**The Center for Control, Dynamical Systems, and Computation**
**University of California at Santa Barbara**
**Spring 2008 Seminar Series**
**Presents**

# Information Flows in Cooperative Networked Control Systems


## Girish Nair

**University of Melbourne, Australia**


**Thursday, June 19, 2008 2:00-3:00pm ESB 2001**


### Abstract:

The control-theoretic equivalent of Ahlswede et. al's network information theory is the problem of determining the rates at which information must flow between control system components in order to be able to cooperatively achieve closed loop stability. This talk considers the case of a linear, time-invariant plant with multiple sensors and actuators that communicate with each other over a network of directional digital channels with finite bit rates. A necessary and almost sufficient condition for determining uniform stabilizability is derived, in terms of the feasibility of a set of linear inequalities in the unstable eigenvalues of the plant and the bit rates of the channels. This provides an exact characterization, up to boundary points, of the region of all stabilizing channel bit rate vectors. The auxiliary variables in this criterion have a natural interpretation as the effective rates of information flow associated with each unstable mode, suggesting a fluid flow interpretation of information. When channel rates are set to either zero or infinity, this agrees with a classical result on decentralized stabilizability under linear, time-varying control.


### About the Speaker:

Dr. Girish Nair is an Associate Professor in the Department of Electrical and Electronic Engineering at the University of Melbourne, Australia, with research interests in the overlap between feedback control and communications. He is a co-recipient of a 2006 Outstanding Paper Prize of the Society for Industrial and Applied Mathematics (SIAM), and the Best Theory Paper Prize at the UKACC International Control Conference in Cambridge, UK, 2000. He serves as an associate editor for SIAM Journal on Control and Optimization, and is an editorial board member of IET Control Theory & Applications.