Autonomous Floating Vehicle

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Background

The use of unmanned buoys for data collection is not a new concept as government offices such as NOAA utilize them for the collection of weather and oceanic data. The reliability of such systems has been a key focus for development. As of 2020, 10% of NOAA's buoys have become inoperable. These reliability challenges necessitate the need for an external method of data collection as a portion of the buoys labeled inoperable may have simply experienced a malfunction in their communication systems. As this is the case for simple peacetime equipment, the need for a physical data transfer system is further necessitated by the complexity of wartime systems. An unmanned vessel that is capable of navigating to a buoy, establishing a physical connection and downloading data would mediate these losses in buoy performance. Furthermore, such buoys could be designed without communication systems which would allow for lower profile designs to reduce the chance of detection while also lowering the procurement costs of these buoy systems.

Goal

- Design a floating vessel that when given coordinates of a buoy, can autonomously navigate to that buoy and create a physical connection to transfer data

Objectives

- Learning how to make navigation and operation of the vessel autonomous
- Making sure the vessel floats by picking proper material and design
- Making sure electrical components are protected from water damage

Timeline

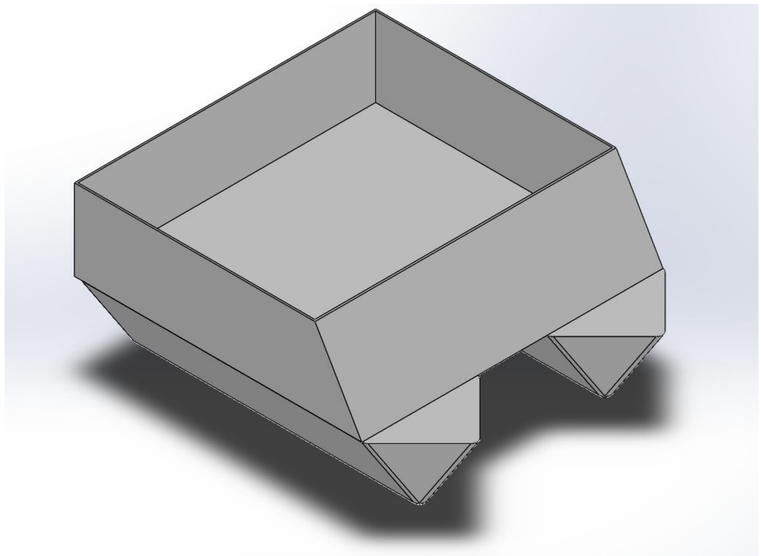
Fall 2021 — Fall 2021 — Winter 2022 — Winter 2022

Starting Phase (week 1-6)
-Learn about existing solutions
-Define goals/design requirements

Design Phase (week 6-10)
- Pick Chassis Design
- -Choose components
- Design steering system

Manufacturing Phase
- Fabricate hull and superstructure
- Integration of electrical/propulsion systems

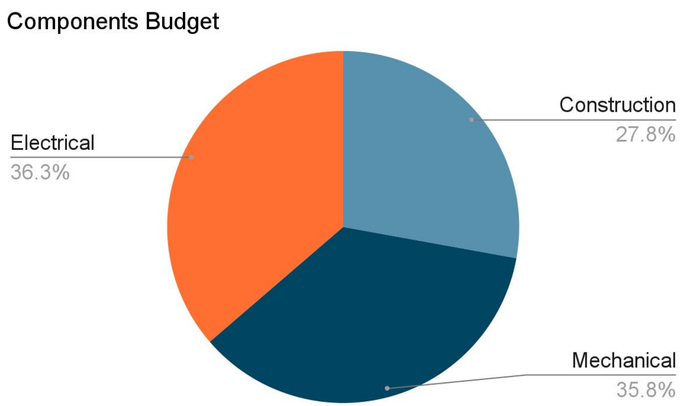
Testing phase
- Load capacity testing
- Investigation into seaworthiness
- Testing of waterproofing



Chassis Design

The chassis was designed with cost and hydrodynamics in mind to reduce the power consumption of the propulsion system while keeping the unit cost as low as possible. The chassis will be fabricated using polypropylene coated expanded polystyrene foam sheets which will prevent water permeation. The double hull design was utilized due to its stability and minimal surface contact with the water which reduces drag and thus power consumption. The superstructure of the vessel will house the navigation and data storage components in a waterproof enclosure to minimize the risk of data loss. The propulsion system will be built into the hulls to lower the center of gravity and improve stability.

Required Components



Next Steps

-fabrication and testing of parts

Design Waterproof Housing → 3d Print and Order Parts → Test and Redesign

-navigation and control to buoy location

Write Code for Arduino → Create circuit for control system → Test and Rewrite

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