Group Meeting 2/1/20212

ECE team and Drew

Budget

Total budget including ME nose construction is about 5k with bulk of cost in the nose fabrication. ECE team has about 1k budget for Sensor and we can include other expenses such as BBB.

AUV Software

The BBB is running a linux OS, Debian 8.3 or 9. The autonomous control software is Moos IVP which is similar to ROS. It is open source software, and Riptide (the AUV manufacturer) added a top level package that integrates the components together. Ultimate goal of the project is to have our Echosounder sensor to send information that Moos IVP can use to make decisions. So we may want to become familiar with it if our project progresses that far.

<https://oceanai.mit.edu/moos-ivp/pmwiki/pmwiki.php?n=Main.HomePage> Moos IVP home page

Misc

In WAVES Project Google Drive, the Metreon folder doesn’t have useful information for our project so stick with the Wracksweeper folder and its contents.

Wracksweeper was last year’s capstone.

Wracksweeper original nose cone had a defect and now leaks so the ME team is aiming to develop a new one that can house the new Echosounder.

End goal of the project is to use the UAV to locate a lost Spanish Galleon ship off the Oregon Coast. <https://www.oregonencyclopedia.org/articles/manila-galleon-wreck-on-the-oregon-coast/>

Sensor Requirements

1. Size, must fit within dimensions given by the ME team.
2. Beam Pattern, the angle of the beam (need more info here)
3. Frequency, the frequency must be able to penetrate salt water and nose cone cap
4. Range,
5. Price, around 1k or less

Additionally the sensor must work with AUV’s capabilities. Top speed is 12 knots but typical speed is 4 knots. Object detection and avoidance must work at top speed. Drew will be looking up the Max Fin Angle “as radius of curvature?” **Max Rudder Angle is 15 degrees**, which will give us our turning capabilities. Sensor will rely on signal processing, so we need to be familiar with that, which I am not. **Max heading velocity is 3 m/s, Max heading acceleration is 3 m/s**

**1 m/s = 1.944 knots**

Object Detection

Drew’s initial thoughts on what to detect are objects that are larger than the diameter of the UAV including fins, and then upto objects that are 10x that diameter such a wall.

Project Proposal

Drew thinks “Must select Sensor based on Requirements Matrix. Must develop tests and do tests. Should integrate with Moose. May have a collision avoidance program.

Actions Items

1. Research other sensors and create summary report / decision matrix
2. Determine Figures of Merit (range, angle of divergence..?) needed for item 1?
3. Complete proposal
4. Have an Agenda for next meeting, see below

Develop an Agenda for the meeting:

1. Follow up on Action Items from last meeting.
2. What is blocking progress.
3. Come up with Action Items for next meetings.

Tasks:

1. Determine Figures of Merit for Echo Sounder sensor and UAV (range, angle of divergence, UAV turning capabilities).
2. Research Echosounder options based on figures of merit and AUV’s speed and maneuverability.
3. Create a decision matrix and summary report.
4. Purchase sensor. 2/15/2021ish
5. Figure out how to operate the sensor using a BBB.
6. Integrate sensor software with existing Moos IVP controls.
7. Develop tests for AUV
8. Test AUV in pool
9. Write final report
10. Write presentation
11. ECE Capstone Poster Session poster?

Timeline:

1. January: Research write Project Proposal (PDS and Schedule)
   1. Write and get Project Proposal approved by sponsor
   2. Collaborate with ME team to agree on specifications that we both can work with
   3. Do some researches about the project and learn more about the details of some projects
2. February: Detailed technical work begins
   1. Conduct research to find sensors that fit this criteria
   2. Generate decision making process (possibly AHP) to select the best sensor for the task
   3. Map out the inner workings of the selected senor (big picture operation)
   4. Gather interfacing, signal processing, and other needed materials for development
   5. Purchase the required parts
3. March: team evaluation and self assessment. Real technical progress: breadboard, code
   1. Isolate and analyze each part of the sensor that will be vital to the overall system
   2. Test the sensor to ensure it can detect objects in general (isn’t defective)
   3. Write small programs that mimic the corresponding small parts of functionality
   4. Connect modular pieces of software to test interconnectivity of sensor
4. April: First working software prototypes/ hardware
   1. Write inclusive software that senses, processes, and sends information needed for obstacle avoidance
   2. Test sensor underwater for its ability to sense forward facing objects, process where they are and how to avoid them, and send the appropriate signals (eventually to the rudder, motor, and fins) to correctly avoid the detected obstacle(s)
5. May
   1. Attempt to integrate tested sensor with on board components and OS
   2. Final circuits phototype completed
   3. Start the final documentation, integrate them and check for missing items
6. June
   1. Project Presentations begin 6/7/2021
   2. Final Project Report due 6/11/2021 Noon