Graduate Seminar Series

The Department of
Mechanical Engineering – Engineering Mechanics
Proudly Presents
Dr. Adam J Rutkowski
Air Force Research Laboratory

Dr. Rutkowski is a Research Engineer in the Alternative Navigation Section, Munitions Directorate, Air Force Research Laboratory, Eglin AFB, FL. He received his Ph.D. in mechanical engineering from Case Western Reserve University, Cleveland, OH in 2008 and was awarded a post-doctoral fellowship from the National Research Council. His primary research interests are in flying insect-inspired navigation, guidance and control and aerial wind-borne odor tracking.

Thursday, Oct. 15, 2009   3:00 – 4:00 p.m.   Room 112, ME-EM Bldg.

Bio-Inspired Odor Source Localization

An aerial vehicle capable of tracking an odor to its source in a turbulent environment could be used to locate anything emitting an odor, such as pipeline breaks, hazardous waste, or improvised explosive devices. Odor tracking is a challenging problem because turbulence within the odor plume creates a filamentous or patchy structure. Thus, an odor tracking strategy based on following a gradient of odor concentration is inefficient. Since many animals use efficient odor tracking strategies to locate food and mates, these animals are studied to develop a fundamental understanding of the underlying behavioral mechanisms. These behavioral mechanisms serve as inspiration for odor tracking algorithms.

The odor tracking strategy presented here is inspired by the three-dimensional pheromone tracking behavior of the tobacco hornworm moth, *Manduca sexta*. The velocity of the odor tracking agent is decomposed into a component normal to the wind and a component aligned with the wind. These two velocity components are governed by simple rules based on the measured odor concentration. Using these rules, the motion of the odor tracking agent has several characteristics that are similar to real moths, including horizontal and vertical zigzagging, and a tendency to remain near the odor source without relying on vision to identify the source.