SFSU School of Engineering Seminar

"A Robust Control Approach to Understanding Nonlinear Mechanisms in Shear Flow Turbulence"

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1:10 - 2 pm
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Synopsis: *Turbulence is undesirable in many applications because it increases drag, which leads to decreased fuel efficiency. This work takes a control theoretic approach to better understand wall turbulence. We are motivated by the notion that developing further insight into the underlying mechanisms will enable better control design. In plane Couette flow, it is well known that the laminar profile is linear while the turbulent velocity profile is a blunted "S" shape. However, the underlying mechanisms involved in creating this blunted profile remain unclear. In this talk, we present a 2D/3C model of plane Couette flow that captures important nonlinear features of turbulence, while maintaining the linear mechanisms that have been shown to be necessary to maintain turbulence. We place this model in a robust control framework and where it is shown to rigorously connect experimental observations of streamwise coherence to the shape of the mean turbulent velocity profile. This model and framework also allow us to isolate the mechanisms responsible for profile blunting, which is directly connected to higher drag.*

Speaker Bio: Dennice Gayme is a postdoctoral scholar in the Computing and Mathematical Sciences Department at the California Institute of Technology. She received her doctorate in Control and Dynamical Systems in 2010 under the supervision of John C. Doyle and Beverley J. McKeon, also at the California Institute of Technology where she was a recipient of the P.E.O. scholar award in 2007 and the James Irvine Foundation Graduate Fellowship in 2003. She received a Master of Science in Mechanical Engineering from the University of California at Berkeley in 1998. Prior to her doctoral work she was a Senior Research Scientist in the Systems and Control Technology and Vehicle Health Monitoring Groups at Honeywell Laboratories from 1999-2003. Dennice's research interests are in the study of large-scale interconnected systems with an emphasis on renewable and efficient energy systems.

Refreshments will be served – come join us!

For inquiries, please contact Dr. Kwok Siong Teh at ksteh@sfsu.edu.