ORE SEMINAR

since 1966

OCEAN AND RESOURCES ENGINEERING

IN THE SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY AT THE UNIVERSITY OF HAWAI'I AT MĀNOA

Persistent Ocean Monitoring with Underwater Gliders: Path Plans and Adapting Sampling Resolution 3D/4D

Ryan N. Smith

Lecturer, School of Engineering Systems
Queensland University of Technology

Post 126

09/14/2011

3:00-3:30 pm Coffee Hour
3:30-4:45 pm Seminar

Abstract

Ocean processes are dynamic and complex events that occur on multiple different spatial and temporal scales. To obtain a synoptic view of such events, ocean scientists focus on the collection of long-term time series data sets. Measurements are continually provided by fixed sensors, moorings, or gathered from ships. Recently, an increase in the utilization of Autonomous Underwater Vehicles has enabled dynamic data acquisition. However, we are not utilizing the full capabilities of these vehicles. Here, we provide an extension to persistent monitoring of a designated region by providing the ability to adapt a mission to increase information gain in areas of greater scientific interest. We first develop a path planner to compute a single, repeatable path to be continually traversed by an underwater vehicle to generate a long time-series data set. The path is optimized for visiting regions of high interest, penalized for navigating through waters of large magnitude ocean currents, and is length constrained. Along this predefined path, we implement a velocity control algorithm to increase or decrease spatiotemporal sampling resolution to satisfy the sampling requirements necessary to resolve oceanic phenomena at multiple scales. The application of these tools is motivated by ongoing research to understand oceanic processes, and specifically algal bloom ecology, in southern California. The computed paths are implemented onto autonomous underwater gliders for data collection during sea trials. Experimental results from this data collection are presented to demonstrate the ability of the proposed method to perform persistent monitoring for resolving large-scale events, while simultaneously collecting high-resolution data for smaller-scale processes.

To receive ORE Seminar announcements by e-mail, please visit
http://www.ore.hawaii.edu/OE/ore_news.htm
Please join us for the coffee hour at the seminar venue a half hour before the seminar, 3:00 – 3:30 pm