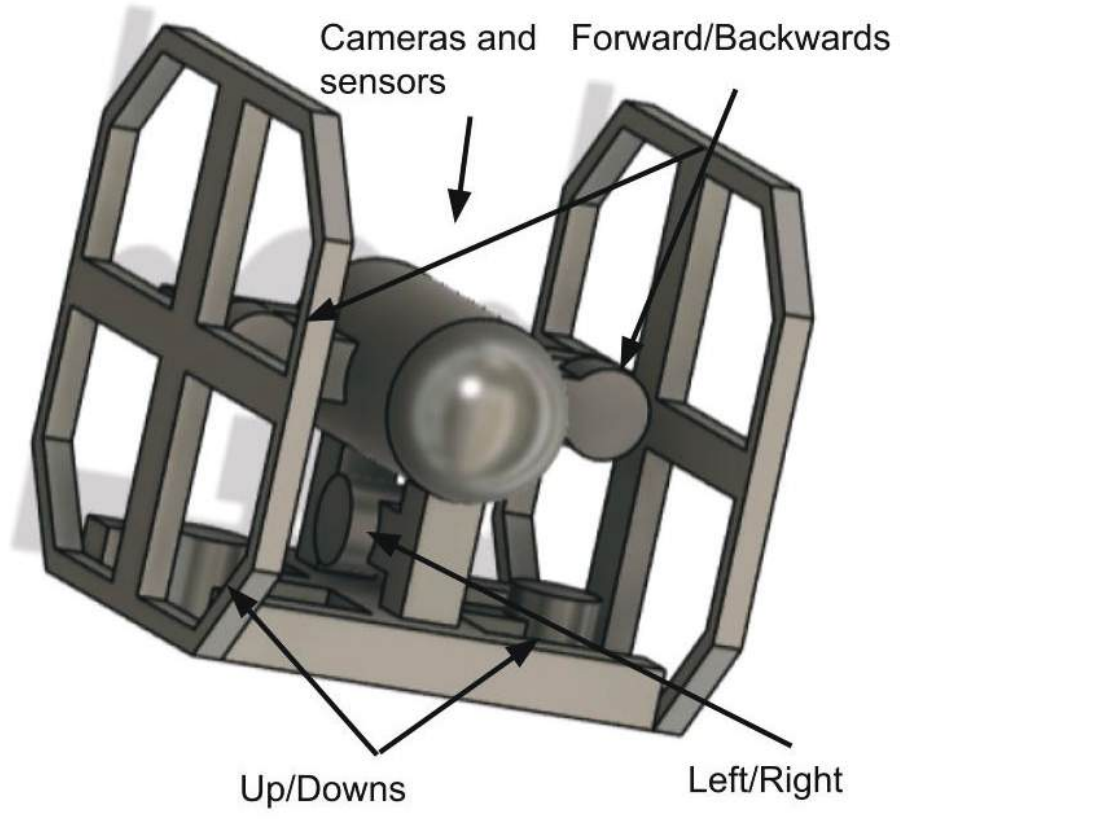
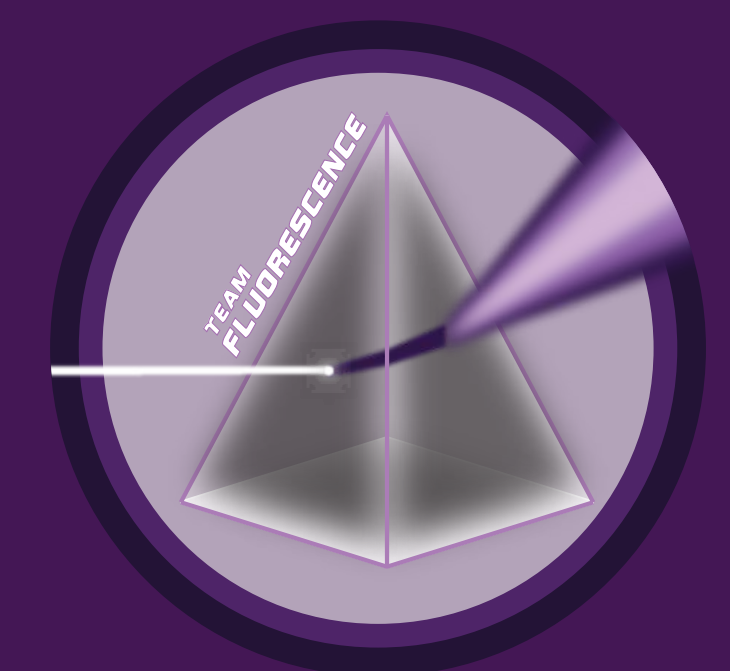


WATER QUALITY MONITORING AND CONTROL

TEAM FLOURENCE: WEST MESA HIGH SCHOOL: NEW MEXICO



Overview

Clean water is essential for both human life and marine ecosystems, but pollution and bacteria threaten its quality. Measuring this quality in the normal way is very expensive, time-consuming, and only covers a small area. This project will take a ROV and equip it with various sensors and equipment to measure the pollutants and quality in real time. Making it faster, more efficient, and cheaper. Allowing for quicker detection and response, easier tracking, and better conservation efforts

Background

Water pollution is becoming more and more of an issue. Affecting marine life, human life, and our drinking water. Let's face it, We are entirely at fault. Our companies are producing waste. Our chemicals are running off, and our plastics are out floating in the ocean. All things that we created that are leading to even bigger problems like dead zones, harmful algal blooms, and habitat destruction. But testing the water to determine quality right now is expensive and very slow. But ROVs can help. By adding on sensors we can make an ROV that can pick up some water, test it, send the data, and then start releasing good bacteria that can eliminate the pollution and clean the water.

Approach

To build the ROV, we plan to design a custom-built vehicle equipped with advanced sensors and control systems. This ROV will feature cameras, six-axis motion control, water collection capabilities, and a bunch of environmental sensors, including pH, temperature, salinity, chlorine, pressure, and depth sensors. Additional components such as GPS, compasses, and various lights will let us navigate and see underwater.

To use these sensors efficiently, we will use a microcontroller and microcomputer combination, such as a Raspberry Pi and Arduino. This setup will allow all data to be processed on a single microcomputer, transmitted through a cable, and controlled from the surface. The ROV will operate by collecting water samples, analyzing them, and transmitting the data. By repeating this process across multiple locations, it can provide an idea of the water quality in a given area. With better movement control and data transmission, this system will let researchers monitor pollution, study environments, and support conservation efforts.

Reasoning

Using the above sensors will allow us to complete the mission of water quality monitoring and control. The pH sensor will allow us to measure how acidic or basic the water is. Having an extreme pH in either direction can be harmful to aquatic life and ecosystems. Most environments and species thrive in a neutral pH range so getting as close to that as possible will be essential.

The temperature sensor will help identify thermoclines, predict algal blooms, and detect climate change effects in the water. Thermoclines are a layer of water where the temperature changes rapidly affecting oxygen distribution and marine life, algae blooms typically occur in warmer water, often releasing harmful toxins that disrupt ecosystems, and by comparing temperature data to previous years we can determine how much the climate is changing. The salinity and chlorine sensor will help us to determine the salt content and chlorination levels in the water.

The higher the concentration of salt and chlorine makes for the less animals that can survive. All this data will help us determine environmental conditions, detect pollution, and better support conservation efforts.

Next Steps

Right now, this ROV is just a concept, but in the future, it would be amazing to bring it to life, test it in multiple lakes, and analyze real-world water data. If we were actually going to build this, we would follow the engineering design process. Prototyping, testing, refinement, final build, and then real world testing. Once built, this ROV could be used to monitor pollution levels in lakes, rivers, and oceans, help communities access safe drinking water, provide real-time environmental data for researchers, and support efforts to track climate change effects on bodies of water. This ROV has huge potential but, right now it is just an idea.

Sources of Water Pollution/Percentage of Studies

