



## **MMAE SEMINAR**

**Wednesday, February 7, 2007**  
**E-1 BUILDING – CRAWFORD AUDITORIUM**  
**3:30 – 4:30 PM**

### **Collaborative Exploration Using Robotic Sensor Platforms**

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#### **Abstract**

We address the problem of gathering information in complex and changing environments---such as the ocean, the atmosphere, and the circulatory system---using small sensors with limited power and range. With robots employed as moving sensor platforms, we design cooperative controllers and filters that are fundamental to a self-organized sensor network. The goal is to persistently survey the most significant area with minimum human intervention. In this seminar, we discuss both theoretical results and experiments involving autonomous underwater vehicles (AUVs) and wheeled ground robots.

We have developed a class of curve tracking methods which incorporate geometric estimates from sensor data. The methods are based on natural frames on curves. Tracking behavior is achieved by developing steering control laws which asymptotically stabilize relative equilibria. This methodology is adapted to handle platform specific dynamics such as wheeled locomotion and legged locomotion. Obstacle avoidance is also achieved. Furthermore, multiple sensor platforms can be employed to cooperatively detect and track a desired level curve in a scalar field. Such task is considered difficult for a single platform. Following similar approaches, we have also established a general method to set up coordinated motion patterns for sensor network coverage. In addition to lab experiments, we have applied the above results to underwater gliders in recent adaptive ocean sampling experiments in Buzzards Bay, MA, Great South Channel, MA, and Monterey Bay, CA. My research works have been supported by ONR, AFOSR, ARO and NASA.