

VizNet

Real-Time Ocean Visibility Measuring

2022-2023 Senior Capstone Project Proposal

Who Are We?

Globally, there are 42 million participants in underwater sports including scuba divers, snorkelers, and free divers. These activities are more enjoyable and significantly safer with clear underwater visibility conditions, but currently there is no accurate way to measure this. Countless dives are ruined by unpredictably poor conditions, wasting time, effort and money.

Last year, this problem inspired an incoming UCSB senior and avid diver to create and lead his own capstone project. He and his team set out to design and deploy a solar powered, self-sustaining marine buoy that could directly measure and upload real-time ocean visibility conditions to the internet. Over the school year, they not only achieved their goals, but they placed third in UCSB's New Venture Competition, and won the Excellence in Mechanical Engineering award at the 2022 Design Expo.



What's Next?

Though the project succeeded, the buoy's measuring device, a wastewater treatment turbidity sensor, left a lot to be desired. This sensor outputs values of turbidity, a relative measurement of scattered light. It is known that turbidity is

related to visibility, yet there is no established correlation between the two. Therefore, all visibility calculations had to be extrapolated by comparing a subjective measurement of ocean visibility to the sensor's output in turbidity units. Although this sufficed for an initial prototype, the sensor was an expensive and relatively inaccurate solution to a critical problem. Thus, this iteration of the project seeks to improve upon the visibility measurement method.

Project Goals

The goal of this project is to design and build a hardware apparatus that can reliably measure and report real-time dive conditions. This includes but is not limited to ocean visibility and temperature measurements.

The mechanism should be able to:

- Make direct, continuous readings in the environment itself (will be eventually deployed at depths up to 50ft)
- Collect and analyze data (report dive conditions, not raw measurements)
- Interface with the buoy power and communication systems
- Minimize cost and optimize manufacturability
- Quantitatively distinguish between the following 5 visibility ranges



Get Excited!

Despite these constraints, this project is still very much open ended. In fact you could have the freedom to completely redesign the entire sensing system!

This project is student born and student led.

You get the chance to solve a common problem that you or someone you know may have faced.

Testing in the field means an opportunity to go on ocean excursions!

Pick up interdisciplinary skills through work with last year's mechanical team.

VizNet will be re-entering the New Venture Competition (NVC), offered by the Technology Management department within the College of Engineering. In this program you gain invaluable business and entrepreneurial skills.



Skills and Interests

In this design, you must determine which physical measurements are valuable and the hardware necessary to take such measurements.

This process involves the following:

- PCB Design
- Signal Processing
- Data Science
- Optics
- Marine Engineering / A Passion for the Ocean!

Through the NVC, you will also have the opportunity to expand on the following:

- Product Design
- Business Planning and Market Research
- Pitching to Real Investors

Student Requirements

There are no citizenship requirements. IP assignment agreement required.
No dive experience necessary!



Questions?

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Last Year's Project

<https://capstone.engineering.ucsb.edu/projects/ocean-visibility-viz-net>



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good viz is our biz