

NYIT Bears in VEX U (Team NYIT4)
IEEE Student Branch at New York Institute of Technology
New York, United States
REC Foundation Online Challenges

Make It Real CAD: Rubberband Standoffs

Our university has a rich history of competing in VEX-U tournaments. Every season, we can see improvements and innovations for all our designs. Every season, we also have more advanced programs.

For Nothing But Net, our team's prowess was seen by us placing 14th in the world, 1st in robot skills, and we won the Amaze Award. Every year, our goal is to have a well-rounded robot that performs well in all aspects of the game. If our robot is not well-rounded, we lose critical opportunities to gain points, so we create robots that are able to tackle most of the design challenges.

Every team always has the same raw material, but it is what they do with these materials that determine the efficacy, efficiency, and consistency of designs. In VEX-U, we have an advantage because we can make 3D-parts. As per VEX-U rules, competition robots are permitted any 3D-printed part as long as it is within 3"x6"x6". Thus, we can make anything we need. 3D-printing allows for out of the box designs that cannot be done with only screws and pre-cut metal. If we can think of it, we can model it, and print it. 3D-printing also makes the robot more cohesive because it makes up for all the mechanism that cannot be made using normal VEX materials.

This game has many challenges. One challenge is that we only have one robot on the field during a match or skills challenge, as opposed to the two permitted in past years. Another challenge is hanging – a lighter robot (which would have many 3D printed parts) can hang more easily than a heavier one, and the position of the hanging mechanism is extremely important. The final major hurdle of this game is that it is low scoring. Each game object is worth 2 or 4 points each in the far zone and there are only a few dozen pieces. This means that there will be a lot of back and forth scoring of the objects. This year, one game object or one second can mean the difference between winning and losing.

For our designs this year, we are using a claw system with rubber bands as intake components. However, after every run we have, we notice that the rubber bands keep moving out of their optimal position. If the rubber bands move, this affects their efficacy during game play. We initially used mesh on the claw because we thought they would provide the best grip for the scoring objects, but they kept falling out of the claw. We then tried a few rubber bands stretching the length of the claw arm, but there was too much recoil. Our last option was to place the rubber bands strategically along the arm using standoffs. But with the standoff method, as mentioned earlier, rubber bands keep moving out of their optimal position. We designed a rubber band standoff in Autodesk Inventor to help us solve this issue. This part can be used with any standard VEX standoff and is an easy way to secure the rubberbands. They can be printed in different colors, so they can add an aesthetic flair to the robot.

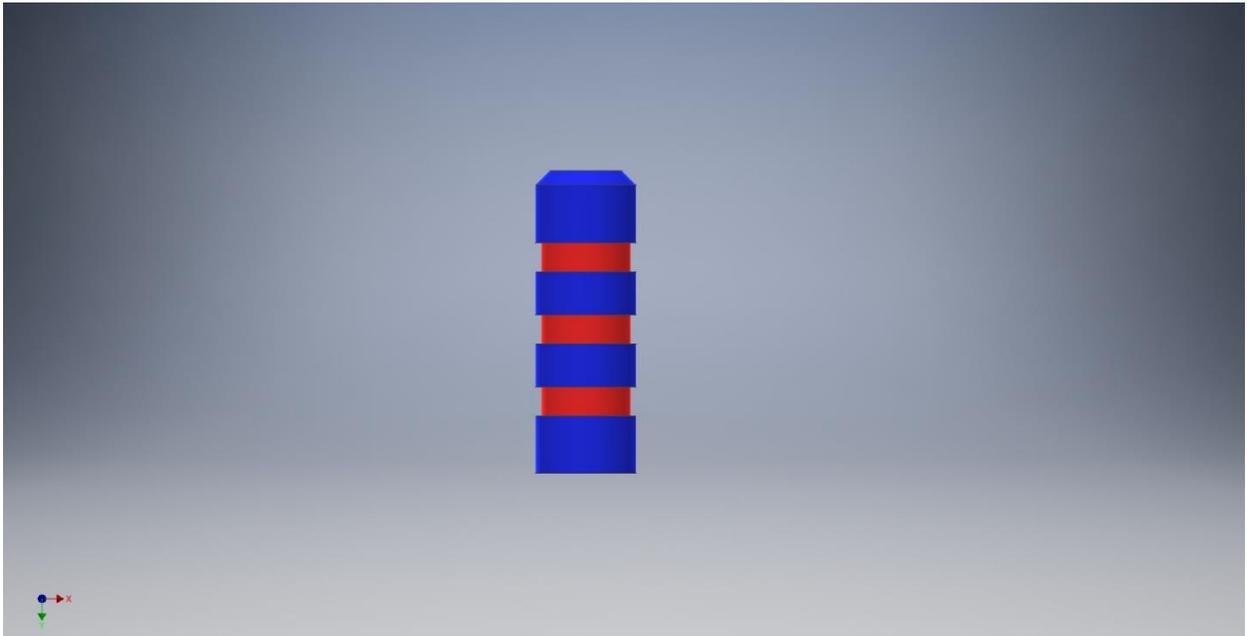
The steps we used to make the part are as follows:

1. Measuring the parts: standoff.
2. Designing in Inventor:
 - i. Why: Idea
 - a. Rubber bands keep slipping
 - b. Need lightweight solution
 - c. Need to prevent rubber bands from slipping
 - d. Draw pictures
 - ii. How: Engineering
 - a. Using a series of 2D sketches made completely from geometric shapes, the basic outline of the part was created
 - b. Extrusions, 3D representations of the 2D sketches, were used with slight alterations
 1. Measured size of standoff hex part and hole for screw
 2. Made a sketch of this hex shape and a surrounding circle
 3. Made notches in the extrusion
 4. Rounded off one end
 - c. Tested the part in an Inventor assembly file to see if the standoff fits nicely
 - iii. Manufacturing and distribution was not attempted for this part, but if we did, this is what we would do:
 - a. Get an STL file
 - b. Import STL file into 3D printer software
 - c. Save file from 3D printer software
 - d. Print and use on robot

While working on the rubber band standoff, we learned that there is no such thing as a bad design. Every idea that someone comes up with can be used for something, maybe not what was initially intended. For us, this rubber band standoff solves a significant problem because we can now have more consistent intake tests. We cannot control the tension of the rubber bands, but we can control where they are placed and how many are placed there. This design can also be extended for longer sized standoffs, which is beneficial if we decide to use the piece somewhere else on the robot. This is a simple, easily applied solution for a significant, possibly game changing problem.



Orthographic View of Rubberband Standoff Attachment



Front View of Rubberband Standoff Attachment