Executive Project Summary

The original design problem we were meant to solve was to make a robot that could be competitive at Mini-Sumo. This includes, locating objects in the ring, pushing them out, fitting the robot into 10 centimeters by 10 centimeters, and staying below the weight limit of 500 grams but also being within 95% of that weight limit. This robot also had to have a long enough battery life to stay on for at least 15 minutes.

We approached this problem with great ambitions and later miniaturized those hopes into something that could be digested. We originally had a lot more planned for the robot but these ideas were cut short due to time, size, and weight constraints. From the beginning of this project, we knew we needed a motor driver to control direction and speed, as well as constant voltage regulation in the form of the buck converter. The motor driver went under some revision depending on how we wanted to drive it and the constraints of PWM from the microcontroller. The buck converter went under many revisions due to power consumption, and inconsistencies with the constant output. One big revision to our design was how our robot was going to let us know about debugging issues. It was supposed to show debugging through a seven-segment display, but having to use a decoder brought up issues that weren't able to be resolved so we used the display on our microcontroller, instead. Probably the most revision-heavy part of the project was the casing for the robot. Many versions and slight modifications were made to the 3D printed chassis of the robot to accommodate tolerances and size restrictions.

Our Project Timeline

Some key lessons we learned from this project is that it's probably best to keep a design simple than to over-complicate it. This is seen from our original design to include many more sensors with different use cases but ended with a single IR sensor for enemy detection and a single limit switch for edge detection. One thing we found that worked really well was setting gears to the motors and wheels to minimize spacing, and the good thing about them is that it's easy to just print. Overall, we accomplished all the requirements we set out to do.