The Center for Control, Dynamical Systems, and Computation
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Presents

Passivity as a Design Tool for Cooperative Control

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Abstract:

In this talk we formulate a cooperative control problem in which the objective is to steer the differences between output variables of the agents to a prescribed compact set via distributed feedback rules. This formulation encompasses several formation stabilization and synchronization problems as special cases. When the information flow between neighboring members is bidirectional, we show that the closed-loop structure inherits the passivity properties of its individual components. By exploiting this structure we develop a feedback design methodology and proceed to study the robustness of the resulting feedback laws in the presence of a time-varying communication topology. The next topic discussed is an adaptive design strategy for the agents when the reference velocity of the group is only available to a leader. The final problem is to accommodate complex agent dynamics (both rigid bodies and flexible structures) with the help of their inherent passivity properties.

About the Speaker:

Murat Arkat received his BS at Bogazici University in Istanbul. He went on to complete both his MS and PhD at the University of California at Santa Barbara in 1997 and 2000, respectively. He joined the Rensselaer Polytechnic Institute in 2001, where he is currently an associate professor within the Electrical, Computer and Systems Engineering Department. Murat received the NSF Career Award in 2003 and the Donald P. Eckman Award in 2006. His research interests are nonlinear control theory and applications. His primary objective is to develop design tools that exploit inherent system structure and nonlinearities in feedback systems. Research topics that are currently being studied by his group include: distributed control for networks of dynamic systems, controllers and observers for fuel cell power systems, nonlinear state estimation and output feedback design, and robustness in nonlinear control.