# SURFER

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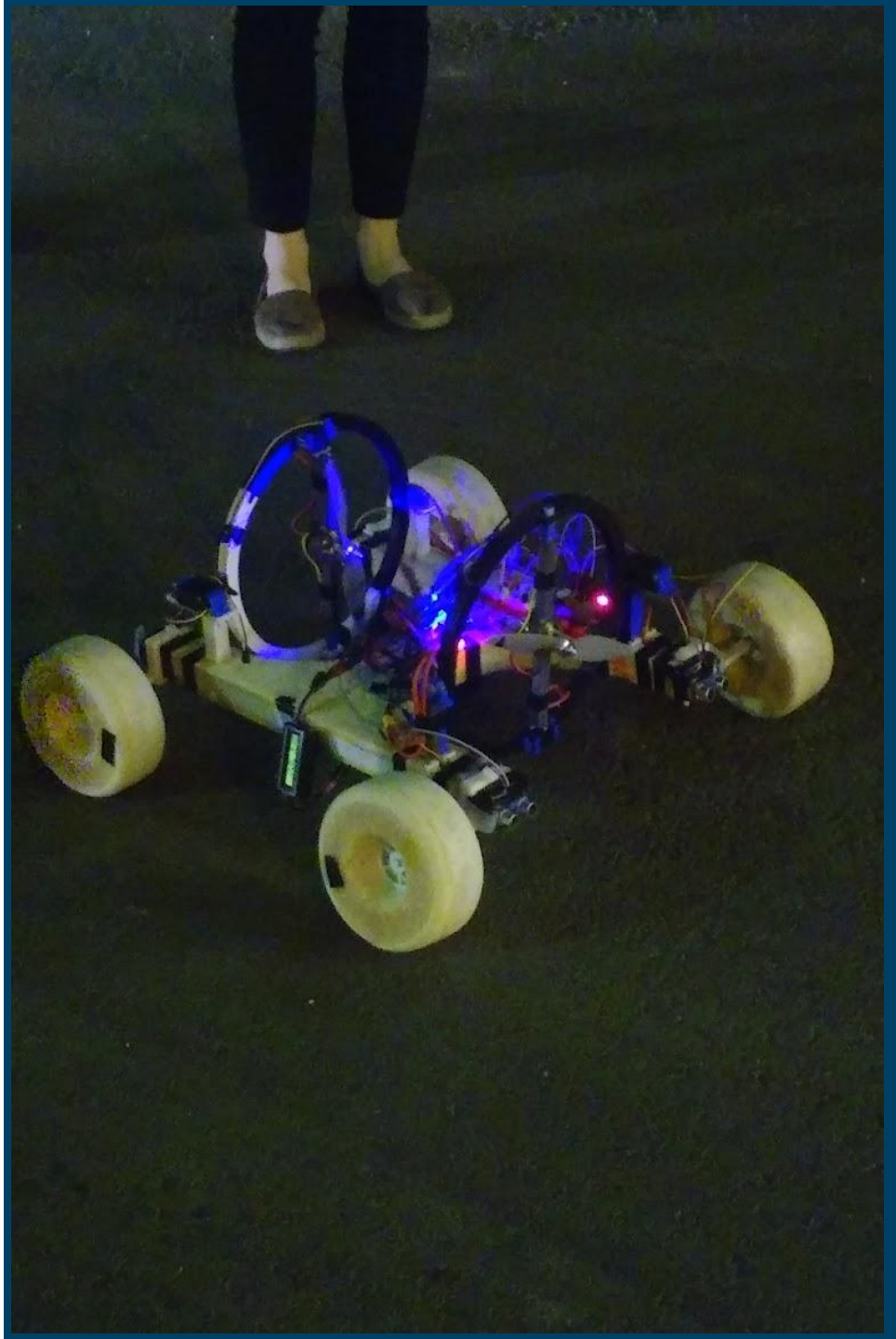
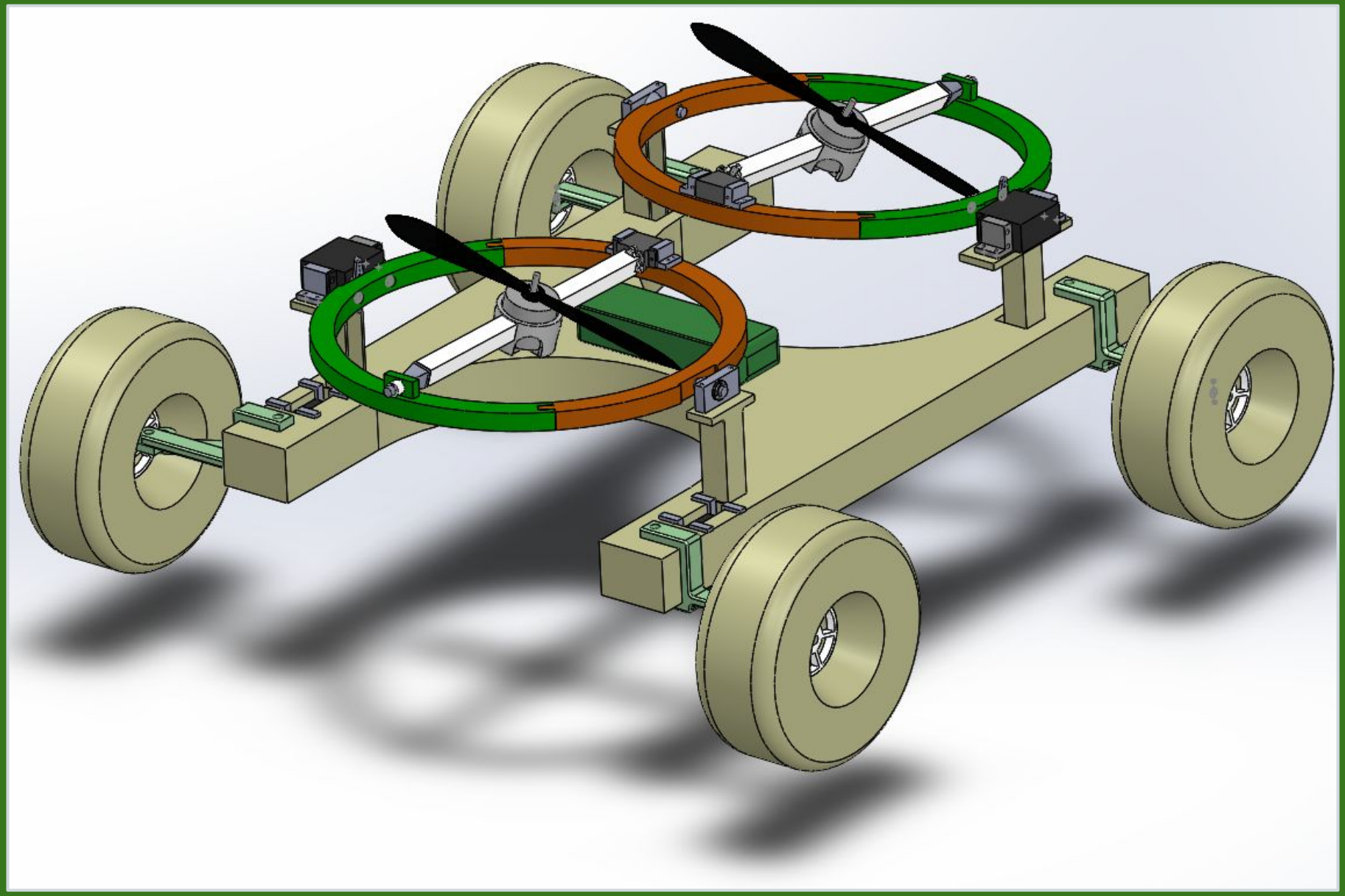


# PROJECT GOALS

- Propeller driven vehicle
- Communication over distance
- Direct steering for front wheels
- Ability to float on water
- Be able to semi-autonomously move from ground to the wall
- Drive and turn on wall

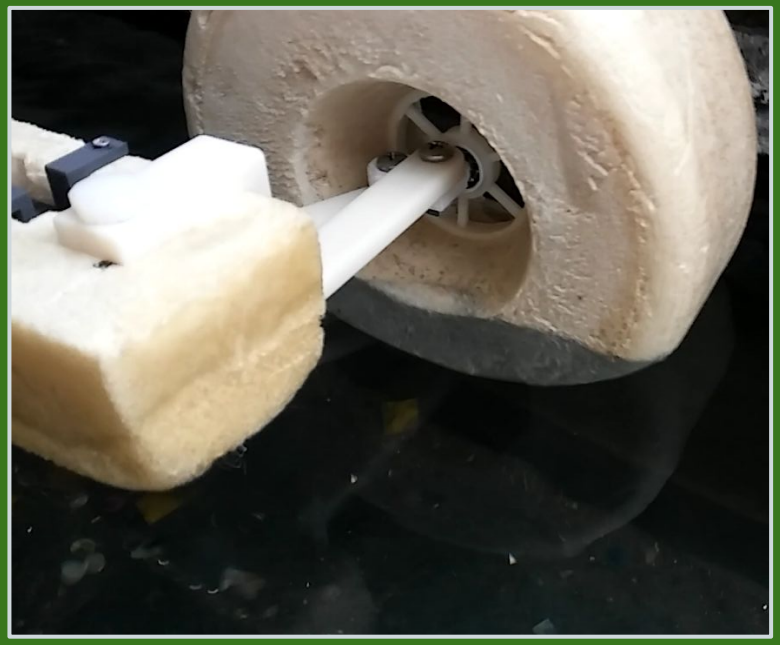
# FINAL DESIGN



# FINAL DESIGN

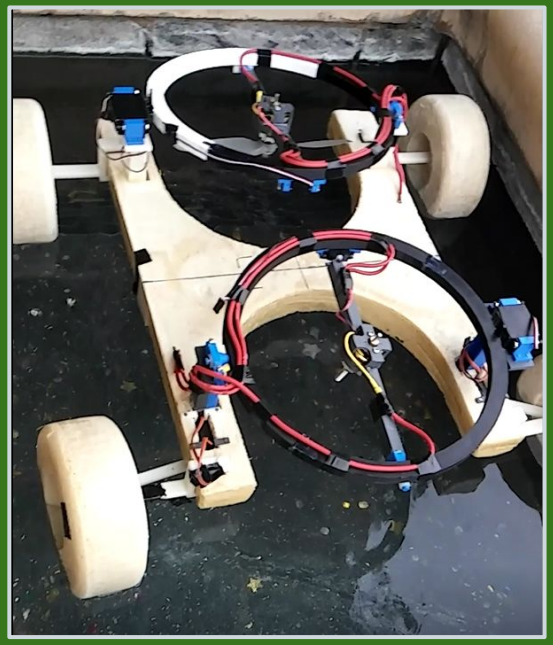
## Functionalities

- Identifies the wall: capable of steering itself perpendicular to the wall
- Uses propellers as propulsion
- RC comms using Xbee
- Full remote controls
- Remote control functional

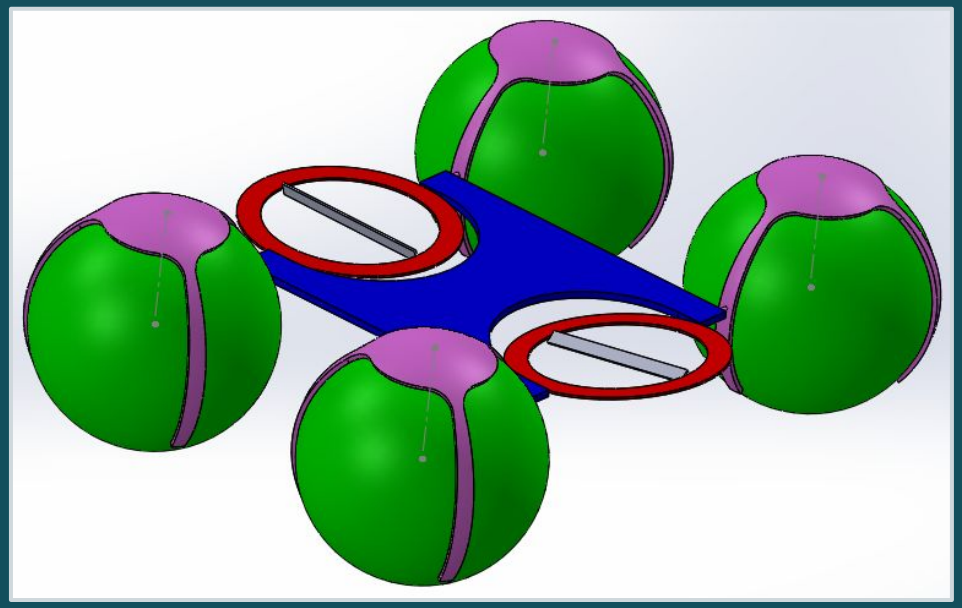


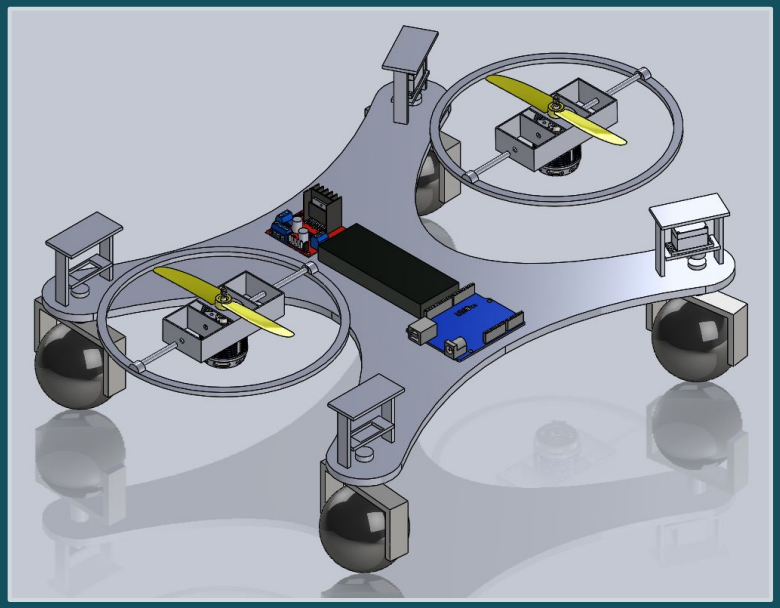
## Changes

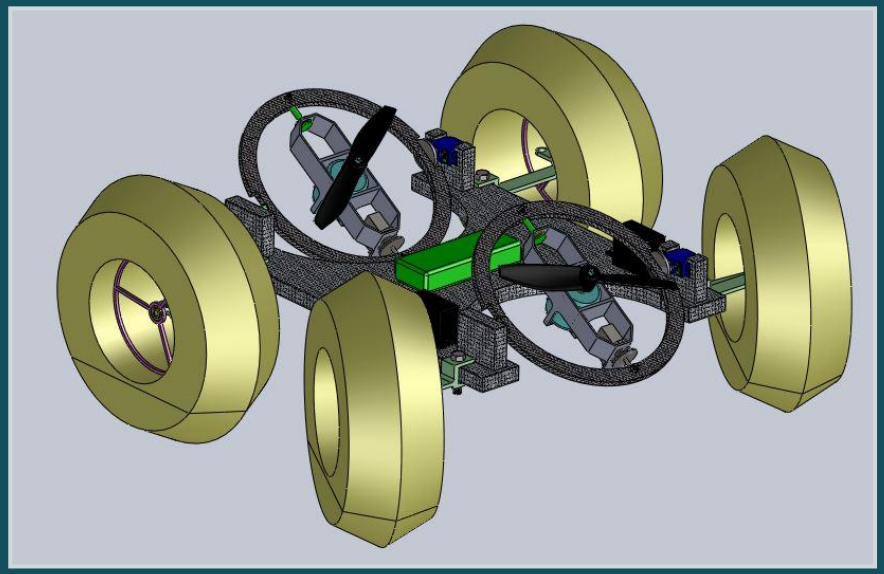
- Spherical to cylindrical wheels
- Propeller size increase: from 6” to 9”
- Propellers only use one degree of freedom rather than two
- Stopped Water

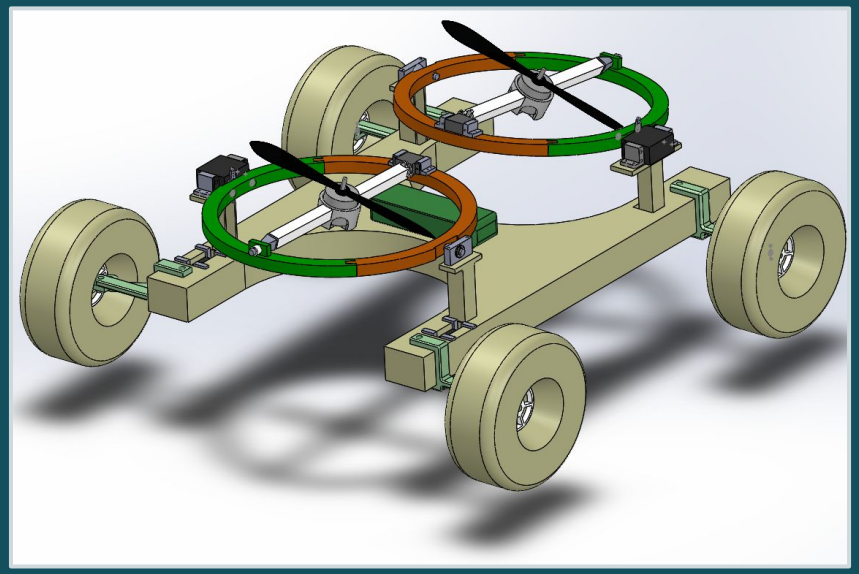


# ITERATIONS

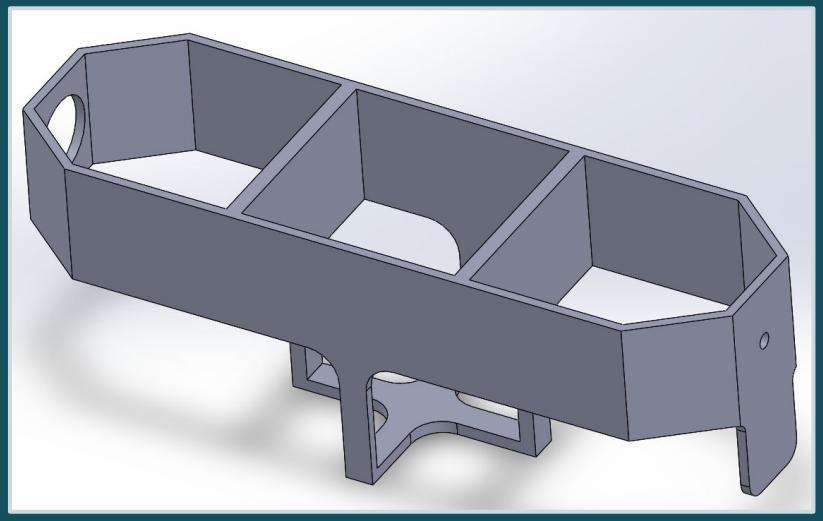


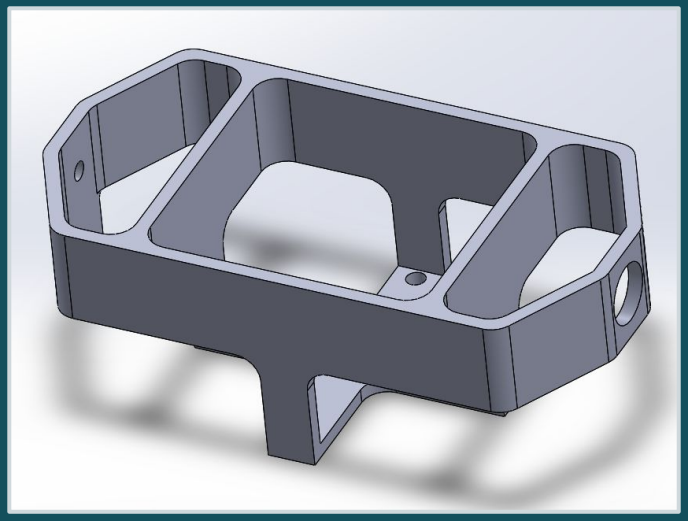


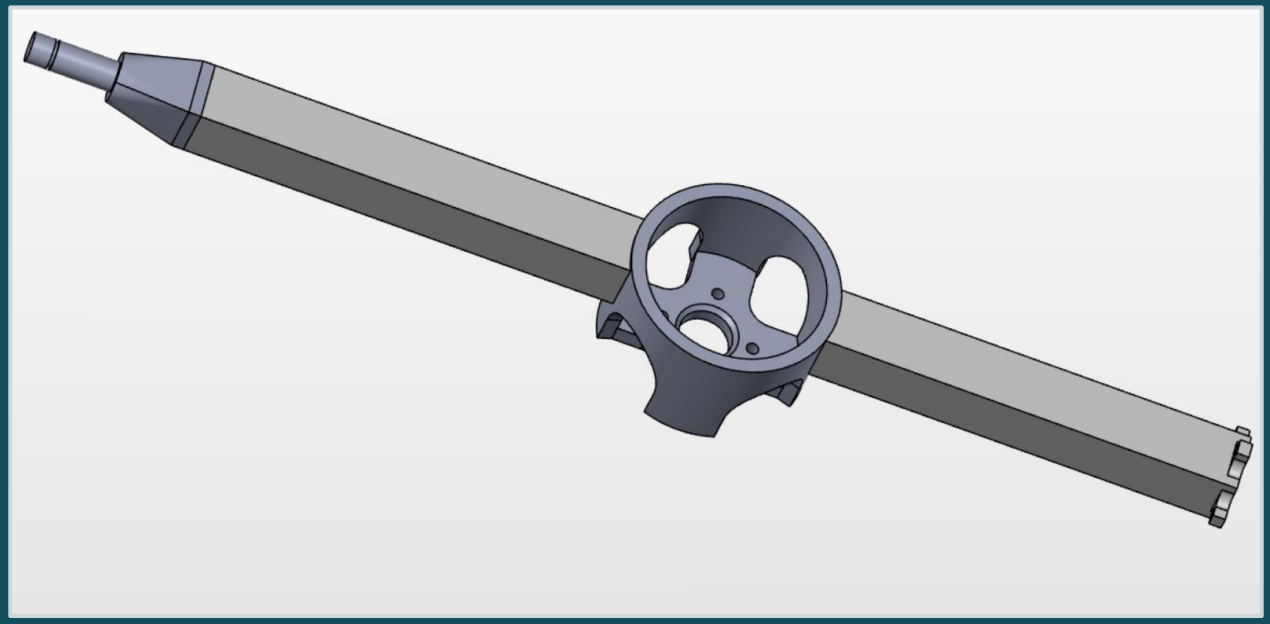




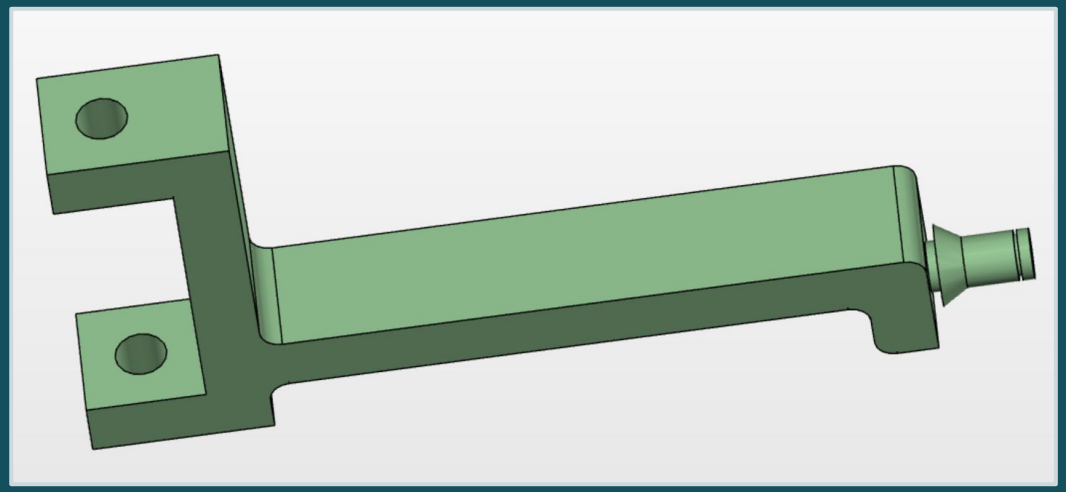
# ITERATIONS: Propeller Housing

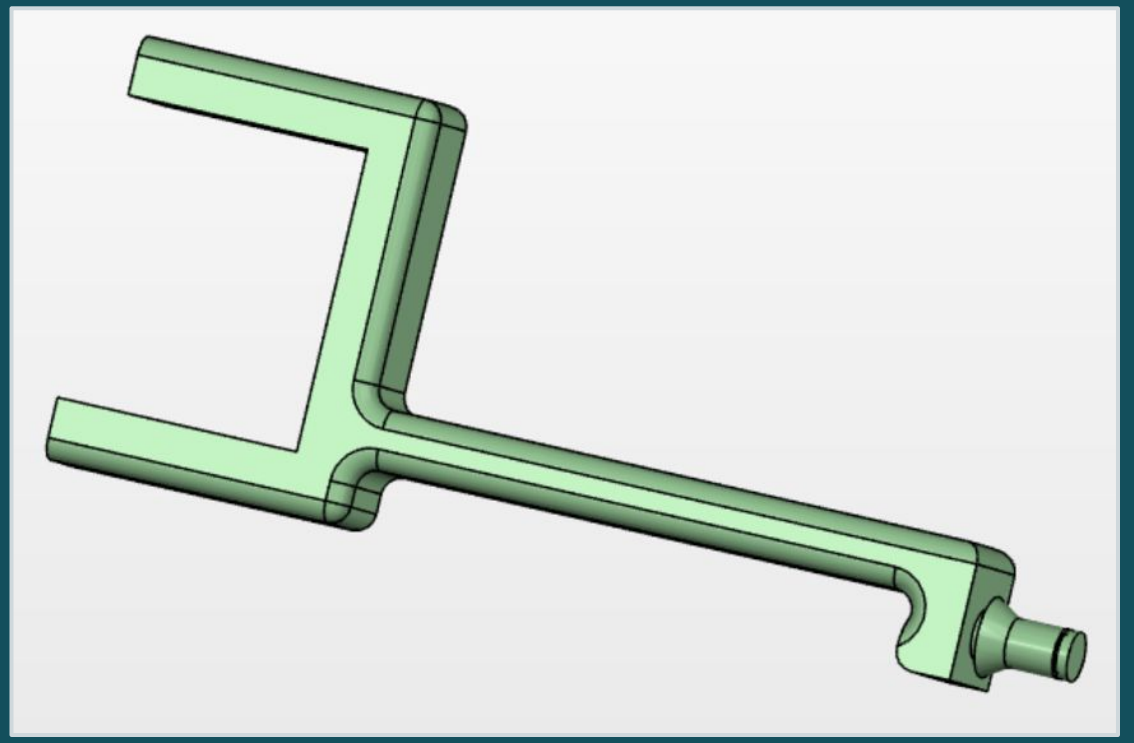




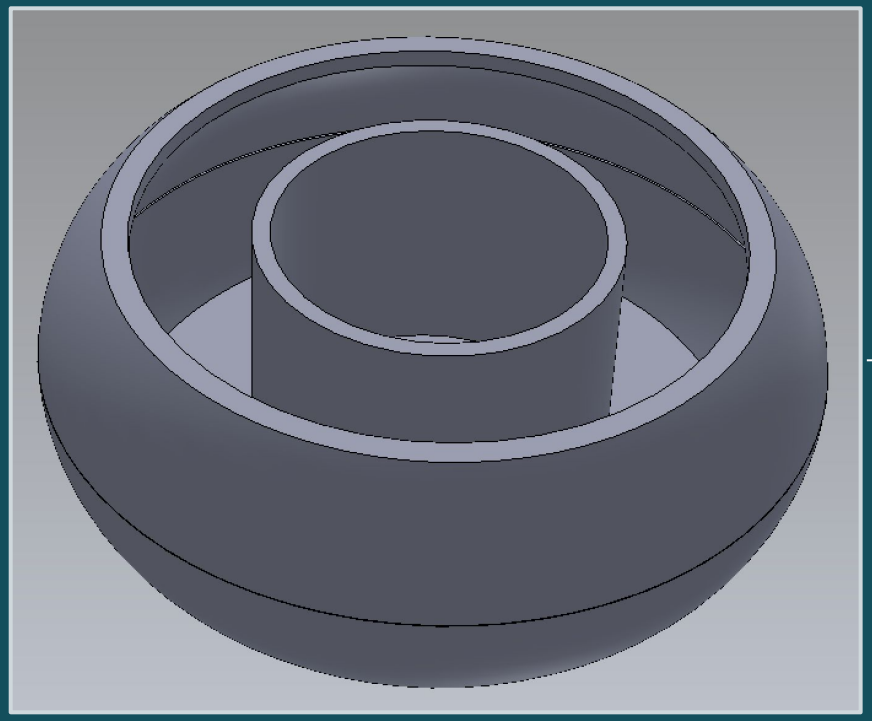


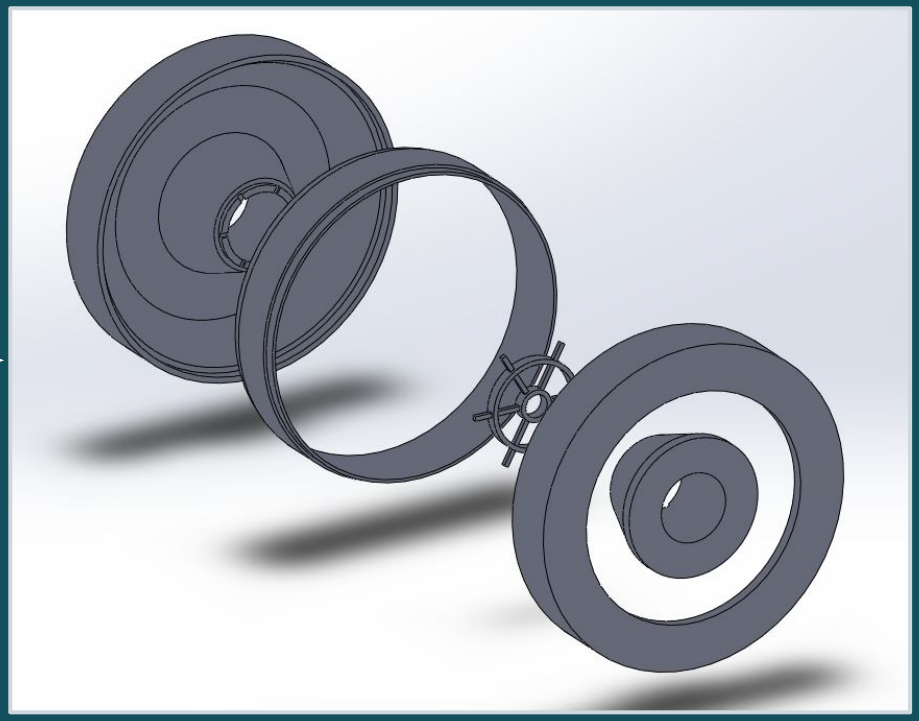
# ITERATIONS: Wheel Axle

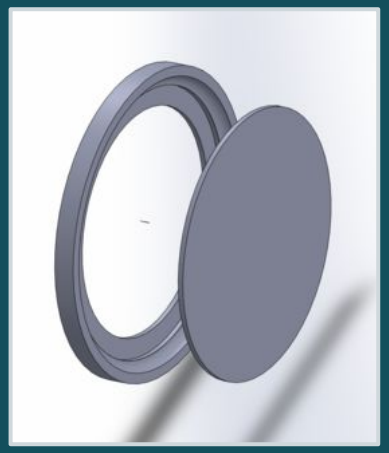


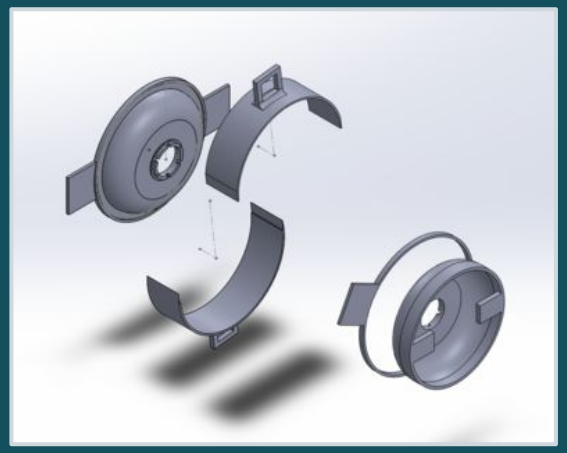


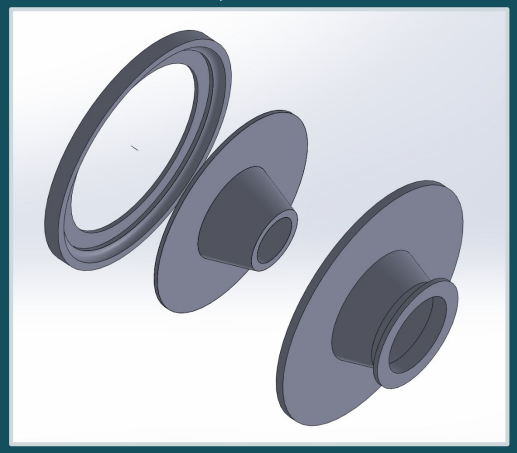
# ITERATIONS: Wheel Mold



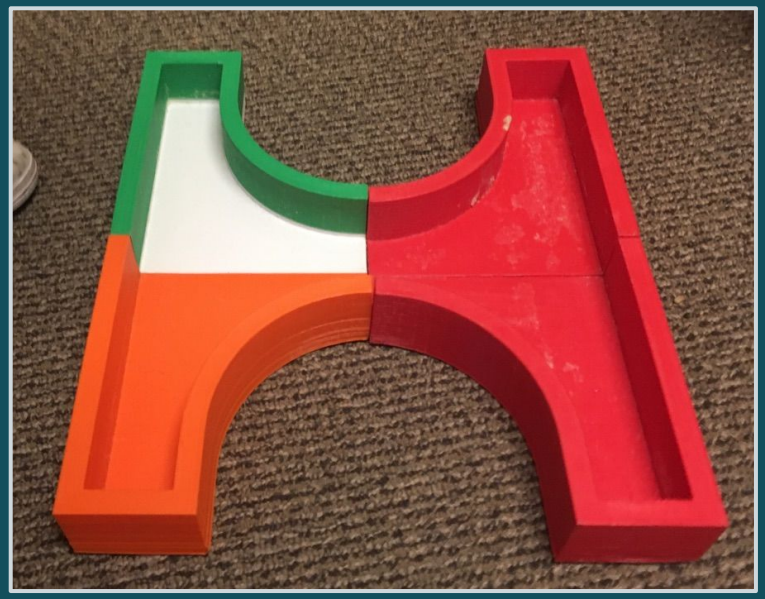






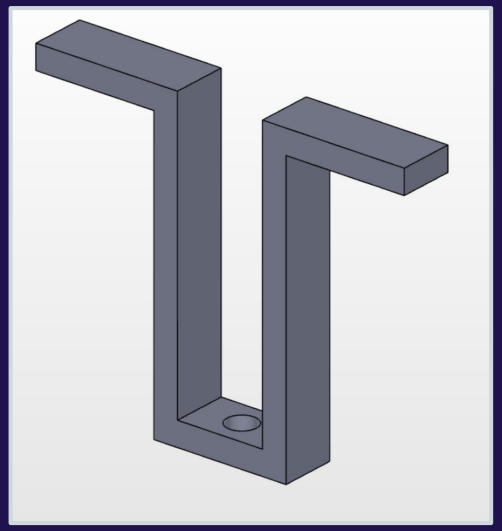


# ITERATIONS: Chassis Mold Production

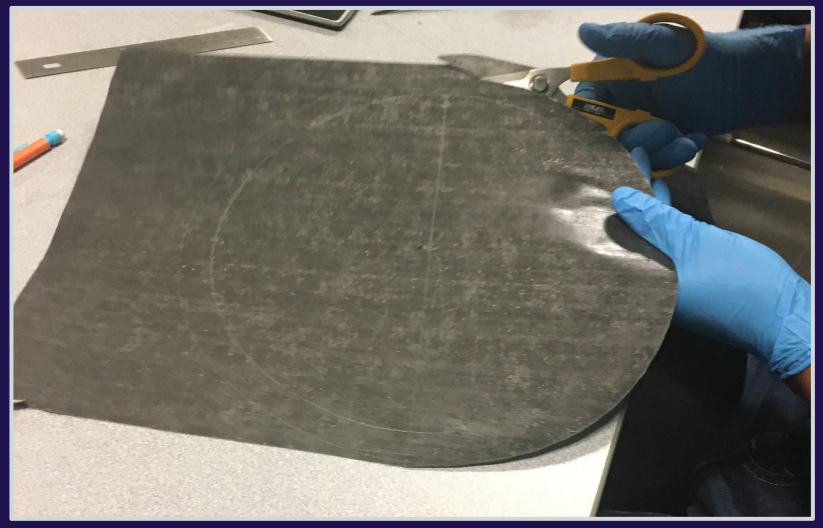


# FIXES

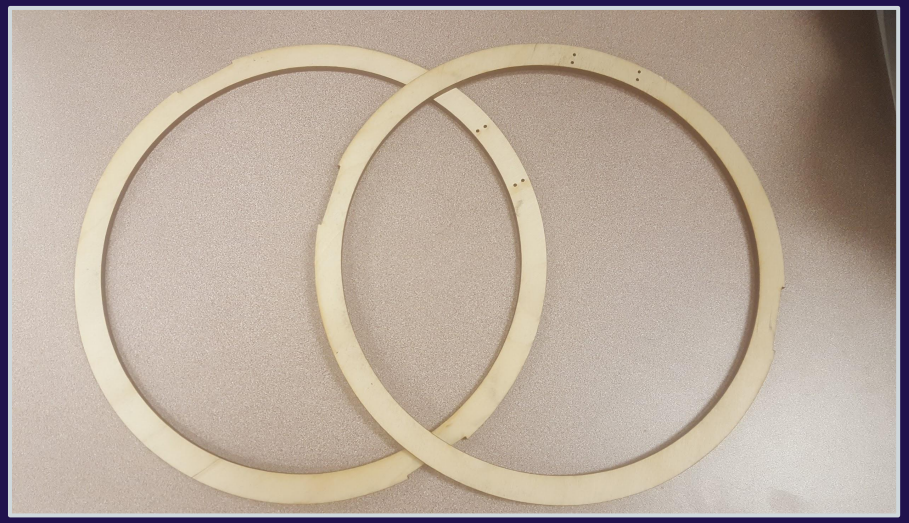
- Epoxied two propeller halves to make a ring
- The chassis was poured without the steering motors in mind so we created a motor holder
- Epoxied many parts that printed in two parts



Steering Servo Holder



Carbon Fiber Ring



Wooden Propeller Ring

# ELECTRONICS and PROGRAMMING

XBee Communication

- XBee Series 1 modules for communication between remote and robot
- Some issues encountered:
  - Understanding how XBee communication worked!
  - Jitters in the servos and brushless motors due to interfering signals

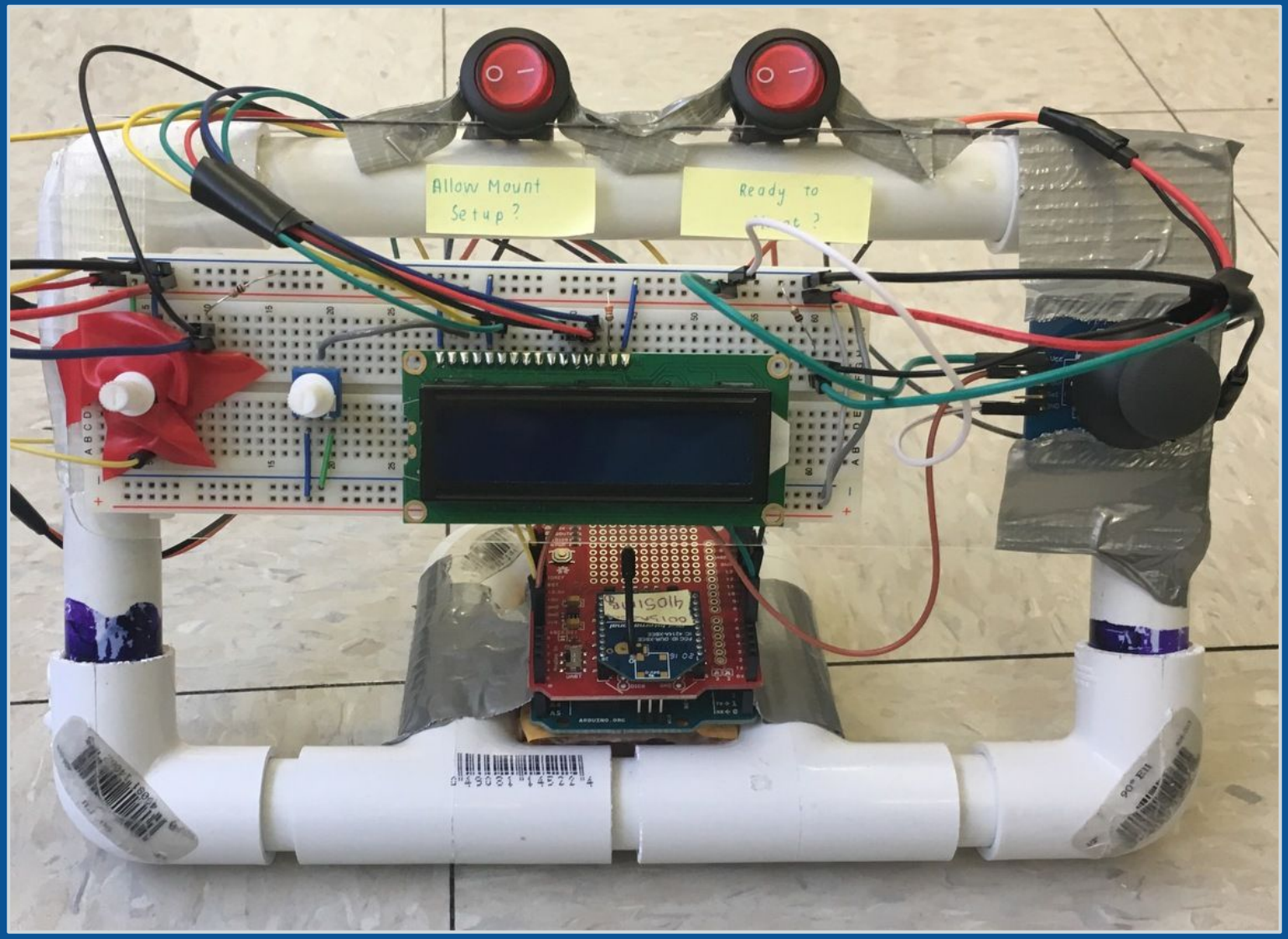
Ultrasonic sensors

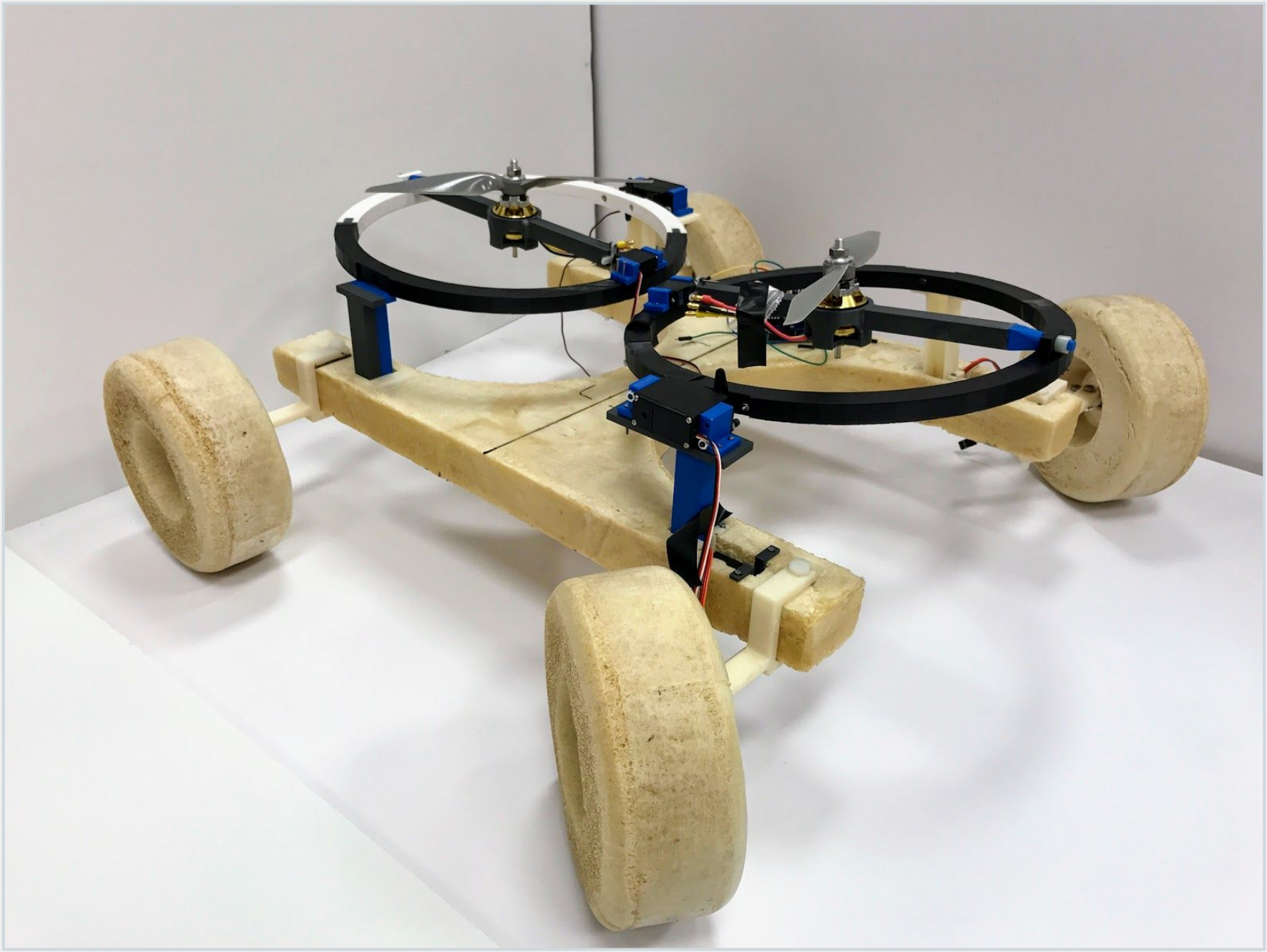
- Ultrasonic sensors to determine the robot's distance from the wall
- 2 sensors on the front of the robot, 1 sensor on the back

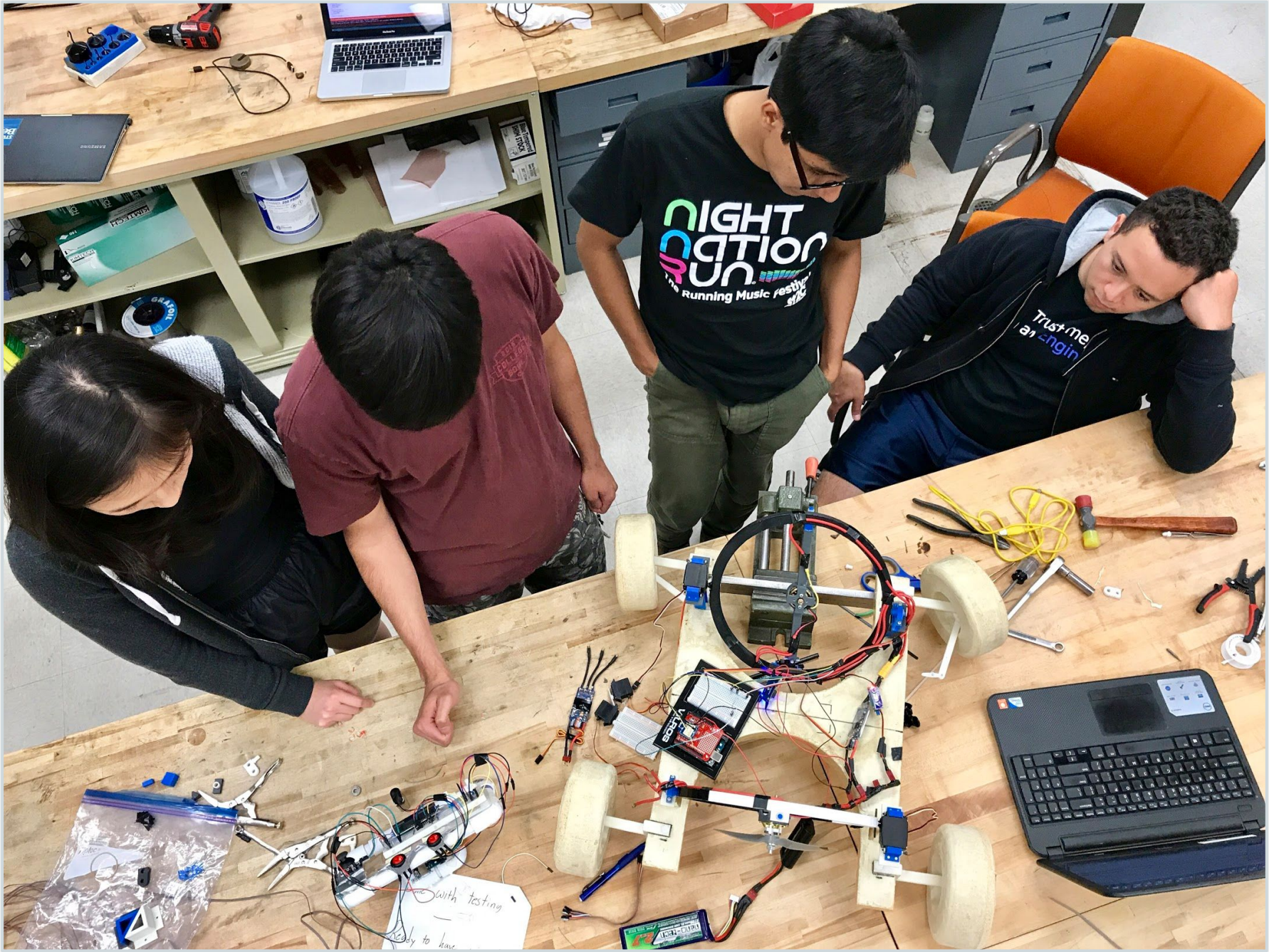
Joysticks, potentiometers, and buttons oh my!

- Servos controlled by joystick
- Brushless motors controlled by potentiometer
- Buttons tell robot whether to mount or not

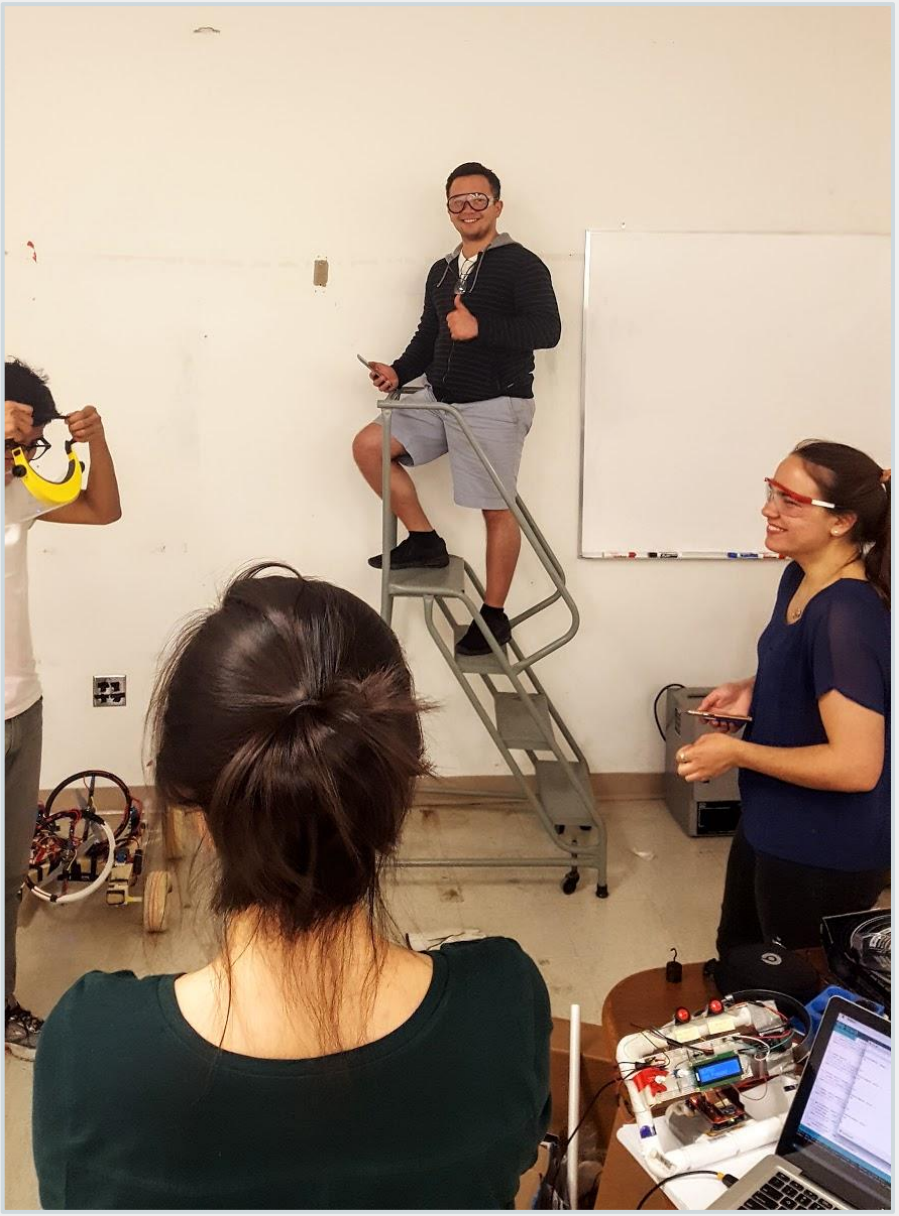
# ELECTRONICS and PROGRAMMING






NIGHT nation RUN
The Running Music Festival
Trust me, I'm an Engin
with testing


THE NORTH FACE



# THINGS WE learned

Planning stage
- Coming up with a general and detailed plan
- Accommodating for mishaps

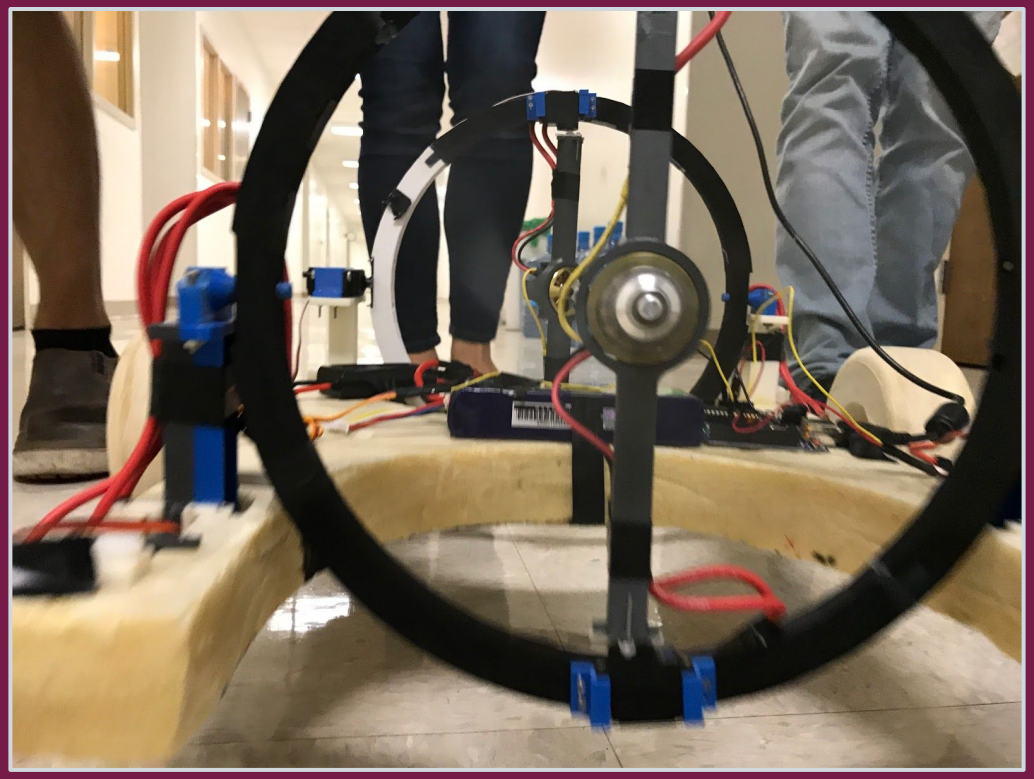
Designing stage
- Component packaging
- Steering links

Arduino programming
- Steering
- Propellers

Materials
- ABS and PLA
- Baltic Plywood
- Epoxy

# THINGS WE enjoyed

- Working together and figuring out each other's strengths
- Problem solving on our own instead of book solving
- Making an actual physical thing we can see and touch
- Successful results! Like the first time the propellers moved the vehicle
- We didn’t start a fire!! ...yet...



# THINGS WE disliked

- 3D printing problems
  - Delay in part deliveries
  - Failed prints
  - Design flaws, like wheel molds and steering linkages
- Location to work
- Programming issues
  - Motor jitters
  - Mounting mechanism
- Time crunch

The Printer Gives Up

# THINGS WE can improve (given more time)

- Orientation detection using Inertial Measurement Unit (IMU)
  - Program feedback loops for accurate and real time thrust vectoring
- Programming water navigation
  - Thrusting up on the surface of water to reduce apparent weight
- Implementing turning on the wall using a combination of roll and pitch motor control
  - Using feedback from the IMU and ultrasonic sensors

# THANK YOU!