DEPARTMENT OF MECHANICAL ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

"Optimal and Sensor-Driven Motion Planning for Unmanned Vehicles"

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Abstract: The ability of unmanned vehicles to plan and execute motions under nominal conditions has been critical to their success over the past decade. However, the ambitious applications envisioned for future vehicles will require an even greater degree of efficiency and autonomy to be achieved by motion planning and control algorithms.

Optimal control theory provides a powerful tool for the design and analysis of motion plans for vehicles modeled as nonlinear dynamical systems. The first part of this talk discusses the application of this theory to the "local maneuvering" problem of optimally steering a planar mobile robot between two nearby directed points under a variety of objective functions.

The second part of the talk presents various strategies used to autonomously direct the motion of a mine-hunting underwater vehicle in response to sensor data: i) using search theory to plan survey routes that account for environment-dependent sensor performance, ii) using reactive behaviors for tracking/collision avoidance with a passive sonar sensor, and iii) using combinatorial optimization techniques to revisit mine-like targets under sensing constraints.

Recognizing that motion planning alone is limited in the extent to which it can improve the performance of unmanned vehicles, the final part of the talk describes several novel actuator designs – including a pneumatic buoyancy system and moving mass attitude control system for an underwater glider, and the use of solid-state control surfaces for a small unmanned aircraft.

Bio: Artur Wolek is an ASEE Postdoctoral Fellow at the U.S. Naval Research Laboratory. His research focuses on developing motion planning algorithms to improve the efficiency and autonomy of atmospheric and ocean vehicles. He has expertise in field robotics and has been involved with the design and/or testing of numerous underwater gliders, propeller-driven underwater vehicles, and fixed-wing aircraft. He received his B.S. and Ph.D. degrees in Aerospace Engineering from Virginia Tech in 2010 and 2015, respectively.

Date: Wednesday, Feb. 28
Time: 3PM
Place: CB 122
Contact: Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments
Attendance open to all interested persons

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