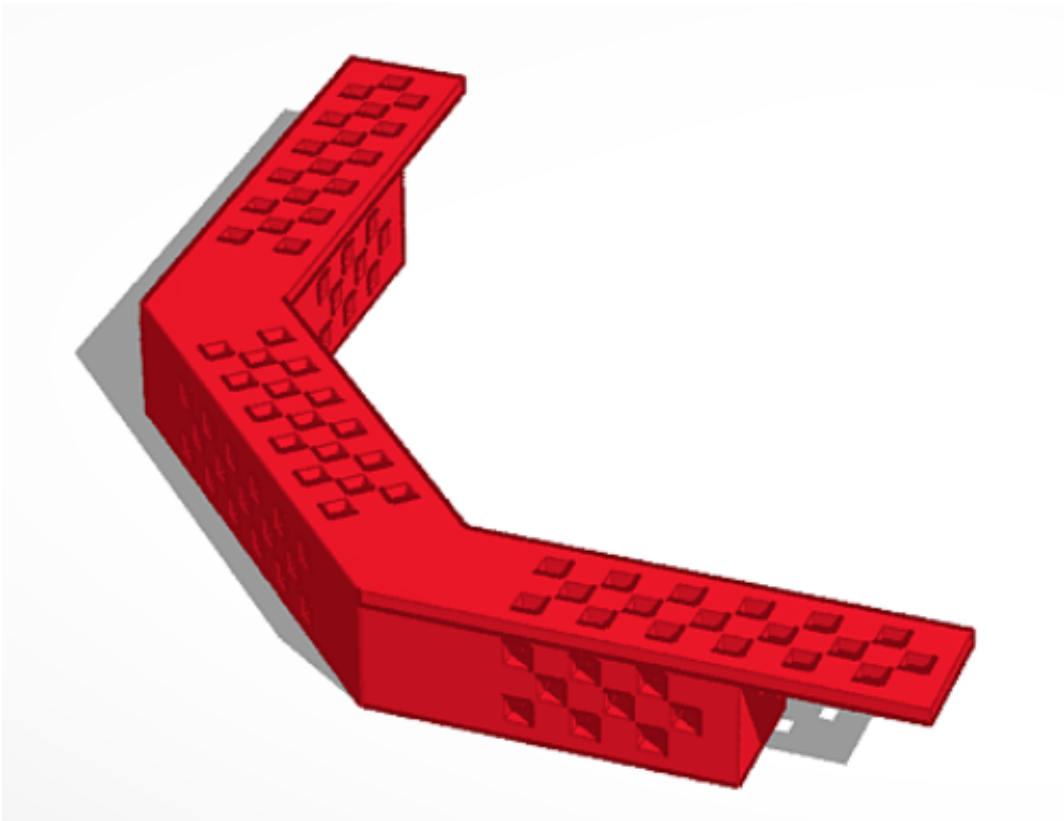


45° U Channel



Millikin Blue Bots

Team Code: MBB1

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Millikin Blue Bots (MBB) has designed a part we have named a 45° U Channel. This part solved an issue our specific team was working through. Our team desired a robot that would be able to move in all directions without having to turn. At the time the team created this part, we lacked the funds to buy mecanum wheels or more omni wheels than the ones we currently had. However, we did have access to a 3D printer through our university. Due to this, our goal was to design a part that would allow us to create a robot that could easily move in all four directions without needing to buy mecanum wheels, use more than four wheels at a time, and use fewer motors, another part we were limited on. Using this part, we have been able to improve upon our drive train functionality and use the parts we currently have.

The 45° U Channel has three segments to give the piece a 45° shape. The center section is 25 mm tall, 108 mm long, and 25.2 mm wide. There are 17 holes on the top and both sides, with 6 across for the top and bottom rows of holes and 5 across for the center row. All holes on the piece are 5.1 mm by 5.1 mm squares going all the way through to the opposite side of the section. This segment has a U channel shape, which is what the piece is named after. The two side sections have a top part that is 3 mm tall, 105 mm long, and 25 mm wide. There are 18 holes going through the top, with 3 rows of 3 holes being alternated with the middle holes farther from the center segment. Each has a bottom section connecting it to the center segment which is 22 mm tall, 70.75 mm long, and 25 mm wide. The bottom section is solid except for 9 holes on both sides, with 3 rows of 3 holes being alternated similarly to the top part. Overall, the piece has dimensions 25.25 mm tall, 181.51 mm wide, and 181.39 mm long.

The idea for the 45° U Channel part was to have wheels on four corners of a robot. The part was designed with the intent of being used as an improved drive train for any of MBB's robot designs. One thought the team had to try later is to rebuild our clawbots using this part in

the design to allow it to be more movable. When using the part, the wheels would be screwed into the center part and the side pieces would connect on top of regular U channels. Having solid bottoms at the corners strengthened the piece to hold up with the level of a U Channel. With wheels in the corners, the robot would be able to easily move forward, backward, left, and right with only 4 motors. Additionally, the robot could be wider since the wheels would not add to the total dimensions. Motors would also not need to spin as much, as only opposite wheels spin to go any direction which would lengthen the battery life while still having the power of 4 motors.

MBB used Autodesk's TinkerCAD program to design our part. . All pieces were solely made from the box in basic shapes. Using the .25 mm grid, the design was built by stretching and compressing boxes to the correct size. It was designed to be able to be printed on a Sindh 3DWox dp200 machine, so the design was optimized to have a flat top and fit in a 190 mm cube. In TinkerCAD, designs can be rotated to a specific degree, which allowed us to create the part to exactly 45°. We used that feature by first creating the middle segment of the part and then rotating it to 45°. The middle segment was then merged with the two side segments which would not be rotated to allow for a 45° angle of the intersecting parts. The merge tool allowed holes to be created when the rectangular prisms were on the hole option.

From this experience, MBB learned about the potential of using 3D parts to expand upon our ideas for our robots and how to use 3D printing when it comes to the limitation of our funds. Several members of our team are passionate about learning how to do 3D design and this experience gave us a starting point for teaching the rest of our team. Additionally, before this experience, the team only built robots using C-Channels for a conventional 4 wheel square base. This was due to a lack of familiarity with our available options and a lack of funds. Now that the skills needed to create parts for the team have been acquired, the robots are going to function at a

higher level. The parts will be considered in future designs. This experience has taught us how to be resourceful in what is available to us to use.