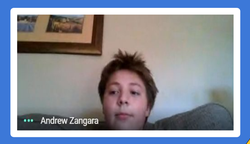
HMS SeaBots: Team Megalodons

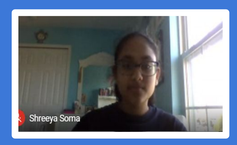
Harrington Middle School
514 Mt. Laurel Rd. Mt. Laurel, NJ 08054 USA

MEET OUR TEAM

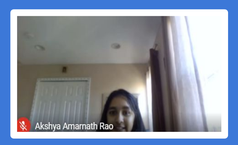
Meghna (Co-CEO & MechE)



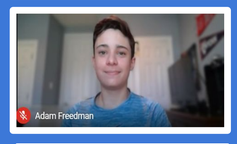
Andrew (Co-CEO & EE)



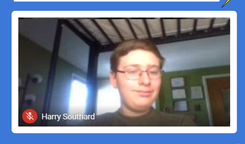
Shreeya (Co-CTO & MechE)



Akshya (Co-CTO & EE)

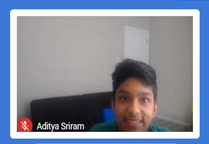


Adam (Co-CFO & MechE)

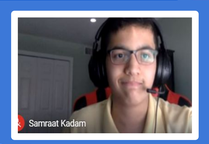


Harry (Co-CFO & Env. E)

Vish J. (MechE)



Aditya S. (MechE)



Samraat K. (MechE)

Step 1-Identify Problem

This year's SeaPerch experience was different from last year. In the 2019-20 season, we were given the requirements and a set of challenges to complete. This year we had to choose a mission based on a real-world problem. We were then required to design an Remotely Operated Vehicle (ROV) to solve that mission.

The real-world problem our team decided to do was salvage marine debris from shipwrecks and sunken vessels. This debris includes metals, like aluminum and steel, as well as plastics, wooden planks or containers.

Step 2- Research

After we identified the problem, our team researched shipwrecks and their impact on the environment. This research included:

- the number of shipwrecks in our oceans
- the materials used to manufacture ships
- the various debris in our oceans because of shipwrecks
- how those remains continue to pollute our oceans as toxins

We organized our information in a research document. This research proved to be crucial when designing our ROV for the mission.

Step 3-Brainstorm

After researching shipwrecks and their impact on the environment, we brainstormed a solution for our mission. We knew our ROV would require a specialized attachment to recover the shipwreck debris. We planned to start with a polyvinyl chloride (PVC) frame. We knew that PVC was durable enough for our mission. From our research, we found out that many of the shipwreck remains were made of metals. This led to the design of a scoop lined with magnetic strips. The magnets would allow us to pick up various metals while the scoop would be used for objects such as containers, boxes or wooden planks.

Step 4- Design

We proceeded to create our design using computer-aided designing software on an application called TinkerCAD. This program allowed us to collaborate on a design virtually. We first focused on creating the attachment, the core feature of our design. We started by creating a hook-like shape for the scoop. Later, we added Neodymium magnetic strips. These types of magnets are very strong, so they would collect various sizes and shapes of metallic debris. Also, these adhesive strips are malleable and would easily attach to our curved scoop. We attached this scoop to a rectangular shaped frame.

Step 5- Build

We weren't able to complete this step of the Engineering Design Process (EDP), as we were unable to build our ROV. Our school district strictly followed CDC guidelines and did not allow in-person extracurricular activities. All of our SeaPerch meetings were virtual, which meant we were unable to build the ROV.

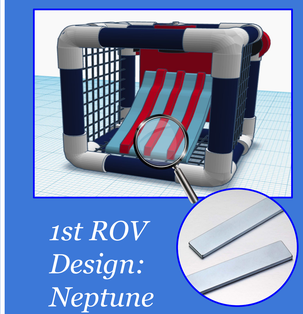
Step 6- Test & Evaluate

Likewise, we couldn't complete the test and evaluate step of the EDP. However, we planned various tests we could conduct if we built our ROV. Some aspects that would need assessment are included below:

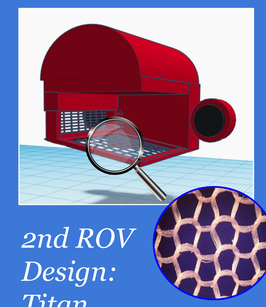
- Buoyancy can be determined by placing the ROV in water. If our ROV is negatively buoyant, we would add floats. If our ROV is positively buoyant, we would add ballast.
- Speed can be tested by conducting speed trials. We would pilot our ROV to a certain distance in a pool and record the time. After a couple of tests, we would calculate an average and modify our ROV as necessary.

Step 7- Redesign

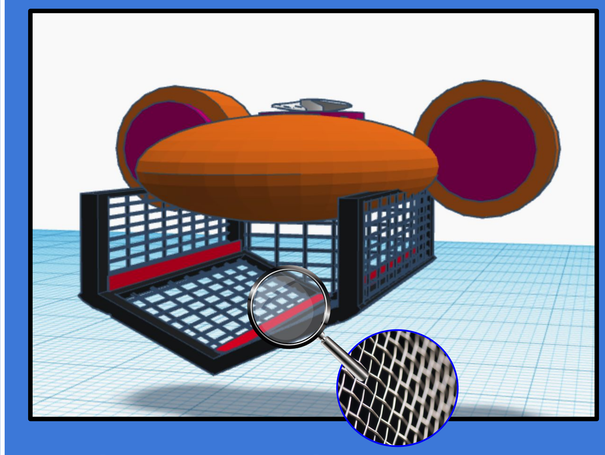
We thoroughly analyzed our CAD design and its potential advantages and disadvantages. Although the PVC frame would be durable, it may weigh our ROV down as it is negatively buoyant. Our scoop is also negatively buoyant because of the magnets. We also realized that some metals used to manufacture ships, such as stainless steel and aluminum, aren't magnetic. We decided to reject our original design. We continued to redesign until we were satisfied with our final ROV.



1st ROV Design: Neptune



2nd ROV Design: Titan



Final ROV Design: Salvage

Step 8- Communicate Results

Our final ROV design incorporates a hydrodynamic frame and compact shape. We communicated our results in our technical design report, the SeaPerch interview, as well as this poster.

Challenges

- Time: We only had a little over 3 weeks to select a mission, design our ROV, and write our technical design report.
- Communication: Virtual collaboration wasn't as effective as it could have been. There were numerous technological issues.
- Building and Testing: We couldn't build or test our ROV. Therefore, we were unable to see our ROV in action.

Acknowledgements