**Joint Dept. Mechanical Engineering /
Collaborative Center of Control Science Seminar**

Modeling Techniques for Control of Cavity Flow Oscillations

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Room 2027 Robinson Laboratory

Modern control theory has yielded many powerful techniques for stabilizing and controlling dynamical systems.! However, in order to use most of these techniques, one requires a model of the system, in the form of a system of ordinary differential equations.! For fluid flows, the governing equations are well known (the Navier-Stokes equations) but are too complex to apply today's techniques of control analysis and synthesis.! In order to apply these tools, simpler models are needed, that describe the essential features of the flow to be controlled, while neglecting higher-order effects, such as details of a turbulent flow.

This talk discusses several techniques for modeling the oscillating flow past a rectangular cavity, a canonical flow that has received renewed interest, through recent efforts to control the flow past aircraft weapons bays.! Both linear and nonlinear models are obtained, using techniques from linear stability theory, Proper Orthogonal Decomposition (POD) and Galerkin projection, and balanced truncation. A new method for computing balanced truncations for large problems is also presented, and this method may be viewed as an improvement on the standard POD/Galerkin procedure.