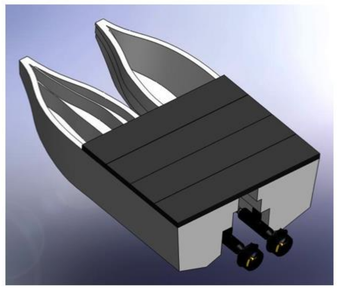
Victoria — Autonomous Surface Vehicle

Georgia Tech Systems Research

Vehicle Design

The electrical and mechanical components of *Victoria* were developed in parallel by two separate groups working in close collaboration. This allowed the testing of algorithms and hardware systems to occur simultaneously with the mechanical design process.

Fiberglass Hull

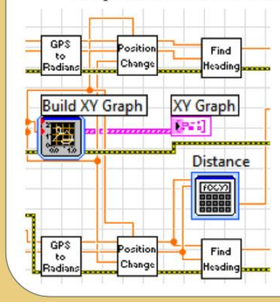


Victoria's hull was made of s-grade fiberglass and a super hard epoxy resin, with a 1 to 1 weight ratio between glass and resin. A vinyl-epoxy white sealer was used as a final layer. The two hulls in the catamaran-style design have room to house the batteries and electronics, leaving space for sensors on the platform that joins the two hulls together.

Hardware and Software

The hardware architecture on *Victoria* was built around the NI CompactRIO embedded controller, which serves as the main processor for all autonomous and remote operations. The CompactRIO uses an expansion chassis with onboard FPGA and modular add-ons for communicating with all of the vehicle's sensors. Other hardware components include:

- Garmin 16x GPS receiver
- Microstrain Inertial Motion Unit
- Axis M1011 Ethernet Cameras
- Sick LIDAR LMS 291
- Ubiquiti Bullet and Rocket M5 (long range wireless)



NI LabVIEW 2011 was used to program both the CompactRIO on *Victoria* as well as the user interface running on the control laptop back on shore.

Victoria

Georgia Tech Savannah Robotics' (GTSR) student ASV project began in January 2010 as an interdisciplinary effort between mechanical, electrical, and computer engineering students. Our mission is to construct robotic vehicles for use in both student competitions and field research. After the 2010 AUVSI's Roboboat competition, *Victoria* was improved to become a more versatile vehicle capable of being deployed in a real world research environment. In the Summer of 2011, following the competition, *Victoria* surveyed near-coastal waterways contaminated by the Deepwater Horizon oil spill, searching for remnants of oil.

In the Field

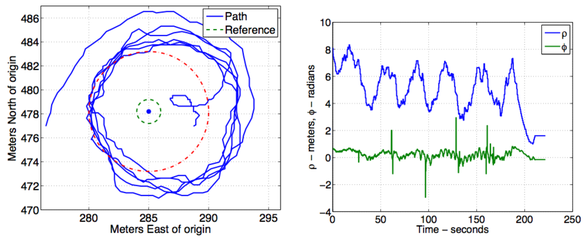
- Environmental survey looking for oil remnants from the Deepwater Horizon oil spill, on the Golf Coast
- Serving as a platform to research formation control and curve tracking algorithms
- Networked control algorithm development and testing together with the Fetch AUV from the Virginia Institute of Marine Science

A joint team of robots from Georgia Tech and the College of William and Mary pose with their human teammates

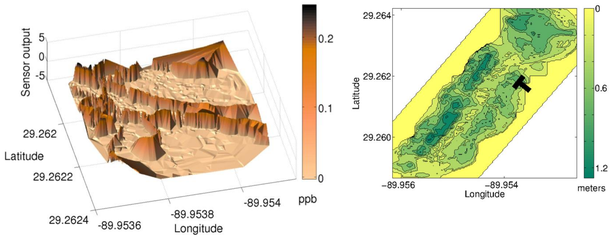
Grand Isle, Louisiana

Study Results

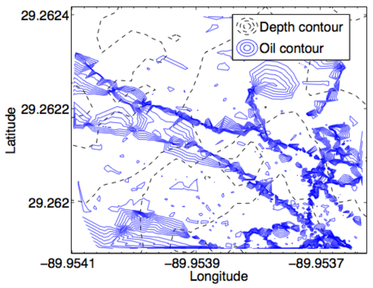
Victoria was able to track the a reference circle at a buffer distance (red dash-dotted circle), well with only slight displacement due to the lagoon's current.



Victoria navigated across the lagoon collecting data on surface oil concentrations, the results are plotted above. While an AUV (*EcoMapper*)collected depth data of the lagoon.



The combination of *Victoria*'s oil concentration data with the *EcoMapper*'s bathymetric map is reconciled to show how various autonomous vehicles with differing capabilities can work well together.



Acknowledgements

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