Monitoring Sensitive Marine Habitats

A Conceptual ROV - Team Vader, West Mesa NJROTC, Albuquerque, New Mexico

OVERVIEW

Our project presents a remotely operated vehicle (ROV) concept designed to monitor and protect sensetive marine habitats such as coral reefs and seagrass beds. By using innovative, low-impact design princaples and sensor-based technologies, our ROV aims to support marine researchers and conservationists in gathering environmental data while minimizing disruption to these delicate ecosystems.

DISCUSSING & REASONING

We chose to focus on sensitive marine habitats because of their ecological importance and vulnerability to human impact. Many ROVs currently used for marine monitoring are either too large, noisy, or invasive for delicate environments. Our ROV addresses these issues by offering:

-Small-scale, precise maneuverability
-Low noise operation to avoid marine life disturbance
-Real-time data gathering without physical sampling

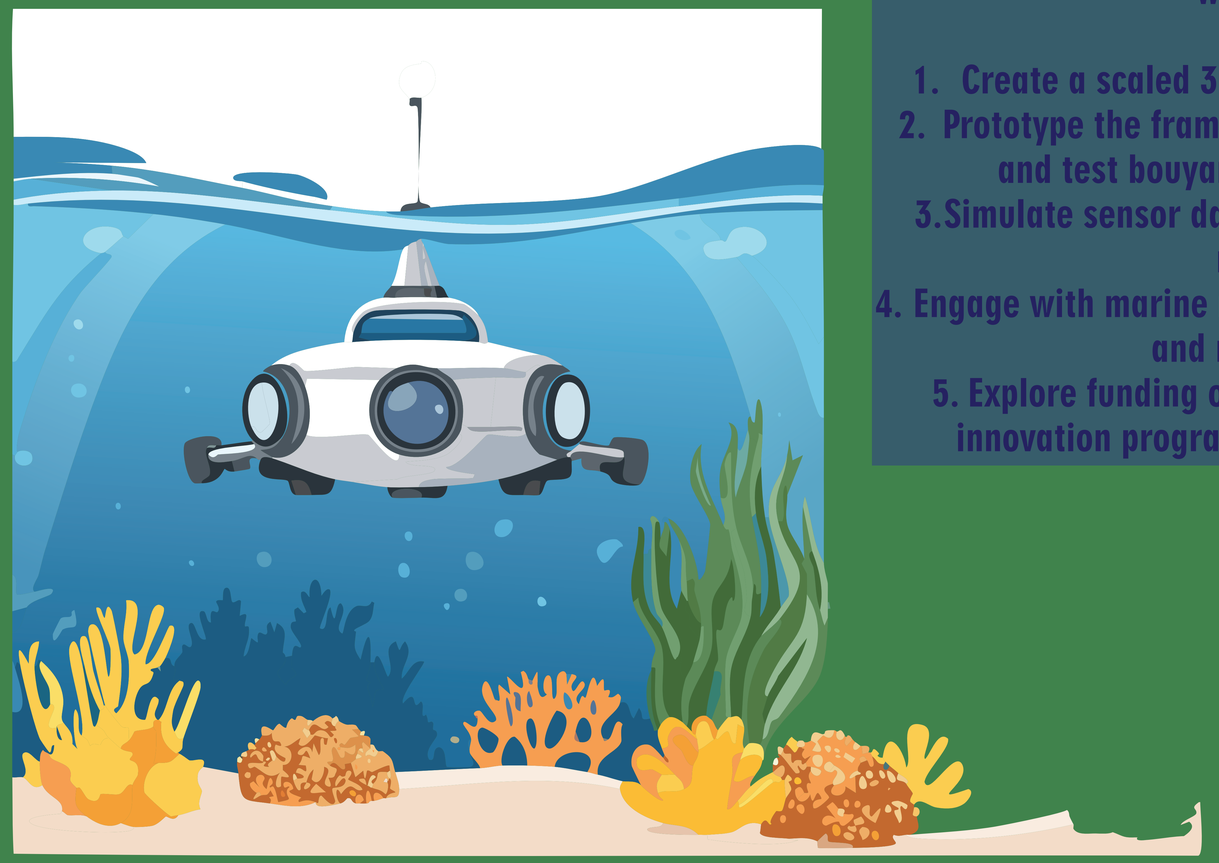
In conceptualizing this design, we reasoned that an ROV should not only observe but also coexist with the environment it monitors.

APPROACH

Our ROV would focus on three key areas:

-Eco-friendly design: A lightweight frame with neutral bouyancy minimizes physical contact and sediment disturbances.
-Sensor Integration: Including pH, tempurature, and salinity sensors, as well as a high quality camera for visual monitoring and documentation.
-Precise Control: An advanced propulsion system using fine-tuned thrusters allowing for precise navigation around fragile marine structures.

We consider practical engineering-constraints such as cost-effectiveness, ease of deployment, and adaptibility to different environments.



BACKGROUND & RATIONALE

Sensitive marine ecosystems like coral reefs are under threat from pollution, ocean acidification, and climate change. Effective conservation depends on detailed environmental monitoring, which often requires expensive and logistically difficult manned missions or satellite imaging with limited resolution.

ROVs offer a unique solution, but existing models often fall short for sensitive environments. By designing a conceptual ROV tailored for minimal intrusion, we support the growing need for sustainable and scalable ocean monitoring tools.

NEXT STEPS

If we were to turn our ROV into a functional prototype, we plan to:

1. Create a scaled 3D model using CAD software.
2. Prototype the frame using sustainable materials and test bouyancy in a controlled pool.
3. Simulate sensor data using Raspberry Pi-based mockups.
4. Engage with marine researchers to gather feedback and refine design.
5. Explore funding or mentorship through STEM innovation programs or conservation groups