

An Underwater Robotic Smart-Sensing System for Water Quality Testing



ALLEGHENY COLLEGE

Elisia Wright and Dr. Janyl Jumadinova

Department of Computer Science, Allegheny College
Meadville, PA

PROJECT OBJECTIVES

The current methods for water quality testing either use a single sensor to get a random sample for testing each water quality parameter separately, or data buoys that are able to obtain readings from multiple sensors at a stationary location.

This project presents:

- ▶ A single unit comprised of **multiple sensors** that are able to collect data simultaneously for water quality testing.
- ▶ This multi-sensor unit attachable to the **underwater robot** to collect data at various depths of the water column for an extended period of time.
- ▶ **Data collection** and **data analysis** software to manage the data and assess certain trends in the water quality over time.

ALGAL BLOOMS

Lake Erie algal blooms are an annual threat to the health of **more than 11 million people**. Toxins produced by harmful algal blooms have deeply affected the economy and health of the environment and the public. Coastal towns that rely on tourism are negatively affected by toxic algal blooms.

- ▶ Drinking water is polluted.
- ▶ Local residents and visitors are prevented from boating, swimming, and visiting Lake Erie shorelines.
- ▶ Nearby residents are vulnerable to illnesses caused by the toxins.
- ▶ Toxins can result in the death of marine life, and severely impact an aquatic ecosystem.



Figure: Great Lakes: October 9, 2011

ROBOT



Figure: Different robot models

SENSORS

- ▶ pH, Conductivity, Dissolved Oxygen, Temperature



Figure: Arduino board and sensors

SYSTEM DESIGN

1. **First prototype:** Extend sensors with 30ft cable, while keeping board and power on surface.
2. **Second prototype:** Create a waterproofed unit to house all sensors and boards on the robot.
 - ▶ Waterproof casing.
 - ▶ On-board battery.
 - ▶ Micro-SD card.



Figure: Soldering sensor wires



Drilling holes for sensors

DATA