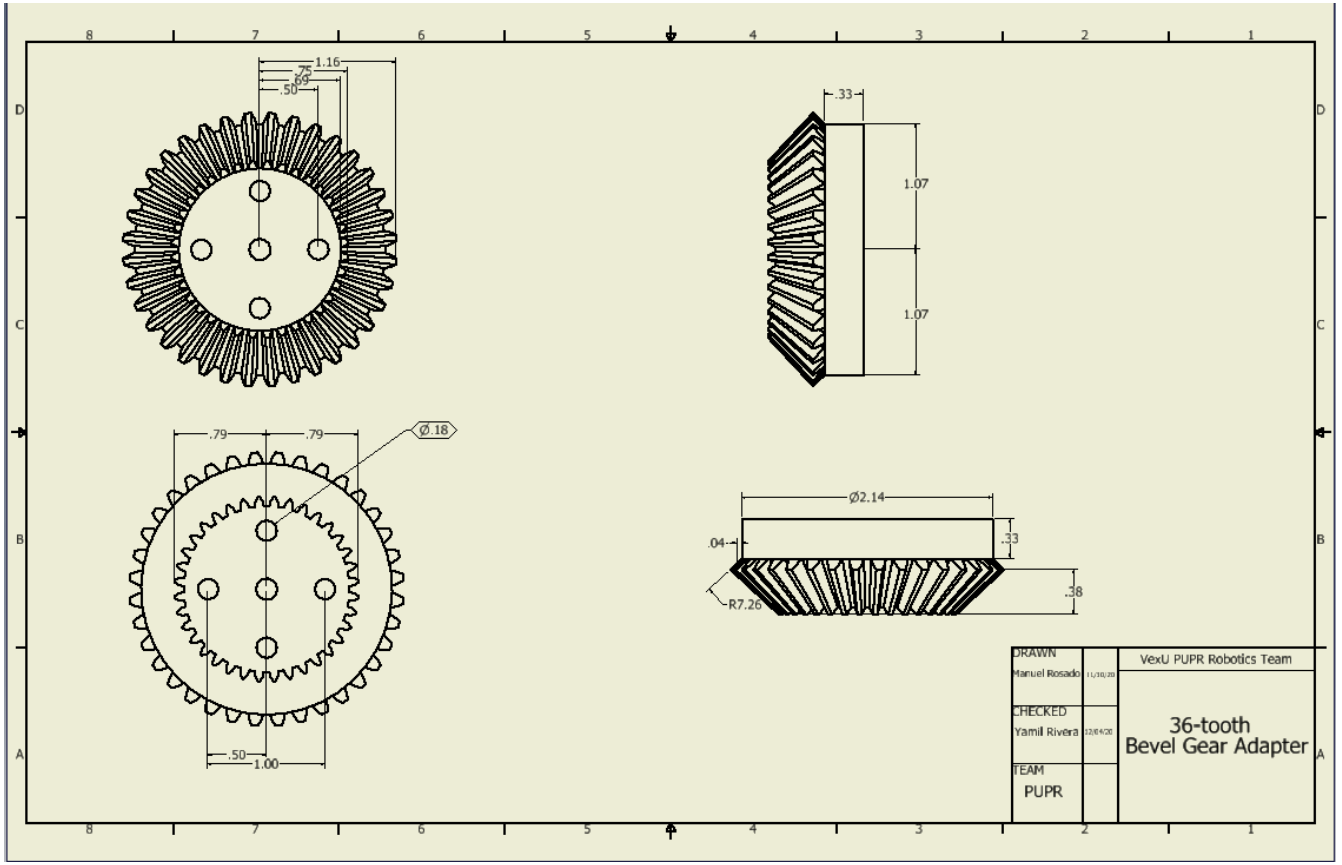
CAD Drawings



12-tooth Bevel Gear Adapter

Bevel Gear Adapter

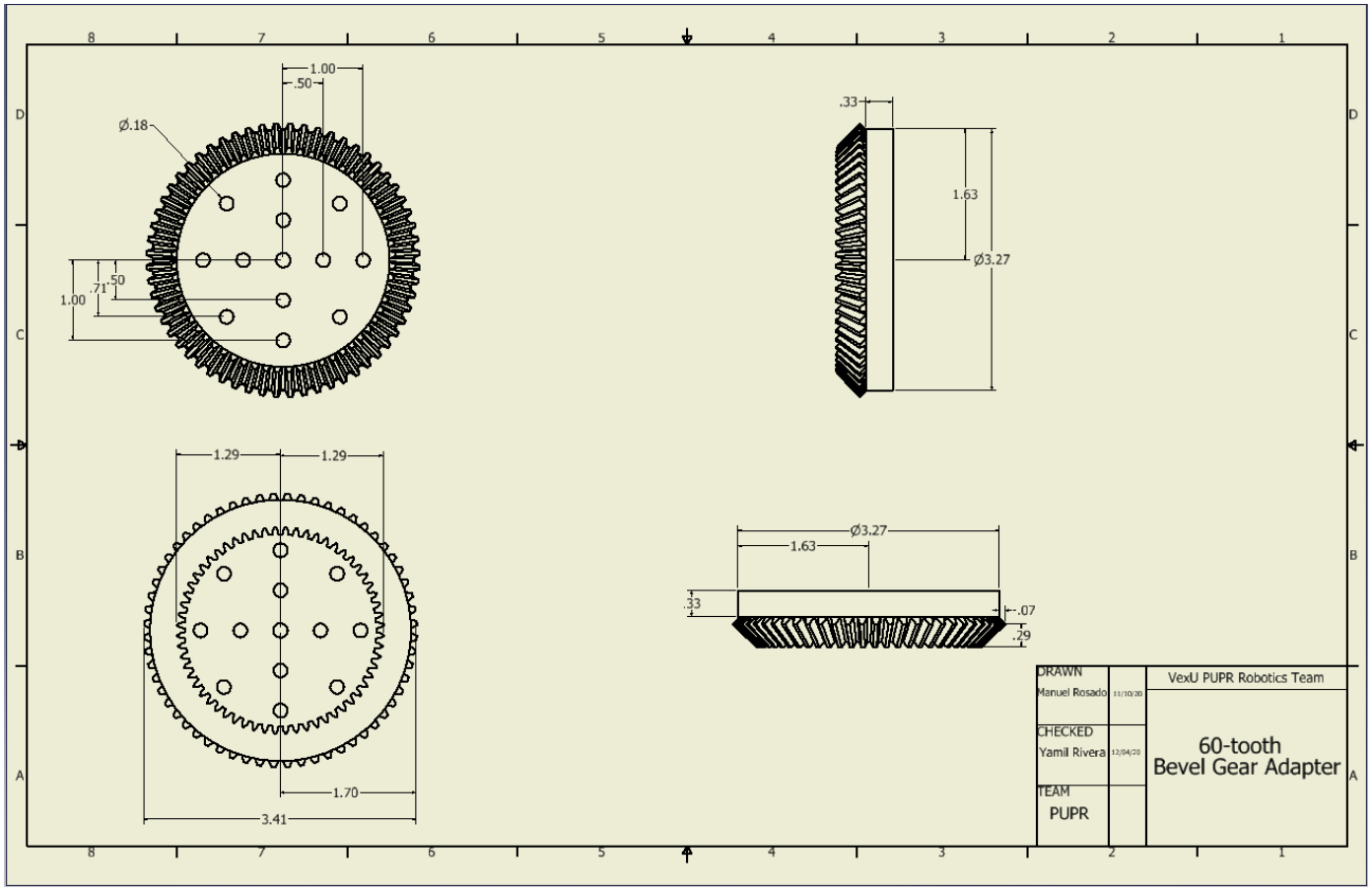
CAD Drawings



36-tooth Bevel Gear Adapter

Bevel Gear Adapter

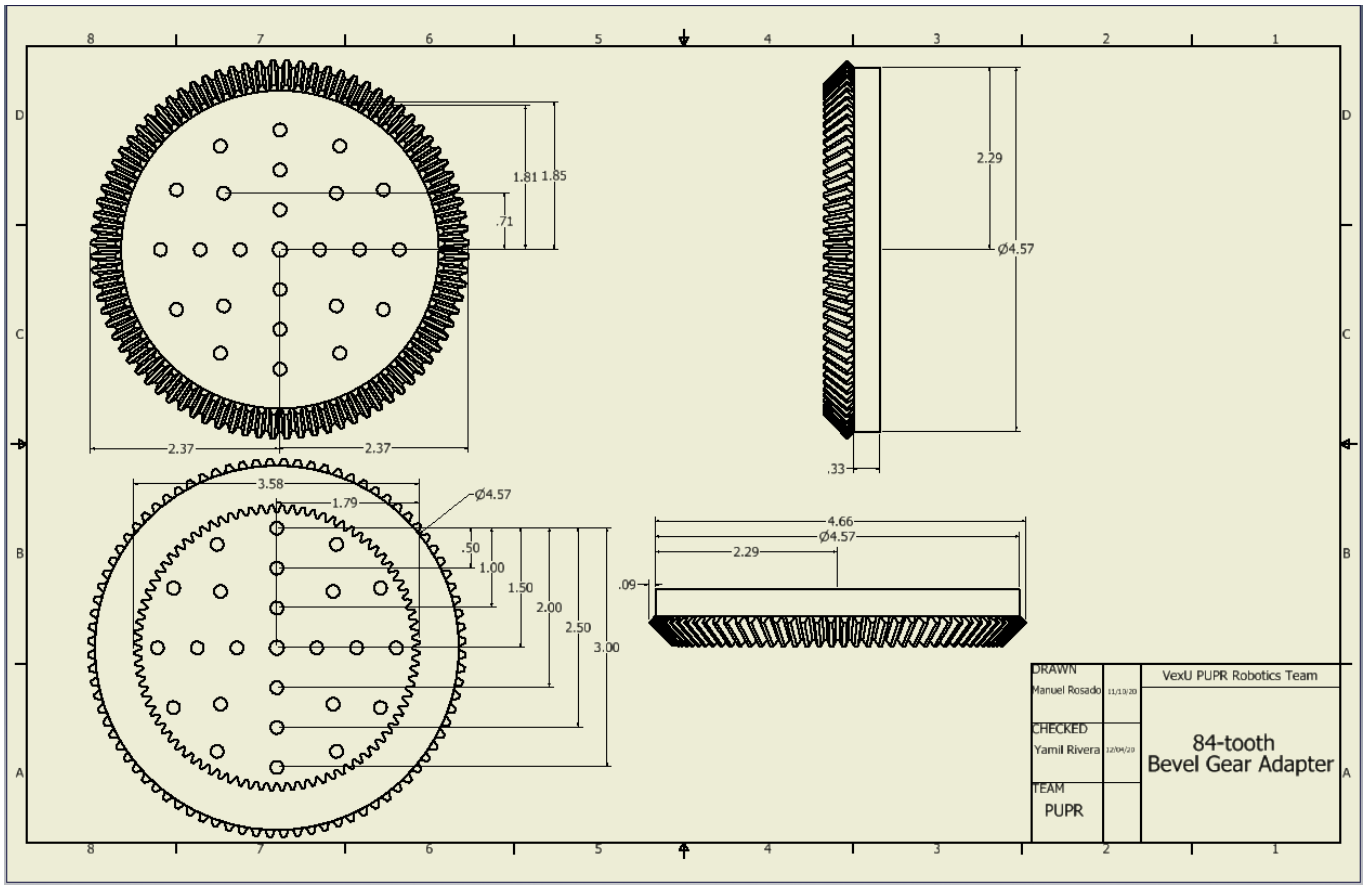
CAD Drawings



60-tooth Bevel Gear Adapter

Bevel Gear Adapter

CAD Drawings



84-tooth Bevel Gear Adapter

Bevel Gear Adapter

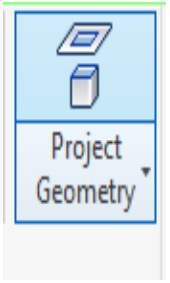
3D Program

In this challenge we use the program Autodesk Inventor 2021 edition. This program we have been using it for the past years because it helps us build the robot in 3D without having to build it with pieces in person that way everybody has the pieces and can do it buy their own in their houses. To make the Bevel Gear Adapter was a little difficult because to do a tooth gear in an angel you have to use a type of function called Bevel gear analyses that makes the bevel gear with your calculation and to use this function it has to be done in Assembly not in Part. When you are finish using the Bevel gear function you have to extend the bevel gear so that the 36-tooth gear can fit into the Bevel Gear Adapter. Last step will be to take a 36-tooth gear and added to the back of the Bevel Gear Adapter and use the Project Geometry function so it could take the tooth of the gear and extrude it to the part. It is hard to do but nothing is impossible to do and we thank Autodesk inventor for that reason.

Step 1

Step 2

Step 3



Bevel Gear Adapter

Usability

With the Bevel Gear Adapter, you can use it in many different ways. For example in **Figure 3** you can see that we use the adapter as a connection link to the other side of the roller because instead of using chain(that can break) we can use a shaft from one side to another. Another way that you can use the bevel Gear adapter is to use it for multiple components. This help the mechanic to use one motor into multiple functionalities and can use other motors for other mechanics. In **figure 4** you will see one motor controlling two upper rollers then two bevel Gear adapters will be added to the side rollers, so then the 1 motor will be controlling two middle rollers and two side rollers. The other way you can use it is for space saver for example in the Vex game change up you need space in the middle for the balls to pass. With the bevel gears its easy because with them you can add the motor to the inside of the wheels area like shown in **Figure 5** and **Figure 6**. With this you can have more space in the middle and can have the balls com in easy without the problem of the motors being in the middle. Another thing you can do with this device is instead of adding the gear inside the Bevel Gear Adapter you can add a rachet inside and make your own rachet system. For now, this is the thing you can do with the Bevel Gear Adapter, but you can do more with your imagination and creativity.

Bevel Gear Adapter

Figures

Figure 3

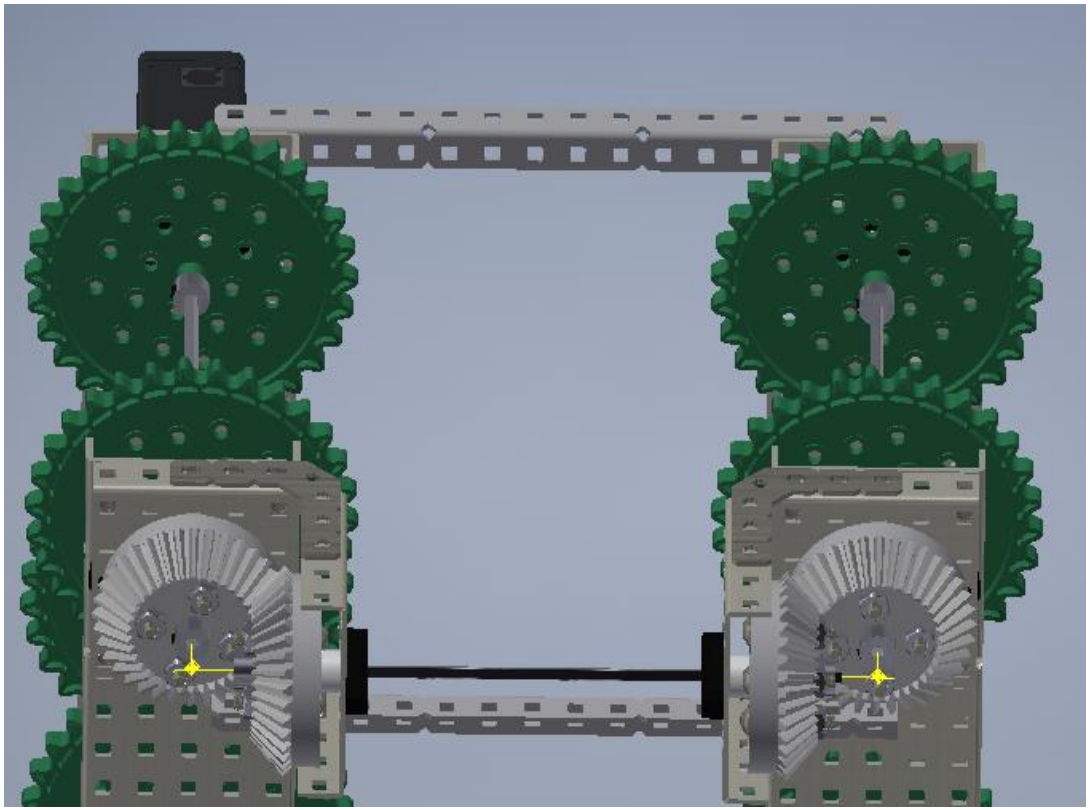
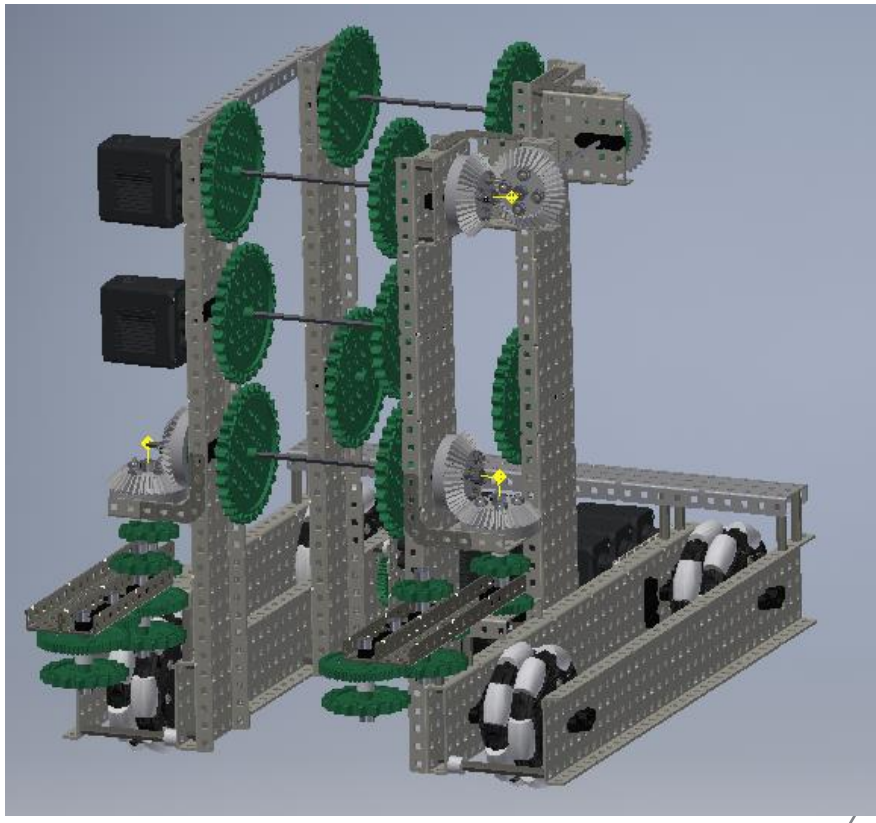


Figure 4



Bevel Gear Adapter

Figures

Figure 5

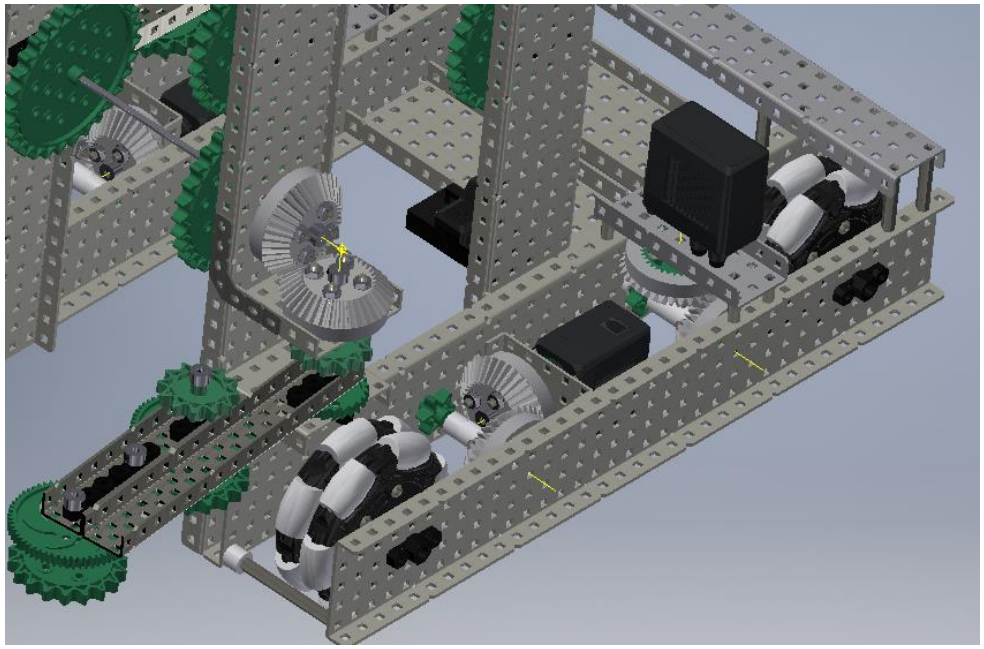
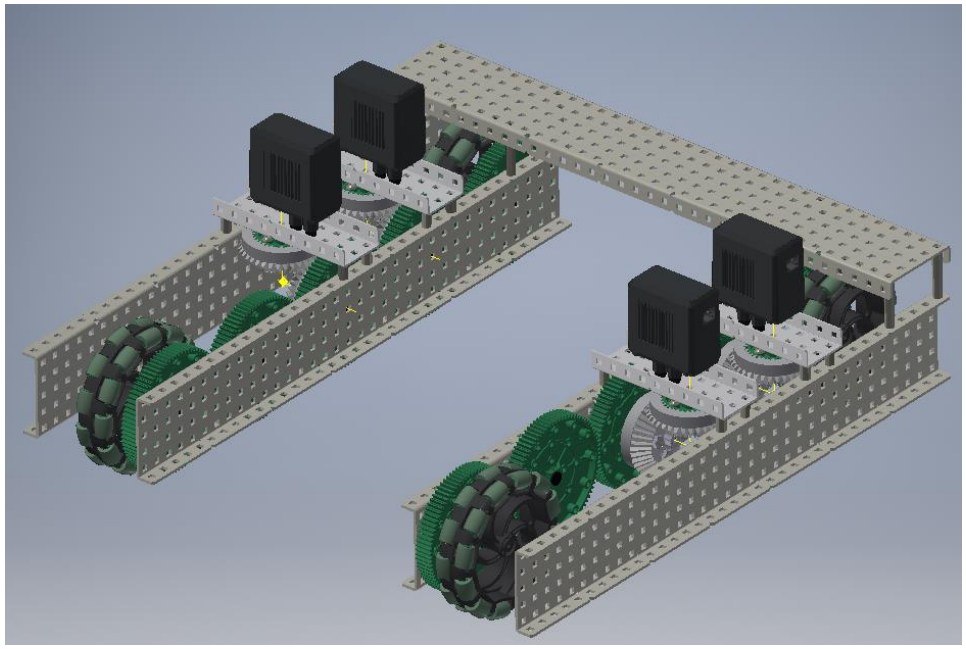
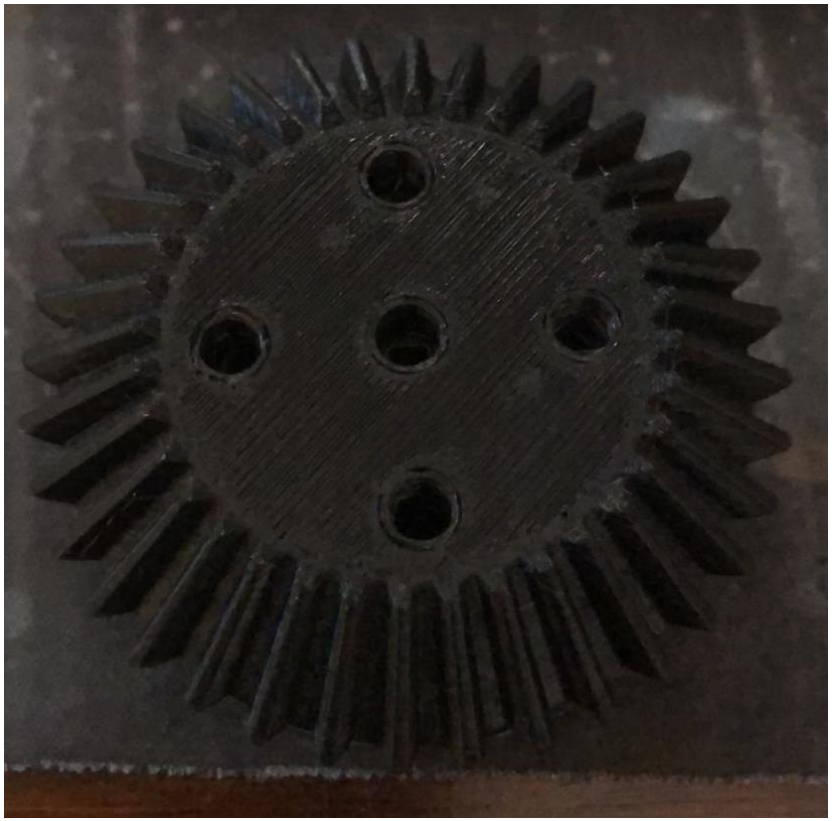


Figure 6



Bevel Gear Adapter

3D printed

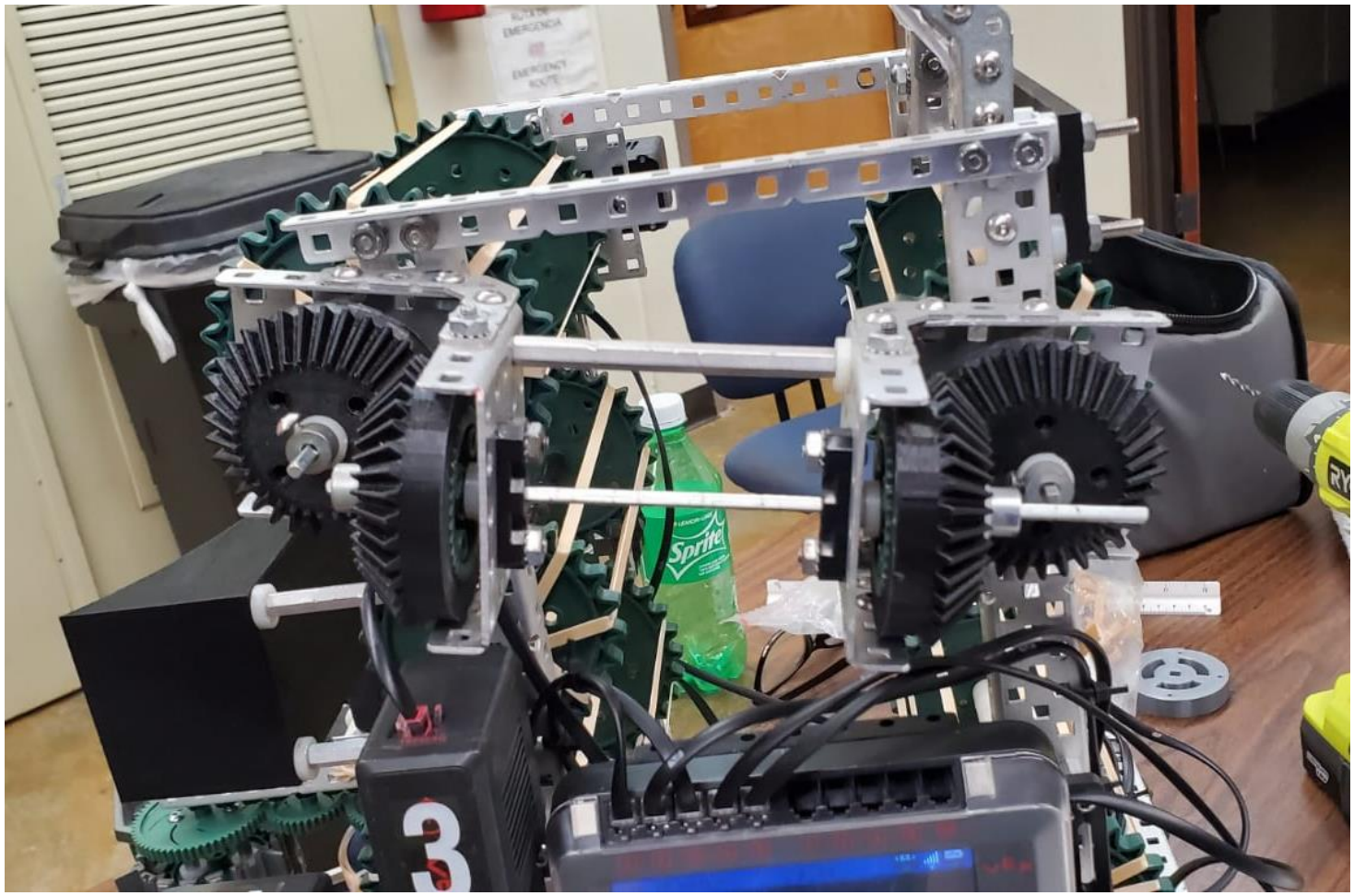


Bevel Gear Adapter Front part

Bevel Gear Adapter Back part

Bevel Gear Adapter

In Robot 3d printed



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Conclusion

With this project we have learn to make Bevel gears and we notice that it is very difficult to make. But with this project we hope that people can have the opportunity to use it so they could have the experience of using a bevel gear and have the advantage of using one. We have also learn how to use more functions from Autodesk inventor that are complicated to use but are very useful and we hope by showing this to the Vex community it will grow their knowledge and it will help them create more parts for 3d printing. In conclusion, the Bevel Gear adapter will be a very good part that will be use a lot in the Vex teams now that we have a very little amount of motors. Hope Vex teams can used them and create more bevel gears.