

# Multidisciplinary Simulation, Estimation, and Assimilation Systems

## Seminar Series

**Dr. Brooks Reed**

Postdoctoral Associate

Hover Research Group, Department of Mechanical Engineering, MIT

### *Controller Design for Underwater Vehicle Systems with Communication Constraints*

Real-time cooperation between autonomous vehicles can enable time-critical missions such as tracking and pursuit of a dynamic target or environmental feature, but relies on wireless communications. Underwater, communication over distances beyond about one hundred meters is almost exclusively accomplished through acoustics, which bring challenges such as propagation delays, low data rates, packet loss, and scheduling constraints due to interference and limited bandwidth. These limitations make underwater pursuit missions preeminent applications of networked control. Motivated by such applications, this talk presents contributions towards multi-vehicle feedback control in the presence of severe communication constraints. The first major area of work considers the formulation and solution of new underwater multi-vehicle tracking and pursuit problems using closed-loop control. Specifically, we will discuss field experiments in range-based target pursuit at high tracking bandwidths, as well as a novel networked control methodology for pursuit of dynamic ocean features, such as fronts, using multiple vehicles and ocean model forecasts. The second area of work presents a unified formalism for multi-vehicle control and estimation with measurement, control, and acknowledgment packets all subject to scheduling, delays and packet loss, which we demonstrate in simulation and field experiments.

**Friday, Feb. 27, 2015**

**2:00PM; Rm. 5-134**

Massachusetts Institute of Technology  
77 Massachusetts Avenue  
Cambridge, MA 02139

Host: Pierre Lermusiaux

<http://mseas.mit.edu>

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0.41  
0.21  
min 2

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