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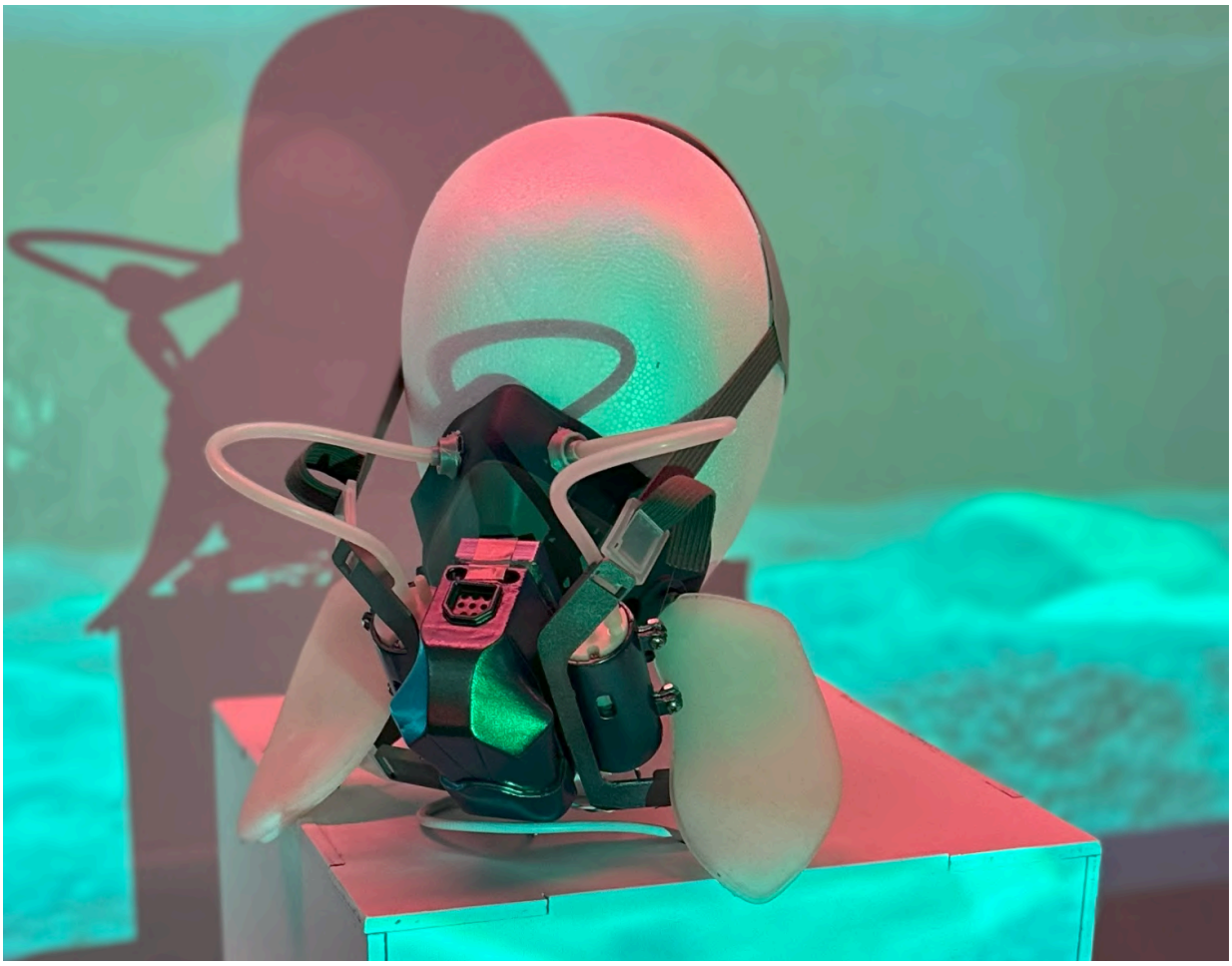
Ocean Lungs

FERAL DESIGN

DESCRIPTION

Ocean Lung mimics the impact of ocean deoxygenation on marine wildlife by adjusting the amount of air available for breathing based on the level of air pollution detected. The goal is to create an immersive simulation of how water pollution chokes ocean wildlife as they struggle to breathe due to the lack of oxygen in the water. We want to raise awareness and promote environmental conservation efforts by providing a visceral and interactive experience of the detrimental effects of pollution on our planet's oceans.



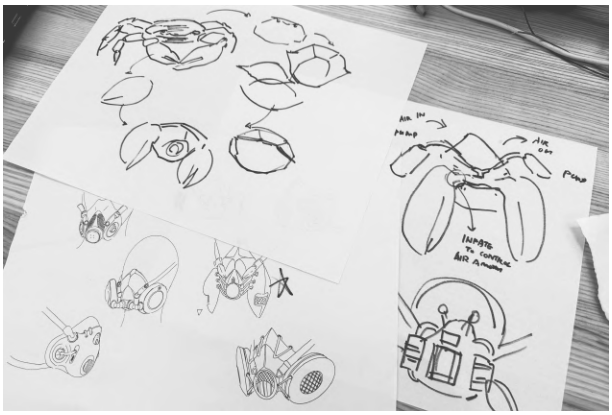
PROCESS

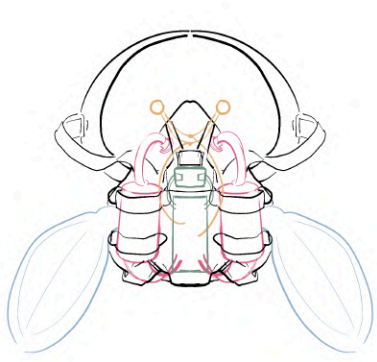
Research

Ocean deoxygenation is a serious problem caused by global warming, which has led to a loss of approximately 2% of the oxygen in the oceans since the 1950s. This lack of oxygen has created "dead zones" in the ocean where most marine life cannot survive. Crabs are particularly affected by this, as they need oxygen for respiration. As the oxygen levels decrease, crabs must move to shallower waters to find oxygen, which can lead to increased predation, competition for resources, and disruption of their reproductive cycle. Additionally, ocean acidification caused by increased carbon dioxide levels weakens crab exoskeletons, making them more vulnerable to predators and other stressors. The survival crisis for marine animals, especially crabs, inspired us to develop this project to make people resonate with them.

Ideation/Sketches

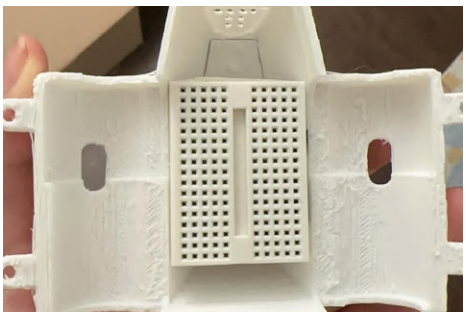
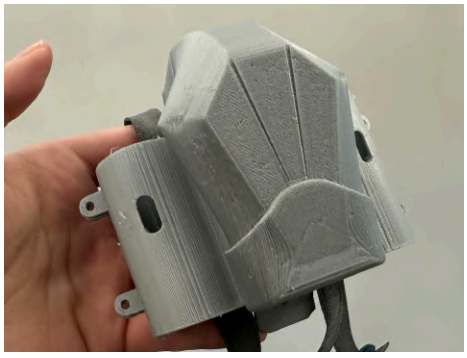
We used the silhouette of a crab as the main inspiration for the form design to raise awareness of the impact of ocean acidification on crab shells. The silicone air pocket, shaped like a crab's claws, is serving as a tangible representation of the effects of ocean acidification, causing the shells of many crab species to dissolve. We aim to inspire our audiences to address the underlying causes and protect the environment's health after seeing this more visible and engaging presentation of the ocean acidification issue.





Prototype

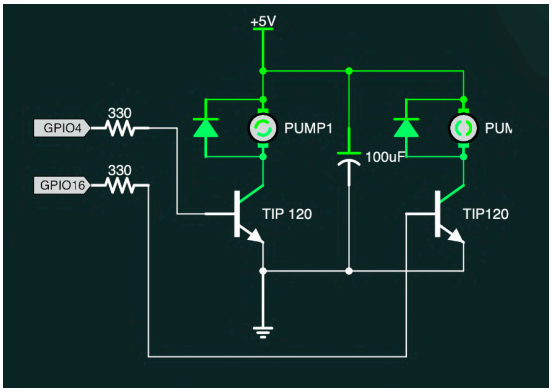
We used part of a 3M 6501 half-face respirator as the foundation of our project. After measuring the electronic components and the base, we designed an assembly in SolidWorks that can attach to the existing respirator and holds the ESP32, sensor, two air pumps, breadboard, and all wires. We then printed, tested, and adjusted it to make each part fit better.


We molded silicone with 3D-printed molds to create the soft robotics part that attaches to the respirator. The shape resembles the theme of “lungs” and accurately blocks the airways when inflated.

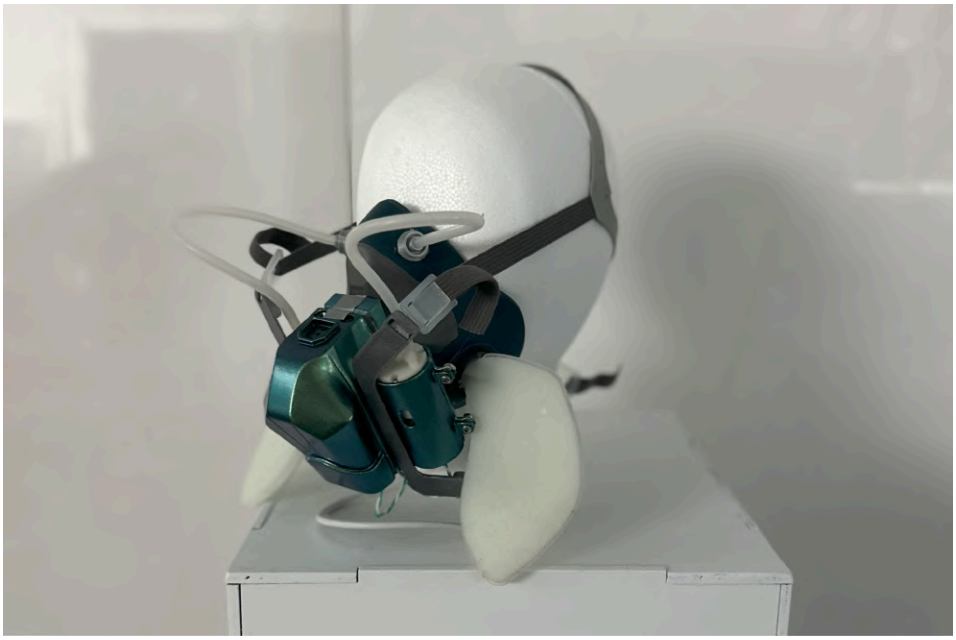

Electronic Components / Schematic

We choose to use two stand-alone transistors as the motor drivers to save space. The TIP120 transistor from ST Electrons has a rated power output of 65w and a voltage of 60v seems to be overkill, but it is actually reasonable to be used due to the lack of cooling in our assembly. We also added a 100uf capacitor to decouple the motor from the power rail to prevent the sudden power drop when starting the motor.

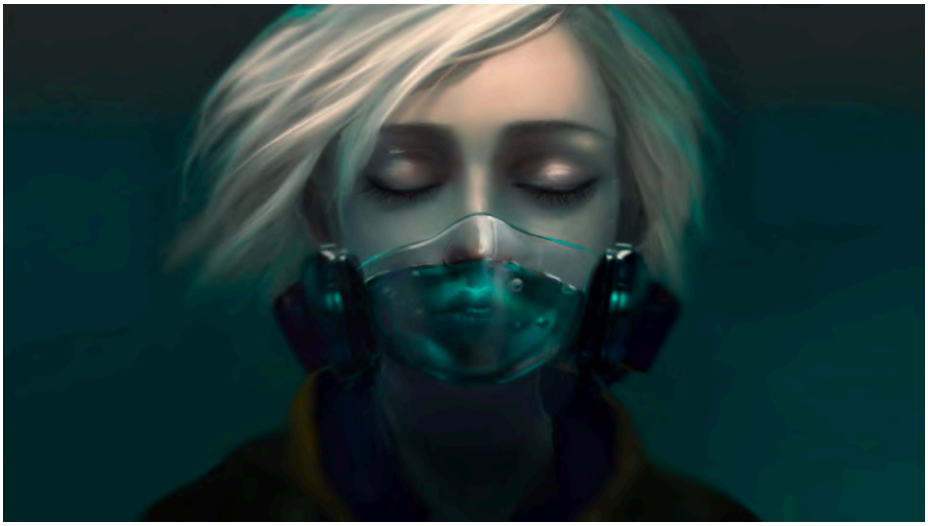


Final prototype

For the final prototype, we added more details and improved the overall aesthetics of the previous version. We chose the blue-green iridescent color and metallic finish to give this project a futuristic touch and emphasize the ocean theme. In addition, we redesigned the harness system to secure the mask when wearing.



ADDITIONAL VISUAL



We also created an illustration to depict the objectives of Ocean Lungs: making the audience experience how ocean animals breathe and be aware of ocean deoxygenation. With a blend of dark blue and green hues, the painting portrays a silent scene that encourages our audience to reflect on their impact on the environment and to consider how they can help preserve the delicate balance of life in our oceans.