



**The Center for Control, Dynamical Systems, and Computation  
University of California at Santa Barbara  
Fall 2006 Seminars  
Presents**

## **Nonlinear Dynamics and Control of Supercavitating Bodies**

**by Eyad H. Abed**

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### **Abstract:**

The dynamics and control of nonlinear models of supercavitating vehicles are considered. Cavitation is the physical phenomenon of bubble formation in a liquid subject to local pressure variations. Supercavitation is an extreme form of cavitation in which a single bubble almost completely envelops the moving vehicle. Due to the reduced drag forces associated with a supercavitating body, dramatic speed increases can be realized through introduction of supercavitation. Cavitation occurs when a certain quantity, the cavitation number, is below a critical value. However, to achieve supercavitation and controlled vehicle dynamics, a device known as a cavitator is incorporated into the vehicle nose to introduce a gas around the vehicle at speed. Moreover, the system dynamics involve significant nonlinear forces as well as model uncertainty, leading to interesting control problems. In this talk, we touch on findings related to bifurcations, control, and absolute stability for the dive-plane dynamics of supercavitating vehicles.

This talk represents joint work with Mr. Guojian Lin (Ph.D. student) and Dr. Bala Balachandran of the University of Maryland.

### **About the Speaker:**

Eyad Abed is Professor of ECE and Director of the Institute for Systems Research at the University of Maryland. His research focuses on nonlinear control, especially on problems involving bifurcations and chaos. He has studied applications in electric power systems, mechanical and aerospace systems, and communication networks. He is a Fellow of the IEEE.

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