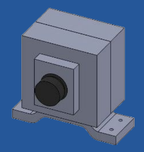
ZotQuatics

Abdullah Alhussain, Gabriela Rossetti, Grace Leffler, Hailey Choi, Indy de Smet, Zina Abu-Salem
Sponsor: Sherif Hassaan

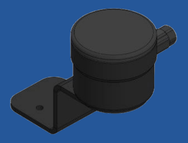
MISSION:

The UC Irvine ZotQuatics team is a project created with the ultimate goal of designing and manufacturing an Autonomous Underwater Vehicle (AUV). We are inspired by the threats of plastic waste pollution in coral reefs around the world and aim to create a robot capable of cleaning reefs efficiently and independently. Our robot will be built with a primary focus on autonomy and will have robust manipulation and sensing capabilities to interact with objects and collect trash effectively. Additionally, the ZotQuatics robosub will be designed and manufactured to eventually compete in the International RoboSub Competition.

CAMERA AND SONAR



Blue Robotics Low-Light HD USB Camera

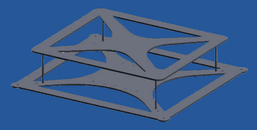


Blue Robotics Ping Sonar

- Camera and Sonar for visual mapping and navigation
  - Low light USB camera
  - Ping Sonar Altimeter and Echosounder
- Accurate mapping and depth control

FRAME AND THRUSTERS

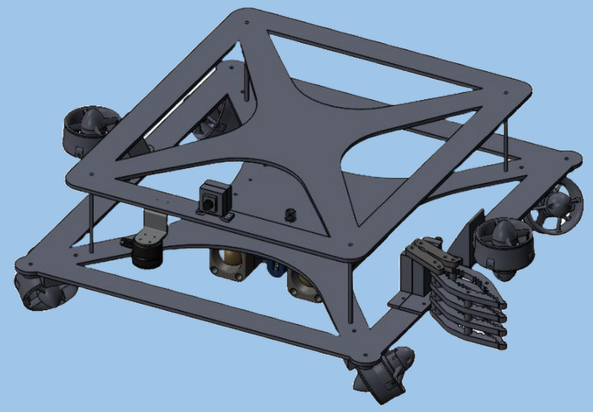
Blue Robotics T200 thrusters connected to frame



Double layered square frame

- Frame designed to hold and support all additional components
- Thrusters oriented for 5 degrees of freedom

FINAL DESIGN:



Final Assembly incorporating all Subsystems

CONCLUSION

Proof of Concept: Successfully developed a model Torpedo Launch System and Mechanical Gripper
- Servo motor rotates to release potential energy from the spring
- Spring force pushes torpedo out of holder
- Gripper can open and close when servo motor rotates

MAE 151A Contribution: Design process, system analyses, and manufacturing were all part of the course contributions.

Societal Impact: Closer to the possibility of autonomous ocean conservation

Future Work and Improvements:
- Finalize the fabrication and assembly of all components
- Ensure all components are waterproofed and properly insulated
- Develop and test the control system for autonomy and navigation

Acknowledgements:
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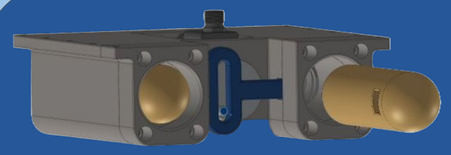
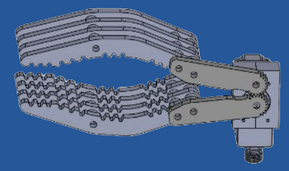
ACTUATION AND MANIPULATION



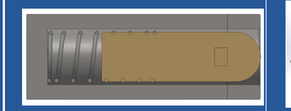
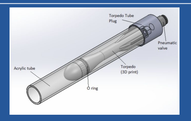
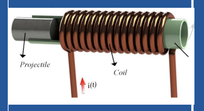
Torpedo Launch System



Mechanical Gripper

- Gripper designed to pick up, hold, and release objects
  - Claw with curved fingers
  - Controlled by waterproof servo (IP68 rating)
- Torpedo launcher designed to store and accurately release torpedo
  - Spring loaded
  - Uses Scotch Yoke mechanism

COMPONENT ANALYSIS

	Spring Loaded	Pneumatic	Magnetic Repulsion
			
Cost	0	-2	-1
Manufacturability	0	-1	-1
Weight	0	-1	0
Waterproofing	0	1	-1
Consistency	0	2	2
Total Score	0	-1	-1

- Spring Loaded is considered base design due to prior robosub competition usage
- Spring loaded was favored due to its simplicity, cost effectiveness, and manufacturability