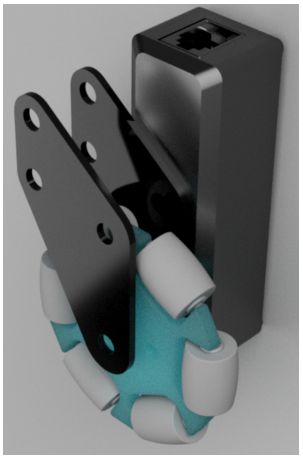
CAD Engineering Challenge

Sponsored by Autodesk

Illini Vex Robotics / ILLIN1

From Urbana-Champaign, Illinois

Tracking Wheel Module



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Introduction:

Some of the biggest challenges when designing and implementing a successful robot is accounting for drift during autonomous code. Drift is when the robot strays from the intended path and highly impacts the success rate of autonomous portions of the game. This becomes an even more significant problem for VEX U as matches have a longer autonomous portion.

In order to combat drift, our team utilizes odometry with 2 tracking wheels, so our programmers are able to track the absolute position of our robot at all times. Here, another problem rises: the tracking wheels take up too much space. This makes it much more difficult to build the robot without sacrificing some performance elsewhere.

This leaves us with one option: make the tracking wheel thinner. The first place where we can reduce the size of the tracking wheel is the wheel itself. The 2.75 Omni wheels we used to use for tracking wheels are roughly 1” thick, while our new wheel is .35” thick.

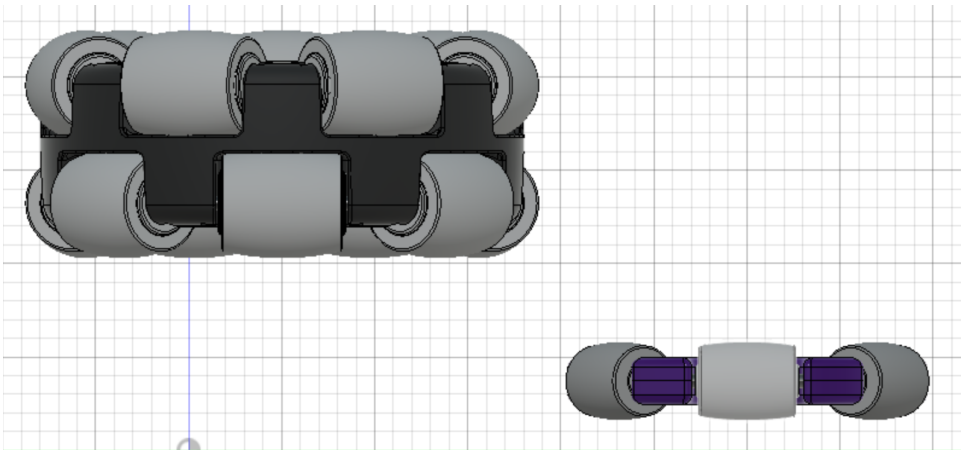


Figure 1 : Thickness comparison between 2.75 Omni wheel and the custom wheel

Overall, the entire module ends up looking much thinner and saves a lot of space.

In order to use the tracking wheel module, simply mount the module using the holes near the top, as shown in the following pictures. Use a rubber band to tension the module down if needed.

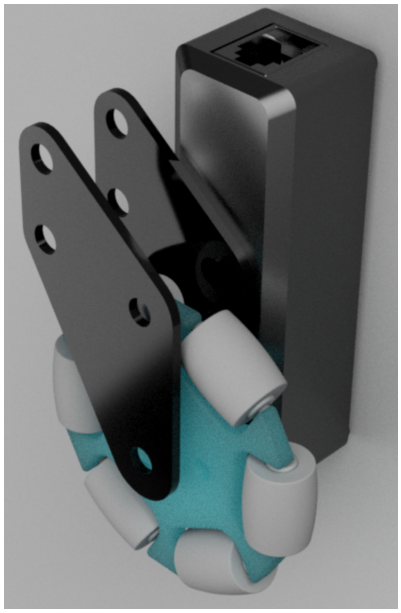


Figure 2 : Tracking wheel module

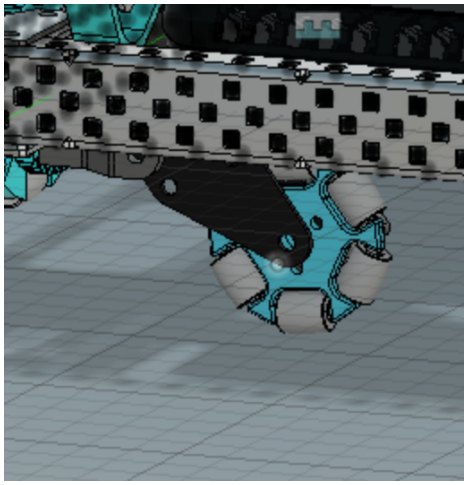


Figure 3.1 : Tracking wheel on robot in Fusion

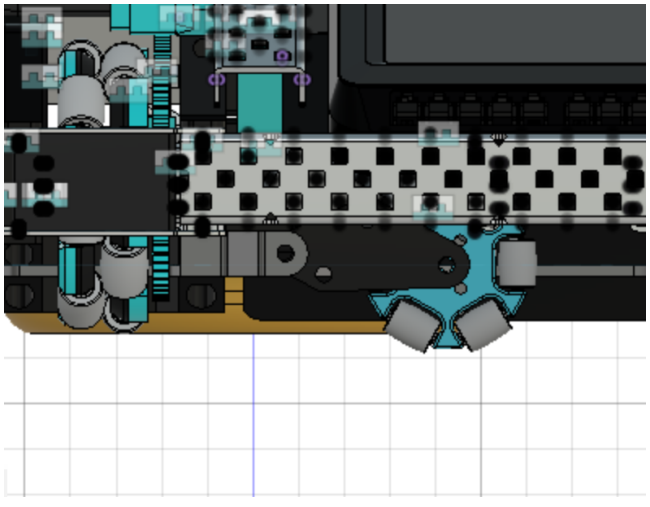
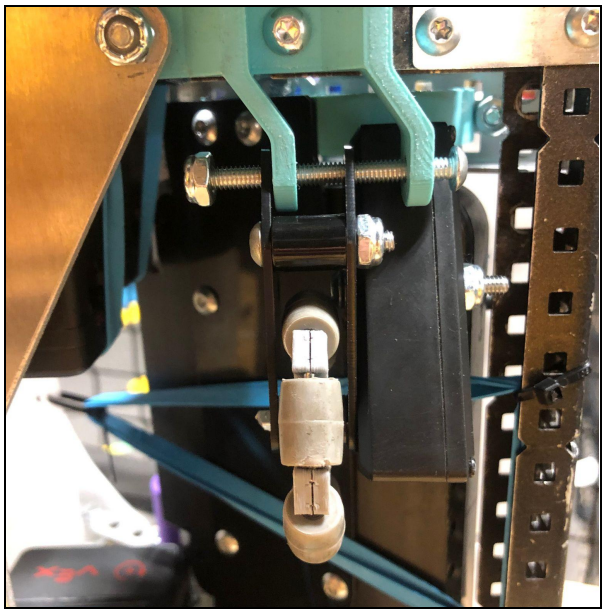
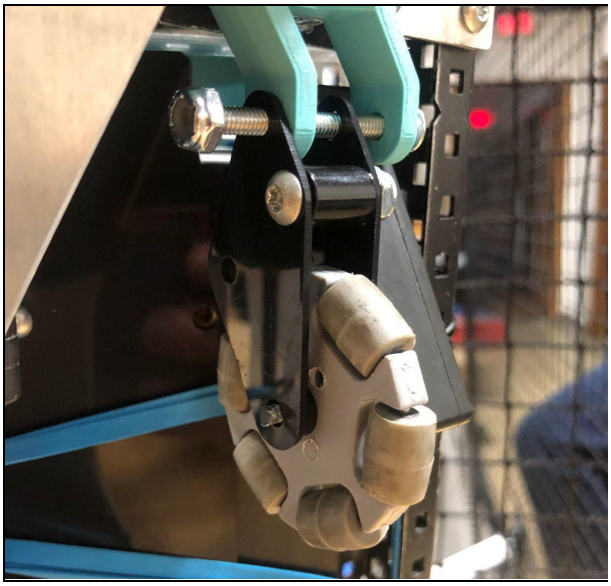
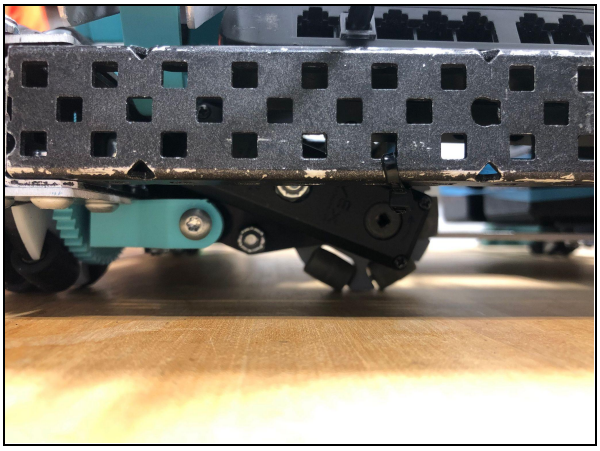


Figure 3.2 Tracking wheel on robot in Fusion

Additional Pictures







Design Software

For this challenge, our team used the latest version of Fusion 360. Since this project and robotics in general is a team effort, we really enjoyed the file sharing capabilities of fusion. This module was created using the sketches, extrude, fillet, and joint features/tools.

Conclusion

This project has taught our team some very valuable lessons regarding CAD and manufacturing. Firstly, it helped us polish our skills in 3d printing, as the custom wheel is a very small 3d print that requires significant precision. Additionally, we also had to take into account the tolerances of our 3d printer and the expansion of the filament during the design process of the custom wheel. Finally, and most importantly, we learned how powerful CAD is in VEX U; previously we used Fusion to assemble robots using already existing parts from VEX. Now we use it to design custom wheels, gears, and anything that could be more effective if custom-made.