MILESTONE 11: Prototype Assessment Plan

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EML 4551C – Senior Design 1

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Prototype Plan

The RoboBoat team will be making multiple prototypes that will help to finalize the final design of our boat.

Hull Prototypes

The hull prototypes will consist of making CAD models of the hull with slight variations in the design (flat front versus a pointed front, wide pontoons versus thin pontoons, etc.). We will then run the models through flow software to find which designs are best. After narrowing down the designs to a couple of models, we will make small-scale hull models to see how it would sit in the water and use weight (that is the scaled-down equivalent of our components) to see how the boat sits in the water with different component placements. These models would be constructed by 3D printing the CAD models we narrowed down and using them as a mold for a hand layup of fiber-glass. The cost of the prototypes would be around $20-$60 in PLA Filament (depending on the infill and support requirements), and the fiberglass cost would be around $24 at $8 per 30” x yard. By teaming up with the Digital Design Studio (DDS) at FSU PC we can bring the PLA cost to $0. The 3D printing process and fiber-glass layup will take the most amount of time for this prototype, although with the amount of 3D printers the DDS has we are able to cut that time dramatically down. Total max cost ($84), Total min cost ($24).

Software Prototype

The software prototyping will be handled by the Electrical Engineering Senior Design team.

Assessment Plan

Testing on the prototype will be carried out in various forms. One form of testing will be completed using a flow simulator to compare the aerodynamic characteristics of each of our models. We will also be putting the models in water to test their buoyancy and how they sit in the water, as well as how component placement affects the prototypes. This will then be used to determine how to place components on the final product.

Our critical targets include maintaining stability, detecting surroundings, processing, and moving the boat. Our metrics for maintaining stability are buoyancy and weight distribution. We aim to have a positive buoyancy for at least 30 minutes, and we want to make sure the center of gravity is below the center of buoyancy. Our metrics for detecting surroundings are sensor range and sensing speed. This will be tested using Solidworks software. We want the sensor range to be 6 meters, and the sensing speed will be 20 Hz. The metric for processing is object detection and will have a target of 327,680 points per second. The metric for moving the boat is thrust, and we aim to have between 13 and 18 lbs of thrust.

The results gathered from the assessment tests will be used to update our design and ensure that our critical targets will be met. These results will be used to make changes to our hull design and increase the functionality of our written code. Changes to the hull design include reshaping of the hull, updating the weight distribution of internal components, as well as changing the thruster orientation and positioning. The code will be rewritten as needed to quicken the processing speed and remove any unnecessary code.