University of Rhode Island 'RamBoat' Robotics Team

For the past six years, a team of URI students has competed in the International RoboBoat Competition, held each July in Virginia Beach, VA. During the competition, student teams race autonomous surface vehicles (ASVs) of their own design through an aquatic obstacle course. This includes littoral area navigation, channel following, and autonomous docking. The competition provides an opportunity for students to develop skills in system engineering by accomplishing realistic missions with autonomous vehicles in the maritime environment.

Last year, the RamBoat team completed an ambitious project to rebuild the entire boat, from the hulls up. This year we hope to build on that momentum and extensively test the boat in the field throughout the Fall and Spring semesters. We are looking for 4 dedicated engineers to work alongside the current team of OCE, MCE, and ELE undergraduate and graduate students on mission critical software and electrical engineering projects.

The responsibilities of the team members are expected to be:

- Computer Engineer A: Vehicle Dynamic Simulation and Control Algorithms
    - Create an interface between the existing robot code base and a Simulink dynamic model of the boat.
    - Perform 'hardware-in-the-loop' simulations of the robot to test the interactions between mission autonomy, navigation, computer vision, and dynamic control of the vehicle.
    - Create and test control algorithms for the competition challenges, in simulation and in the field with real hardware.

- Electrical Engineer A & B: Power and Control Electronics/Algorithms
    - Upgrade the combined sensor/motor/actuator power regulation circuit -- this is a direct follow on from work by members of last year's capstone.
    - Design and implement a stress testing program for the power monitoring, testing the ability to sustain exposure to variations in environmental conditions (vibration, humidity, and temperature fluctuations.)
    - Collaborate with Computer Engineer to develop, code, and test control algorithms for specific competition tasks.

- Electrical Engineer C: Communications and Health Monitoring
    - Refine the communications systems (wi-fi, R/C, point-to-point Ethernet over RF) to provide robust stable comms under all expected conditions with graceful failure modes.
    - Design a standalone monitoring unit, including an embedded display, which will allow the team to monitor system health and environmental conditions while in the field under adverse conditions.
    - Validate under field conditions -- i.e. test it on the water!

The project will build on the efforts two previous ELE Capstone teams which focused on mission autonomy, computer vision, and power systems design . In each of the last three years, ELE/ECE students have taken the opportunity to attend the competition in July (although this is entirely optional). Several former ELE Capstone students are active members of the team.
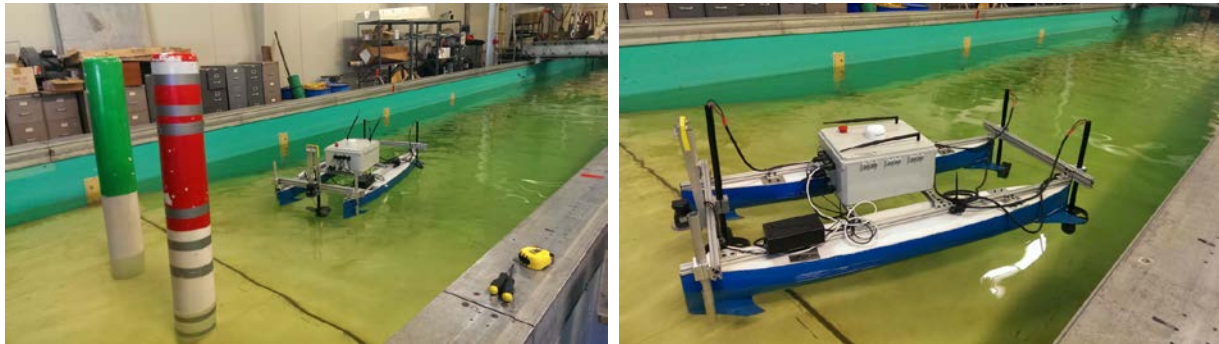
The 2014 RamBoat navigating autonomously through buoys (left). Close up in the water in the model testing tank (right).

The Univ. of Rhode Island "RamBoat" team prepares to depart for the July 2013 RoboBoat competition. *Photo: Stephen Licht*