VEX Robotics Competition "Make It Real" CAD Engineering Challenge

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 Lion-Tech Robotics

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I.   Introduction

Over the five years of experience in Vex Robotics, I have seen a variety of different challenges when designing and building robots for each annual game. However, one constant I have noticed that many teams experience in all of them is with wires. With limited sizes when it comes to the motor wires, it can be of difficulty when attempting to place different motors distant from the brain, which ultimately leads to stress on both the motors and wires, leaves wear/tears on the connecting wires, and in many unfortunate cases, the wires get pulled off during a match. As a result of such, I decided to look into creating what I have called: **The V5 Wire Extension Coupler.** It works the same way an ethernet cable extender does, you plug two different wires together using a coupler in the middle to extend beyond the normal reach of the normal V5 Wire sizes.

II.   Implementation

The preeminent aspect of this piece is that the applications for it are limitless. Its dimensions are small enough that it can fit most nearly anywhere on the robot, with a threaded hole on the bottom to connect the robot using any vex legal sized screws. You can use it whenever a motor is far away from the brain and is difficult to use one of the legal sizes of the V5 wires. So you plug one end of a wire to the brain and the other end onto the coupler. You then get another wire, of which connects from the motor onto the coupler. The coupler then acts as a sort of bridge between the two wires. An example of this being useful can be in the 2019-2020 Vex Game *Tower Takeover,* where many teams had intakes on a barlift that extended far beyond the reach of any sized wires, unless the brain was positioned close to the intakes motors. The wire extension coupler could have solved many issues that teams had or will have with this.

III.   Fusion 360 Utilization

In Autodesk Fusion 360 software, I first had to create a simple rectangular prism for the dimensions of the piece (insert dimensions). I did this by using the "create form" solid tool and extruded it as I needed it to be. Then for the shape of the wire, we found an intuitive alternative to getting the shape and size needed. We simply got the V5 brain from the Fusion 360 files provided by Vex, and we created a sketch around the hole. Then extruded everything negatively except for inside the sketch which left us with just what we needed. To combine the component and sketched hole together, we then used the joint feature to combine the two pieces together as one whole piece. Knowing that it would have to be done to the other side, we made the proportions of the length have the size and what we did was copy the component, duplicate it, and mirror it to the opposite side, thus having the connectors on each side of the coupler. We had to make more extrusions and sketches for the sake of the inner components and shape of the coupler. Then for the threaded hole needed for the screw, we first made the hole big enough for it to fit but small enough that it would not interfere with anything else. We then created an object cylinder and added a thread to it. Once more using the joint mechanism to add the threaded hollow cylinder into the hole. As for the software, we used Autodesk Fusion 360, year 2020 , version 2.0.3113 for Windows 10.

IV.   Conclusion

In this project, we learned a new way of design and engineering. This gave us a new tool to further improve our design process by which we can all easily contribute to the same project, whether that be together or even remotely. Fusion 360 also adds to much better planning for us,

being able to build the robot without having to waste time building it and now we can visually see any performance issues we may have pre-building time. This 3D design software will definitely be implemented on our team from now on as it contributes greatly as just mentioned. For a competitive robotics team, one of the main challenges is simply time, and when you have to constantly be building, unbuilding, building again, it can be a hassle. This software prevents that by allowing us to test the robot for things such as stress tests or if it will violate any rules of the game. This has definitely been a stepping stone in terms of our engineering careers, as we experience what many professional engineers go through in their design process.