ECE 4012 Senior Design Project

Georgia Tech School of Electrical and Computer Engineering

Autonomous Sailboat for Penguin Searching and Recording

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Problem Statement

Penguins are one of the species with a high extinction risk due to the global warming and environmental contamination. Currently, the only method available to record penguins' behavior consists of using drones or personnel. Both methods cause too much interaction to penguins' daily life and fail to gather accurate information.

"It would be great to see the penguins when they are socializing in the water." quoted from Dr. Dee Boersma, a Co-Chair Penguin Specialist Group for International Union for Conservation of Nature (IUCN).

In order to further research of protecting penguins, scientists need the tools that can search and record penguins' underwater behaviors.

Background

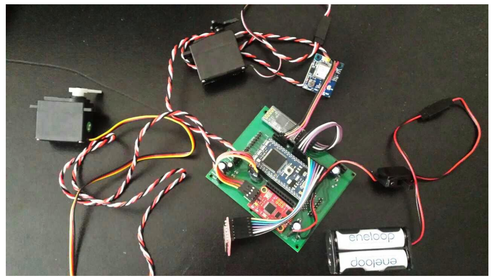
The Robotic Sailboat System is one kind of unmanned surface vehicles (USV) which is designed to provide an effective ocean sampling capability.

Wingsail is a wing-tailplane aerodynamic structure that fitted to a marine vessel in place of conventional sails. Wingsail is analogue to airplane: the wing is to create 'lift' to push the boat moving and the 'tailplane' is to control the 'angle of attack' of the wing to control the 'lift'.

Sailboat Prototype

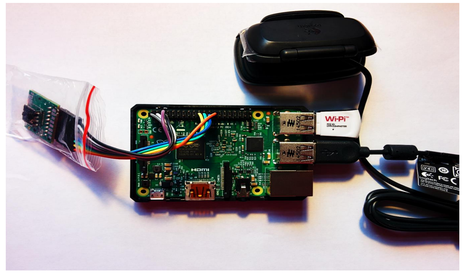
Devices on mBed

- Inertial Measurement Unit (IMU)
- Global Positioning System (GPS)
- Wireless Module
- Two Servos



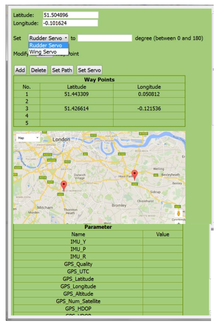
Devices on Raspberry Pi

- Infrared (IR) Camera
- Web Camera
- Wi-Fi Adapter



User Interface

- Actively control the boat
- Show current boat status
- Python GUI kit PyQt
- Google Map Javascript API

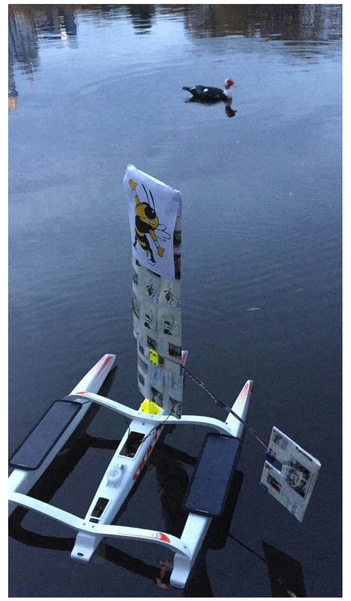


Energy Harvesting System

- DC-DC Converter
- Solar energy
- NiMH battery

Test in the Lake

Test Location: Piedmont Park



Future Work

- Improve the waterproof ability.
- Improve communication between the Raspberry Pi and base-station PC.
- Add more energy harvesting devices besides solar panels.

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