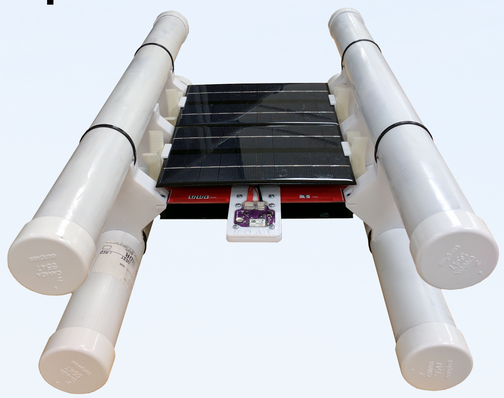
Budget Oceanic Autonomous Tracker

A.K.A. Autonomous Aquatic Drone

Joseph Canfield



Mitchell Overdick

SUMMARY

The proposed project was to construct a small solar powered paddle boat capable of navigating itself using GPS waypoints. The boat needed to be versatile, designed to be flipped 180 degrees in any direction and still function as intended. This involved applying solar panels to both the top and bottom of the boat to ensure the onboard systems have power at all time. In order to implement these specifications, hardware such as GPS, accelerometers, magnetometers, and batteries was be required. Tests were be conducted on small bodies of water such as swimming pools and small lakes like Lake Padden. The end goal was for the boat to travel Lake Whatcom, launching from Bloedel Donovan Park, circumventing Reveille Island, and finishing in South Bay. Success in navigating Lake Whatcom would have demonstrated the capability of a small watercraft to travel a great distance without direct human control. However, due to the accelerated development process this voyage was not completed before demonstration.

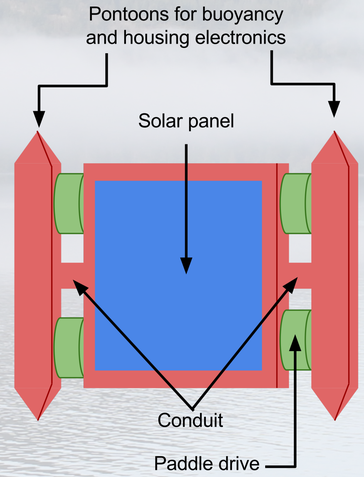
FEATURES

1) Waterproof Chassis
2) Paddle Wheel Propulsion
3) Solar Powered Battery
4) Waypoint Storage System
5) External Power Switch
6) Global Positioning System
7) Compass

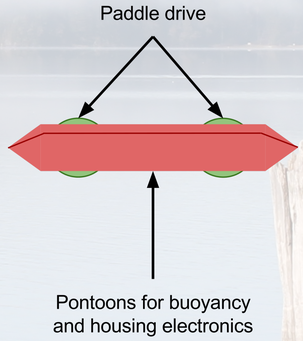
BENEFITS

The benefit of this drone will be a proof of concept for small crafts capable of large excursions. A working build of this drone will prove that a small unmanned aquatic vehicle is able to navigate across open water. This drone would also benefit technologies in remote oceanic research by serving as a platform for possible monitoring equipment. One possible application of oceanic monitoring could be using the drone to generate a map of water temperature in a given area. This could be programmed by setting a waypoint path in a body of water and with a thermometer peripheral take data at each waypoint. In our research we have come across several unmanned submersible drones, generally for military use and reconnaissance. Our drone could have similar applications at much lower cost for surface level surveying/reconnaissance once the initial proof of concept is successful.

INITIAL DESIGN CONCEPT

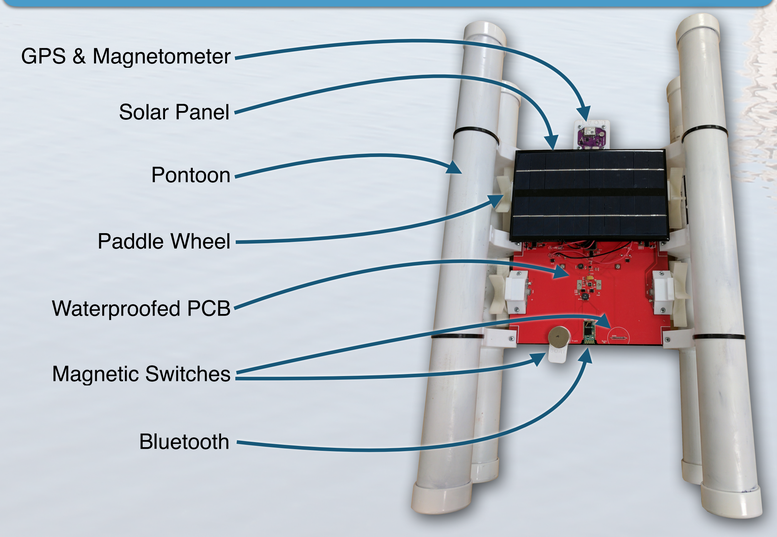


TOP VIEW



SIDE VIEW

FINAL DESIGN CONCEPT



SOFTWARE

Kernel	μC/OS-III Real Time Kernel
Shell	Shell Implemented Over Bluetooth for Programming
Navigation	Proportional Control System Using GPS and Magnetometer
Magnetometer	Self Calibration sequence

HARDWARE

MCU	Texas Instruments MSP432 (ARM Cortex-M4)
Accelerometer	NXP MMA8653FC 3-Axis 10-bit
Flash	Winbond W25Q64FV 64 Mbit
Magnetometer	Honeywell HMC5883L 3-axis digital compass
GPS	uBlox Neo-6
Bluetooth	HC-05
Solar Charger	Linear Technology LT3652 Power Tracking 2A
Motor Driver	Texas Instruments DRV8834

CONSTRUCTION

Pontoons	2” PVC Vacuum Pipe
Pontoon Mounts	3D Printed Using PET-G Filament
Pontoon Straps	UV Black Zip Ties
Motor Mounts	3D Printed Using PET-G Filament
Paddle wheels	3D Printed Using PLA Filament
PCB	Designed in Altium Designer, Coated in Silicone
Solar Panels	Manufactured 10v Panels Emerged in Resin
Battery Box	3D Printed Using PET-G Filament
Magnet Holder	3D Printed Using PET-G Filament