Progress Report #4

AUV Project
Phase II

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09/23/2023

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This fall 2023 phase II independent study project constitutes the continuation of the design and development of a proof-of concept autonomous underwater vehicle (AUV) from the spring 2023 phase I independent study with the intention of constructing a secondary AUV in the spring 2024 semester. This is proof-of-concept AUV will be capable of meeting all technical requirements to participate in the *2024 International Robosub Competition* [1]. Progress reports #4, #5, and #6 document the technical development of the project.

Executive Summary

Completed tasks since the beginning of the fall phase II independent study AUV project consists of team recruitment, team member task assignment, a presentation of the Robosub competition overview, the project's Gantt chart formation, and the successful initialization of the project's first milestone. Progress report #1 is part of milestone # 1 out of the five milestones that constitute the project. Current tasks consist of reviewing the Gantt charts of each sectional lead to recommend any changes for proper reflection of project's milestones overall. Next month's tasks consist of completing the remaining tasks of milestone #1 and beginning the first tasks of milestone #2. These tasks are in reviewing prototype subsystem designs to recommend any changes for final approval and in reviewing the overall AUV design integration of all subsystems designs to recommend any changes for final approval.

Completed Tasks

A 10-member vetted team was successfully recruited to begin phase II of the AUV independent study for the fall 2023 semester. The official Robosub team is comprised of

undergraduate and graduate students from the fields of mechanical engineering, electrical engineering, computer engineering, and computer science. The official team has an additional four volunteers who assist the team members with individual tasks. Individual tasks have been assigned to each team member on the team. The mechanical tasks consist of the design and construction of the AUV's individual subsystems (robotic arm system, torpedo system, buoyancy system, and overall AUV hull design. The computer science and electrical/computer engineering tasks consist of autonomously programming all AUV sensors, motor controllers (Arduinos), computer (Raspberry Pi), graphical processing units (Nvidia Jetson), as well as the LIDAR system and synchronization of two AUVs. The second AUV will be designed and constructed in the spring 2024 semester. In addition, a power point presentation describing an overview of the most recent 2023 competition with the required technical requirements and task challenges was presented to the 10-member team.

The project's Gantt chart was constructed and is shown in *Figure 1*. The project start date began on September 11, 2023 and the projected end date is January 15, 2024 for the completion of AUV #1. The project's Gantt chart is divided into five milestones. Milestone #1 is the initial concept prototype designs for each AUV subsystem and milestone #2 is the unification of all prototype concept designs into one overall AUV design. Milestone #3 is the construction of the AUV prototype into a working model and milestone #4 is aimed towards the AUV's prototype testing, debugging, and refinement. Milestone #5 is aimed towards advanced programming of the AUV for implementation of the AUV's strategic course of action during the competition.

Prototype concept designs for each subsection of the AUV have begun, successfully initializing milestone #1 for the mechanical team and are expected to be completed by September 27th. Additionally, the development of the AUV's strategic competition tactical strategy or

course of action for competition has also begun and is currently being drafted. The AUV's finalized course of action is the first step for the electrical and computer engineering team to begin work on configuring the electronics and programming for the AUV.

Robosub Project Milestones Fall 2023

AUV Independent Study Phase II — Project Start: September 11, 2023 — Week: 2

Task	Task Owner	Begin	Days	End	Progress
Milestone #1: Initial prototype subsection concept designs-AUV 1	Denise	September 11, 2023		October 17, 2023	
Project director makes Gantt Chart and reviews section leads Gantt chart	*Denise*	September 18, 2023	7	September 25, 2023	In Progress 50%
Review initial concept designs from each subcomponent area, provide feedback and suggestions	*Denise*	September 27, 2023	4	October 1, 2023	Not Started 0%
Incorporating changes into prototype design	*Denise*	October 2, 2023	5	October 7, 2023	Not Started 0%
Review & approve finalized concept designs	*Denise*	October 8, 2023	2	October 10, 2023	Not Started 0%
Compile parts lists & order required parts	Denise	October 10, 2023	8	October 17, 2023	Not Started 0%
Milestone #2: Unification of all subsection prototype designs into one AUV overall design	Denise	October 18, 2023		November 1, 2023	
Review initial overall concept design, provide feedback and suggestions of overall concept design	Denise	October 21, 2023	4	October 24, 2023	Not Started 0%
Incorporating changes into prototype design	Denise	October 25, 2023	5	October 30, 2023	Not Started 0%
Review & approve finalized overall design	Denise	October 31, 2023	2	November 1, 2023	Not Started 0%
Milestone #3: Construct Prototype into working model	Denise	November 2, 2023		December 1, 2023	
Construction of all individual subsectional components	*Denise*	November 2, 2023	10	November 11, 2023	Not Started 0%
Physical assembly of all subcomponent sections into one model prototype	*Denise*	November 12, 2023	10	November 21, 2023	Not Started 0%
Autonomous programming for basic functionality testing	*Denise*	November 22, 2023	10	December 1, 2023	Not Started 0%
Milestone #4: Prototype Testing, Debugging, & Refining	Denise	December 1, 2023		December 22, 2023	
Testing, debugging, and refining of prototype for basic operation	Denise	December 11, 2023	12	December 22, 2023	Not Started 0%

Figure 1: Project Gantt Chart

Current Tasks Underway

Current tasks underway consist of reviewing the Gantt charts of the section leads (electrical, mechanical, computer engineering and computer science) to reflect the project's milestones overall.

Upcoming Tasks

Upcoming tasks consist of finishing tasks remaining to complete milestone #1 and beginning the tasks of milestone #2. Subcomponent concept prototype designs will be reviewed by September 27th to recommend any necessary changes for the finalized designs. The competition's flight path will also be reviewed for any necessary changes prior to finalization. A

parts list will be constructed and parts will be ordered as needed throughout the duration of the project. The first task of Milestone #2 will be in reviewing the overall AUV design which will consist of the successful integration of all subcomponent system designs.

References

[1] “About,” *RoboSub*. https://robosub.org/about/ (accessed Sep. 24, 2023).