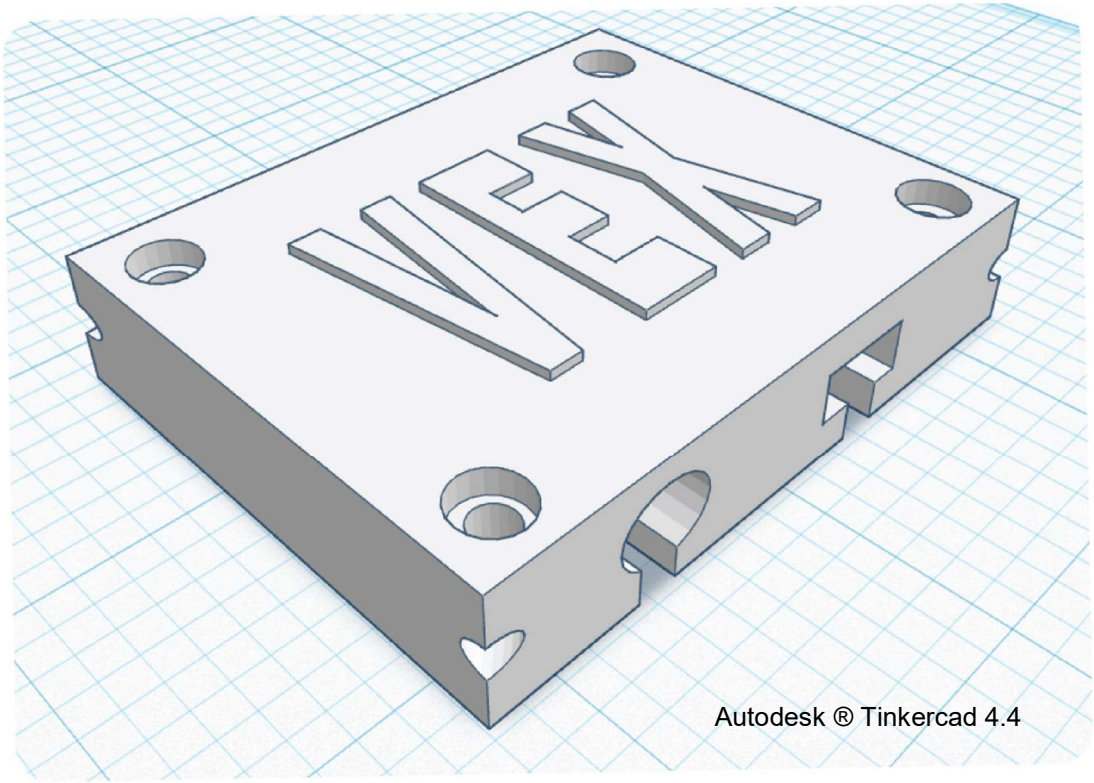
V5 Cable Control Platform



Autodesk ® Tinkercad 4.4

2019 AUTODESK - MAKE IT REAL CAD ENGINEERING CHALLENGE

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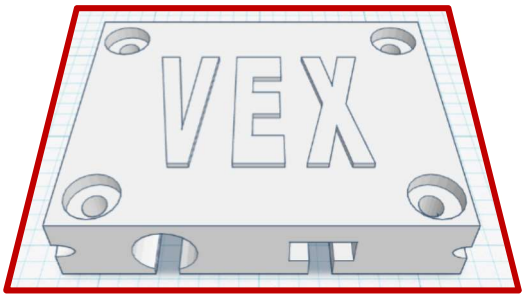
BRENTWOOD ACADEMY (BRENTWOOD, TN)
HIGH SCHOOL DIVISION



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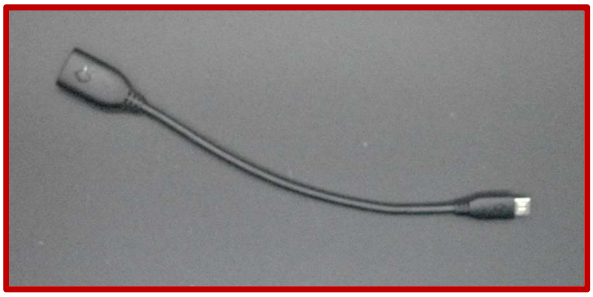
Brentwood Academy (Brentwood, TN)
High School Division

V5 Cable Control Platform

THE CHALLENGE

At the beginning of this season, VEX Robotics introduced the new V5 System Bundle. Although V5 revolutionizes programming and competition, there are small kinks in its configuration that make it harder to use and easier to break. One of these problems revolves around the programming and battery charging cables. Due to the size of the V5 system and methods of attachment, the V5 brain and battery are often placed in positions that make accessing their sides difficult.

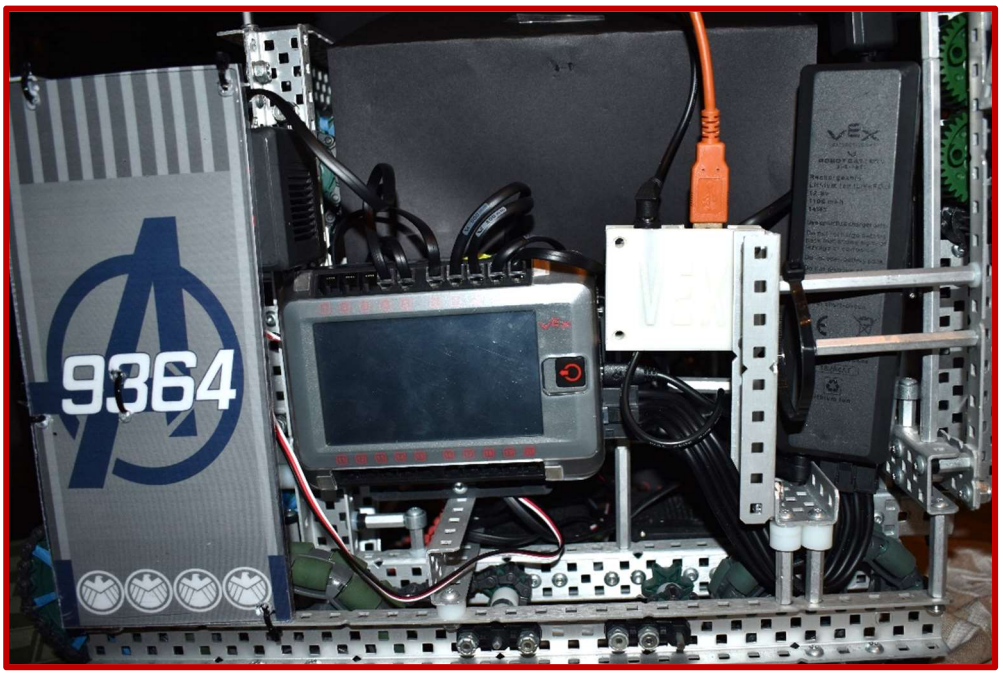
Our team also realized that even if there was a way to plug them in, it would be at an angle that could potentially break the pins inside the micro USB port (much like those in a phone charger) or bend the plug that is in the programming port (same for the charging cord). If either of these two scenarios occur, then the V5 Brain and/or battery must be replaced. This problem can be very costly as well as time consuming and is not a good situation for people who must buy the new part. In consideration of those who have run into this problem, I decided to look for a solution that made the process of programming and charging more efficient and minimize the risk of damaging a part that is expensive and inconvenient to replace.



THE SOLUTION

The **V5 Cable Control Platform ["CCP"]** is a simple system that allows the programing and battery charging cables to be plugged in easily without the risk of damage. The solution is a 3D-printed platform that contains two interfaces, one for programming and one for charging. The programming space is filled with a short cord with a micro USB connecter on one end and the female end of a USB connecter on the other. The charging interface is accompanied by a similar cord that plugs into the battery and features the female end of the battery charging cord. When put together, the **CCP** creates a simple, durable, and reliable way to program and charge the robot.

This system is designed to be mounted on the robot wherever the designer wants so long as it is within 5 inches of the brain and within 6 inches of the battery. The platform is designed to be attached using screws in concave holes for a flush fitment or zip tie holes if the screw holes are not accessible. The platform requires a space of 2 in. by 2.5 in. and is best positioned if mounted upright. After using the **CCP** and the two cords, plugging and unplugging the programming and charging cords becomes easy and risk-free.



SOFTWARE

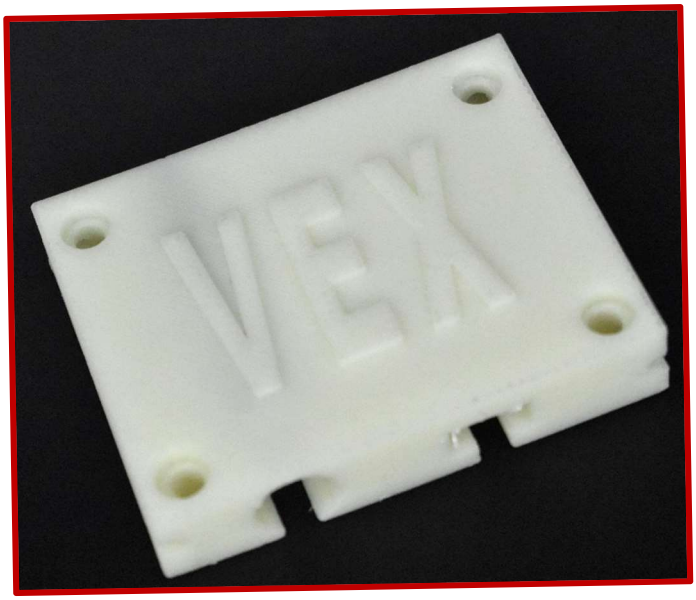
For this project, I chose to use Tinkercad to create the **V5 Cable Control Platform** due to its simple approach to modeling a complex concept. I used version 2018 Autodesk, Inc. - Tinkercad 4.4.

This is my third year competing in this challenge and have used both Fusion 360 and Tinkercad. In 2017, I created the VEX License Plate Holster, which won first place in the middle school division, using Fusion 360; in 2018, I created the VEX Adjustable Tension Tether, which won the same honors, with Tinkercad. When I started thinking about this year's challenge, I had the same choice as last year, use Fusion 360 to create a simple part, or try the simpler Tinkercad to create something more complex.

After brainstorming an idea that I thought would be able to help my team and the VEX Robotics community, I went to the drawing board and sketched out the **CCP** solution on graph paper so that I could pre-determine the scope of the project and calculate accurate measurements.

Within Tinkercad, I first created the rectangular platform piece and hollowed out the two spaces for the cords. Then using a hollow cube, I created the space for the cords to be placed inside the platform. Then, I made four holes in the corners for screw mounting (or zip-ties) and made the holes concave to allow the screw to be flush with the platform. Lastly, I positioned the VEX letters on top and finished the **CCP**.

The next step was to have the **CCP** protoype printed. When 3D-printing, accurate measurements are very important. After previous failed attempts, I took this knowledge into account when I made the **CCP** this year. Even though this is my third year doing this, it still amazes me how I can manipulate objects in the CAD software, and then 3D-print a concept that transforms from the screen to a physical object.



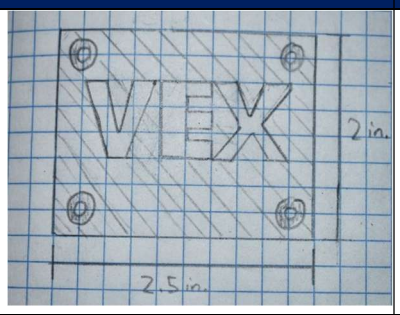
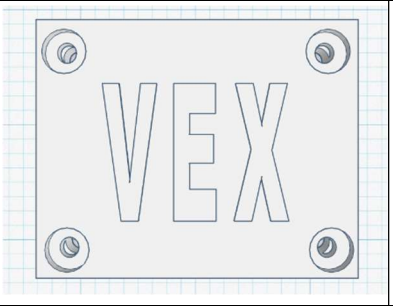
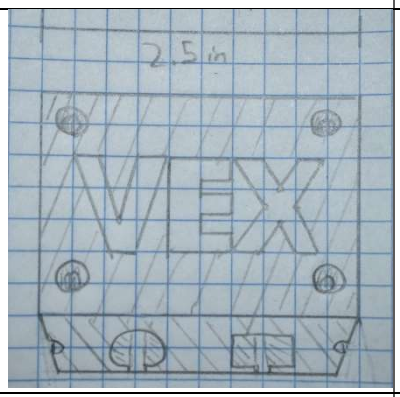
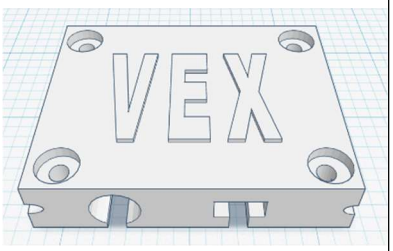
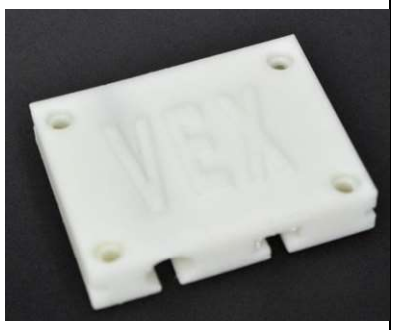
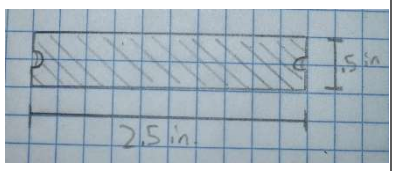
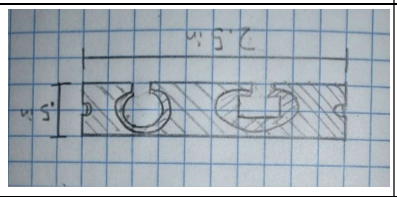
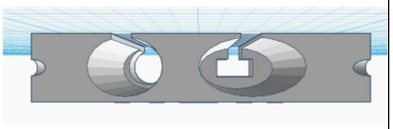
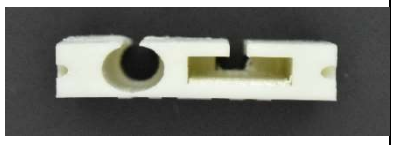
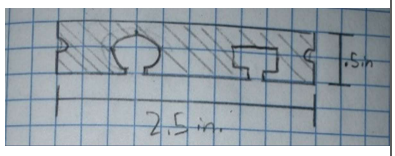
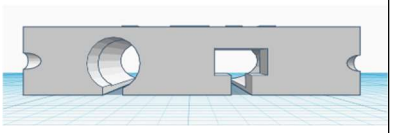
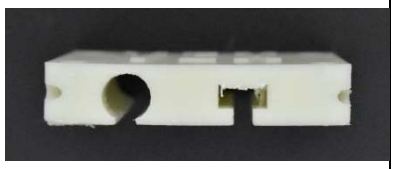
REFLECTION

Although the V5 System is still new to many teams, I hope that the **V5 Cable Control Platform** will revolutionize programming and charging V5 robots so that ultimately it saves teams time and money by protecting the charging/programming cables.

This challenge has further elevated my understanding of CAD and shown me that I can create more complex objects than I had originally imagined. 3D-printing a tangible model allows me to see what I have created in a perspective that is impossible to achieve on the computer. “Simpler is better” is another important concept that can be applied to many things, such as a mechanism on a robot, a CAD project, CAD software, or strategy in a competition.

I plan to use this software for both school and robotics projects in the future. I look forward to designing new robot mechanisms and creating helpful parts for the VEX community as well as everyday life. Down the road, becoming more proficient at using CAD will also be helpful in VEX U when I will be able to use 3D-printed parts in conjunction with normal VEX-produced components. Also, I plan to enter the field of engineering and mastering CAD will allow me to gain a more advanced understanding of how things are made as I learn how to create more complex concepts.

Ultimately, I hope that the **V5 Cable Control Platform** will supplement the V5 System Bundle and help the entire VEX community when programming and charging their robots.

	SKETCH	TINKERCAD	3D-PRINTED PROTOTYPE
TOP			
TOP FRONT			
SIDE 1/2			
SIDE 3			
SIDE 4			
BOTTOM