Acoustic Target Motion Analysis from Novel Autonomous Systems Using Light-Weight, Low-Power Data Acquisition Systems

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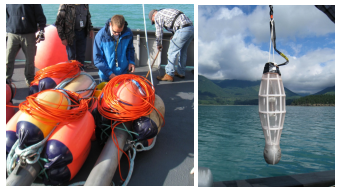
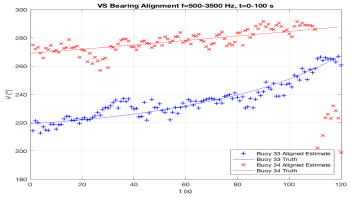
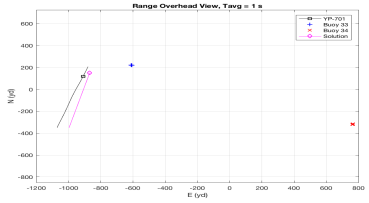
Consortium for Robotics and Unmanned Systems Education and Research







Clockwise from upper left: Surrogate distributed node (drifting buoy) with tethered acoustic vector sensor being deployed in Dabob Bay, WA; bearing estimates from two separate buoy systems; TMA target track estimation (pink track) from two separate buoy systems (blue/red crosses) as compared to actual target track (black line); future concept of mobile drifting platform (AquaQuad) deploying acoustic vector sensor.

Background and Objectives

- Previous work with small form-factor acoustic vector sensors showed capability to accurately estimate bearing to targets of interest using a single sensor.
- FY18 work showed that bearing estimates from two independent systems, each employing a single vector sensor, could be incoherently combined to develop accurate target motion analysis.
- FY18 work also made significant progress in the development of small, light-weight, low-power data acquisition (DAQ) system for real-time data processing and bearing estimation.
- Goals of FY19 work include integration of vector sensors with new DAQ system, and real-time processing strings for coordinate transformations and bearing estimation across sensor's operational band.

Approach

- Laboratory/benchtop development of DAQ system and integration of real-time processing strings will be conducted to ensure accuracy of results in controlled tests.
- Subsequent integration of underwater acoustic vector sensor with new DAQ will then test limits of lightweight, low-bandwidth tether for AquaQuad proof-of-concept.
- Concurrent work with drifting buoys will test real-time processing strings on field data collected at Dabob Bay, WA, and Monterey Bay, CA.
- Integration of low data-rate comms link onto drifting buoys will allow testing of TMA processing strings at receiving station.

Deliverables

- Surrogate distributed node (either drifting or moored) with integration of tethered acoustic vector sensor(s), and DAQ board.
- Small form-factor, low-power DAQ system for acoustic sensing that includes a data acquisition and processing board, vector sensor, and a "combined" power-data transmitting tether.
- Embedded software that supports the layers of data sampling, preprocessing, and communication.
- Receiving station to acquire data from distributed nodes, and TMA processing strings to analyze incoming data.

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FY19 Call for Proposals

Prof. Kevin B. Smith
Dept of Physics
kbsmith@nps.edu

Prof. Vlad Dobrokhodov, Dept of Mech and Aerospace Engineering
Dr. Paul Leary, Dept of Physics