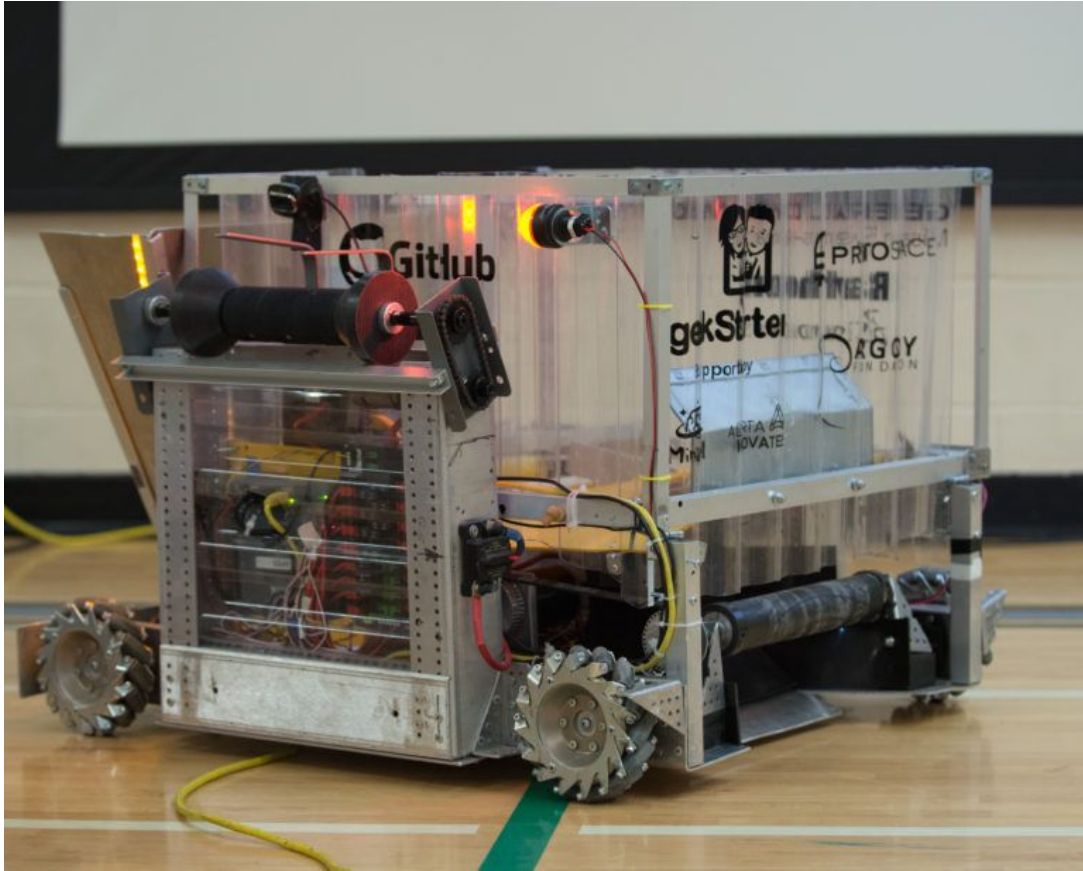


2017 FIRST Robotics Competition Design - 'Toggle'

<http://savsidorov.com/projects/>



Overview

Toggle was a robot that I helped build for the 2017 FIRST Robotics Competition, in my last year of high school. Every year, the game rules are completely different. In 2017, there were three main ways to earn points - Collecting and scoring wiffle balls at a rapid rate (each ball was worth very little points), collecting these yellow 'gear' game pieces and carrying them to a human player on the field, and climbing several feet in the air on a rope dropped by the human player at the end of the match.

Toggle was designed to tackle all three challenges. It was designed to max specifications for wiffle ball storage, but also maneuverable and speedy enough to carry gears from one side of the field to the other efficiently. We used four mecanum wheels to drive the bot, which allowed for intuitive omnidirectional movement (we used an Xbox controller, it controlled similarly to a top-down shooter). We tuned the gear ratio to get maximum speed out of the robot while still having enough torque to effectively move it. For wiffle balls, we had this whole intake-storage-shooter system. The shooter was just a ramp with a wheel to accelerate the balls and shoot them out. The chassis could spin and translate just the way we wanted it to in order to hit the target. For gears, we went with a simple but highly effective design - essentially a holster at the front of the robot that the gear was dropped into, and raised out of with a peg controlled by the human player. We also had a climber. We were allowed to design our own rope as well, so we came up with a velcro solution - spinning velcro drum and rope. Over the course of the season we managed to get the climbing time down from around fifteen seconds to five. Another cool thing that the omni design allowed us to do (hence the name) was toggle which side of the robot was the "front". For example, getting the rope caught on the drum required a fair amount of precision, so we would flip the controls to treat the climber side as the front of the robot. All of our electronics were conveniently placed to one side, clearing a lot of real estate in the chassis for wiffle ball storage, the shooter and the intake.

As common with FRC Teams, the electronics, wheels and various motors were COTS (FIRST sends you a big crate full of stuff like that). Past that, the majority of the robot was designed and built by us. Pretty much everything you see in the pictures.

Out of the active members, there were about seven of us. As a result everyone got to be a part of multiple areas on the team. I was involved in design, manufacturing, electronics, marketing, finding funds and driving the robot at the competition, as well as helping fix a few bugs in the code.

Team Stats and Performance

Videos

- [Game Rules Video](#)
- [Robot Reveal Video](#)
- [Western Canada Regional Semifinals 1](#)