

Senior Design Project in Electrical & Computer Engineering



Coordinated Autonomous Boating

1/c Bradley Davis, 1/c Gabby Lemly

Advisors: Prof. Freeman, Prof. Emami, Prof. Hartnett

Sponsor: US Coast Guard Academy

Project Background

The goal of this multiyear project is to develop a system of multiple autonomous vessels coordinated together to perform one of several Coast Guard missions, including roving security for the Ports, Waterways, and Coastal Security (PWCS) mission of the Coast Guard, as well as maneuverable oil skimming platforms for the Marine Environmental Protection mission.

Motor Controller



Arduino UNO and Relay Circuits Used to Model Potentiometer

Shore-Side Server



Acer Aspire One D255 10.1" Netbook

Current Status

Currently, one prototype vessel is constructed and has undergone initial tests for maneuverability and system identification, to be used for vessel autonomy.



Graphical User Interface Designed in Matlab

Project Requirements

1. The vessel's sensor package shall determine the vessel's current position and direction of motion, as well as weather data including wind speeds.
2. The vessel shall provide a live video stream for shore-side monitoring over a secure, wireless connection.
3. The vessel shall be maneuverable in calm waters.
4. The vessel shall navigate through an arbitrary set of externally entered waypoints.

Live Video Streaming



Creative HD Webcam

Sensor Package

- WAAS Enabled GPS
- Anemometer
- Heading Sensor
- Camera



Airmar PB200 WeatherStation

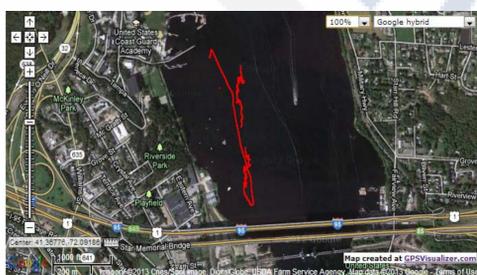
Onboard Server



ASUS Eee PC 1015PN-PU17-WT 10.1-Inch Netbook

Design Solutions

The current design uses two trolling motors mounted on either side of a kayak hull, for turning and propulsion. The system uses an Acer Aspire One netbook computer as the onboard server, partitioned with a Windows 7 operating system and Matlab programming for the motors' remote control. Digital input on the onboard processor will receive data from a GPS sensor, webcam, and heading sensor and save it to a central database. An ad-hoc network was utilized to ensure secure communications among kayaks and the shore-side server for information confidentiality and integrity. This way, the coordinated autonomous fleet implemented later will be able to conduct multiple missions.



GPS Plot on Google Overlay