The Septapi

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QR Code for additional information

The Mission: Material Identification

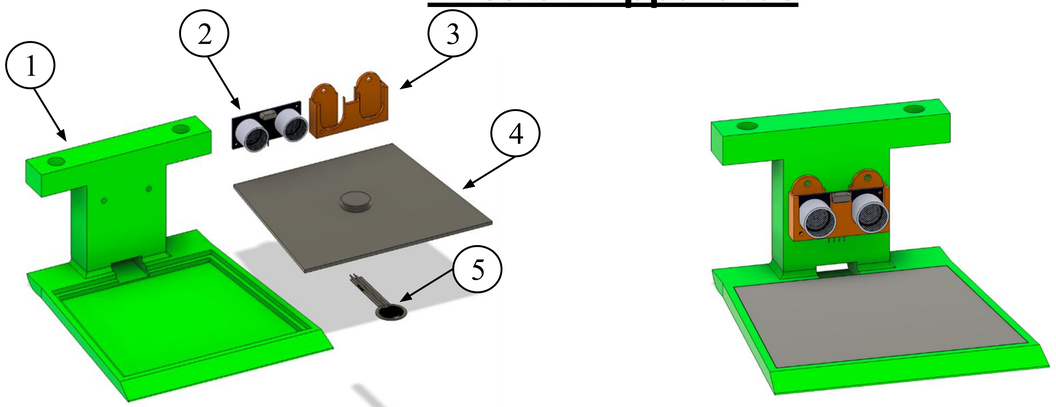
OTV needs to be able to

- Navigate to the mission site
- Get block off the ground
- Distinguish the material type of block (plastic or foam)
- Determine block's weight class (light, medium, or heavy)
- Navigate past the obstacles into the extraction zone

Mission Apparatus & Sensing

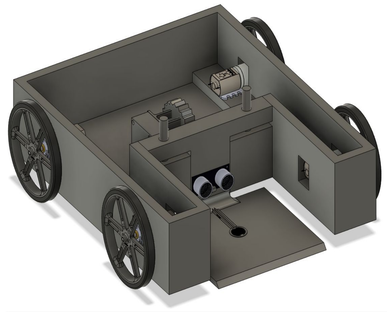
- Forklift (1) for scooping up payload with indentation for force sensor & pressure plate housing
- Ultrasonic (2) for material identification
  a. Foam distorts ultrasonic sensor readings, allowing us to determine material
  b. Sensor housing (3) is mounted on mast of forklift
- Pressure plate (4) covers forklift indent & rests on top of force sensor (5) to determine weight

Mission Apparatus

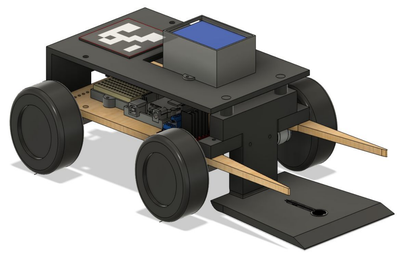


Design Evolution

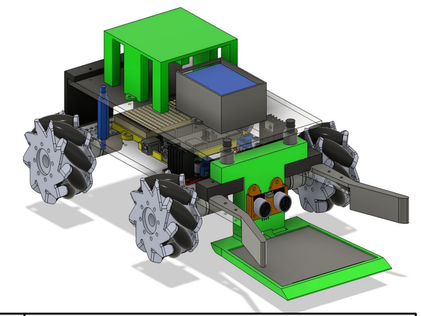
First Iteration



Second Iteration



Final Iteration



Design 1

- Very boxy design
- Extremely small and low torque motors
- No actual assembly method or material choices
- Forklift with force sensor on top
- Thin, rubber wheels

Design 2

- Wooden chassis
- Top layer to fit the battery and Aruco marker
- Uses M3 nuts and bolts to fasten parts
- Custom 3D printed parts including forklift and electronic mounts

Design 3

- Acrylic chassis and top layer
- Aruco marker stand to ensure visibility
- Forklift with pressure plate to measure weight more precisely
- Guide rails to help align the block
- Mecanum wheels for strafing

Challenges

- Sensors were very inconsistent with weight and material ID
- Wifi module had connectivity issues
- Circuit had power distribution and shorting issues

Solutions

- Modified pressure plate design to measure weight more accurately
- Added electrical tape to avoid shorting and ensuring wire safety
- Implemented second battery for power support

Results

- OTV successfully navigated the arena
- Material ID and weight sensing worked occasionally, but not consistently

Future Changes

- Implement servo to lift forklift off of ground & implement a strain gauge instead of force sensor
- Change material ID mechanism to a physical squish test rather than the ultrasonic sensor