Autonomous Water Quality Monitoring System

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Background

Water quality monitoring is important for many applications such as ensuring freshwater is safe for drinking, for scientific research, and for monitoring general changes in the properties of water.
Examples:

- The United States Geological Survey (USGS) regularly monitors 7,200 lakes and reservoirs
- Public beaches are tested daily for E. coli outbreaks, which can be harmful to humans.

Purpose

Today, water samples are mostly acquired manually

- Time consuming
- Expensive
- Often unsafe
- Human samplers must be trained

Automatic water sampling:

- Can access large areas and hard-to-reach locations
- On-demand
- More often, more data

Approach

The goal of this research is to demonstrate that an autonomous water vehicle can be developed that can direct itself across a body of water, move along a predefined route, and communicate wirelessly with ground based units.

Initial ideation on the designs has been completed; what remains to be done is design, prototyping, and testing of an autonomous watercraft.

The overall system will be broken down into four main subsystems, each to be designed separately, but intended to work together, These are (1) propulsion system, (2) wireless telemetry system, (3) computing/control system, and (4) power system. Each subsystem will be designed using conventional off-the-shelf technologies.

A single prototype unit will be developed that floats on water and incorporates all subsystems. This prototype will be a scale model of the envisioned final device, approximately 1:6 scale. The prototype will not actually perform water sampling since that is a significant engineering effort beyond the scope of this project.

Once a working prototype has been developed, the team will perform field testing. Field tests will include monitoring watercraft speed, accuracy and repeatability of positioning, range of operation, and range of telemetry.

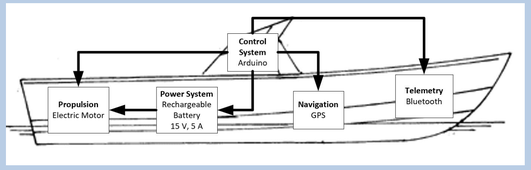
Timeline

Quarter 1

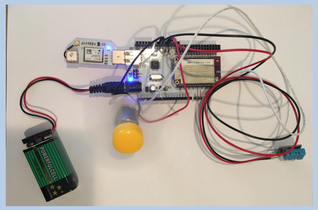
ID	Task Name	Start	Finish	OCT	Nov	Dec
1	Initial Research (Define Problem, Scope, and Market Research)	10/1/2018	10/30/2018			
2	Ideation and Design	10/31/2018	11/27/2018			
3	Milestone (Arduino communication w/ GPS, motor and sensors)	11/5/2018	12/7/2018			
4	Documentation (Report, Poster, etc)	11/27/2018	12/5/2018			
5	Apply for Funding	10/15/2018	11/13/2018			
6	Order Parts	11/9/2018	12/5/2018			

Progress

1. Created System Level Diagram



2. Programmed Onion Omega Arduino Breakout to collect data from sensor, control a DC motor, and retrieve coordinates from GPS navigation unit.



Future Work

The upcoming quarter the team will be creating the five subsystems of the autonomous water quality monitoring systems. Each subsystem has been carefully designed to meet the requirements set by the need of water sampling. Together the team will combine all subsystems in our water vessel and conducting testinging. Throughout the process the team will troubleshoot and fit all bugs.

Team Organization

Jazmin HardWare	Team Leader Propulsion and Power Lead
Arelys Hardware	Project Manager Control System Lead
Daniel Software	Funding Manager Telemetry and Navigation Lead

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