Project Nautilus: Phase 2

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ABSTRACT

Very little money is being spent on research of the ocean. In fact, 80% of the Earth's oceans remained unmapped. (US Department of Commerce, 2009) The purpose of this research project is the open ended development of an autonomous underwater research vehicle for oceanic research and exploration. One prominent method of ocean exploration today is the use of a remotely operated vehicle (ROV) transported out to the ocean by a large research vessel and then released over the side of the vessel and controlled via tether from on board the vessel. Project Nautilus will seek to mimic this method by designing an autonomous surface vessel and a companion autonomous underwater vehicle (AUV).

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INTRODUCTION

Over the past school year, Project Nautilus has focused extensively on the design of an unmanned surface vessel (USV) to house communications equipment, docking, and charging capabilities for the ROV the project constructed in the 2017-2018 school year. The USV, also called the Home Unit Base (HUB), has proven exceptionally difficult to design. Ocean currents, rough surface conditions, as well as limited communication options are some of the numerous obstacles the project has worked to overcome. The solutions to these obstacles will be developed and explored in further detail in the coming school year.

CHALLENGES FACED

DOCKING

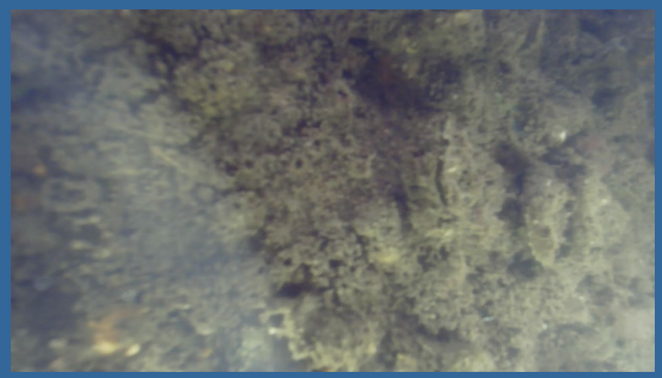
Traditionally, when docking an ROV or submarine, an operator guides the entire process and accounts for any issues that arise in real-time. However, with the goal of automating the process, Project Nautilus encountered significant challenges designing a dock for the HUB. Initially, a dock suspended several feet below the surface of the ocean from the bottom of the HUB was designed. After some review, this design was rejected due to the inability to fully control the position of the dock. The current design is something similar to a resident ROV with the dock resting on the ocean floor. The dock resting on the ocean floor also provides the added benefit of serving as an anchor for the HUB above it

COMMUNICATION

Originally, it was believed that satellite communication via a satellite phone would be sufficient to send data from land to sea. Upon further review, it was discovered that satellite communication did not send data speedily enough to meet our requirements. Satellite communication equipment is also prohibitively expensive. While, there is no system that excels at data intensive communications at sea, wireless point-to-point communications are being investigated for the HUB prototype.

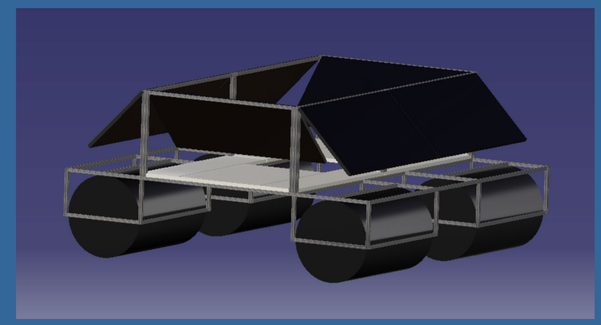
PROGRESS ON DESIGN

- Dock design finalized
- Charging method selected
- Flotation on four 55 gallon drums
- Solar powered AUV charging
- Keel to prevent spinning in the water
- Self-deploying, stationary, underwater dock



NEXT STEPS

- Integration of more sensor systems
- Visual recognition systems
- Dock deployment and removal
- Greater autonomy
- Open sourced design
- HUB construction
- Securing more partnerships
- Communications
- Acoustic Navigation
- Autonomous docking
- Image stitching to map the ocean floor
- Deep ocean tests



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