

Remotely Operated Vehicle-*β*





Remotely Operated Vehicle-*α*



NSF RAPID: Collaborative Research: Autonomous Control and Sensing Algorithms for Surveying the **Georgia** Impacts of Oil Spills on Coastal Environments **Tech** Impacts of Oil Spills on Coastal Environments PIs: Michael Malisoff (malisoff@lsu.edu) and Fumin Zhang (fumin@gatech.edu)

Fundamental Research

This project establishes a collaborative research program at Louisiana State University (LSU) and the Georgia Institute of Technology (GT) to jointly develop theoretical and experimental methods that are implemented on marine robots developed by student teams to survey Louisiana estuaries, coastal wetlands, and lagoons under the influence of oil spills. More specifically, the project goals are:

•Demonstrate the capabilities for student developed marine robots to survey estuaries that are inaccessible, dangerous, or tedious when using conventional surveying methods. •Develop novel autonomous control and sensing algorithms that are specialized to surveying the impacts of oil spills on coastal environments, under the guidance from biologists, geologists, and oceanographers.

•After verifying the algorithms using rigorous mathematical control methods for time delayed or uncertain systems, implement the algorithms on marine robots, and perform surveys in estuaries such as those under the impact of oil spills.

The research is urgent because of the scale and scope of the recent Deepwater Horizon oil spill in the Gulf of Mexico, the need for survey methods for Gulf Coast estuaries, and the hazards and high costs associated with conventional human-based surveys.

Ongoing Research:

•Autonomous navigation capabilities •3 DOF underwater manipulation •Autonomous chemical field-tracking •Vehicle, thruster & battery modeling (for simulation and improved controller design)

•Simulation environment for algorithm testing



Education Benefits:

- •A diverse team of 20 LSU and GT math and engineering students led by graduate students has been formed.
- •With 2 ROVs, an ASV and other platforms planned, undergraduate students are working with graduate students to help
- apply research to competition vehicles.

LabVIEW 2009 is used for all programming. The LabVIEW FPGA module and Vision module are used for FPGA control and vision tasks, respectively.

The control system for Victoria was developed in parallel with the hull fabrication. In order to allow easy testing of algorithms and hardware systems, a simple land-based vehicle was utilized.







Robot Ship -Victoria



