Hands-on Demonstrations by Workshop Participants

16:45 – 18:15 on Friday June 22, 2012

Rooms 14-16-18 at International Village, Northeastern University, Boston

Hands-on demonstrations by workshop participants will take place on the first day of the workshop. This one-of-a-kind event includes demonstrations of portable experimental set-ups, hands-on software, video-uplinkable real-time experiments, with the purpose to engage the participants actively in the experimental/interactive work related to time-delay systems research.

The following demonstrations are scheduled in parallel:

Signal shapers in control of Flexible 2020 Aircraft

Presenters: Vladimir Kucera, Martin Hromcik, Tomas Vyhlidal

*DCE: - Department of Control Engineering, Czech Technical University in Prague,
Technicka 2, Czech Republic*

The application of time delays in control algorithm of the novel concept of Flexible Aircraft designed in the project ACFA 2020 (funded by the European Commission http://www.acfa2020.eu/) will be presented in a form of simulation results. Time delays are used in signal shaping of pilot's commands in order to pre-compensate flexible modes of wings and the hull of the aircraft during maneuvers.

Sampled-Data Optimal Signal Processing

Presenter: Masaaki Nagahara

Kyoto University, Japan

In this presentation, we will show the concepts of signal processing based on sampled-data H-infinity optimal control and give MATLAB demonstrations of filter design, simulation of signal reconstruction, and audio and image processing. Also, we will present an iPhone application for audio designed by the proposed signal processing method.

Inverted Pendulum Stabilization with Two-Delays and CTCR Paradigm

Presenters: Qingbin Gao, Rudy Cepeda-Gomez, Zhenyu Zhang, Nejat Olgac

*ALARM Lab - Department of Mechanical Engineering, University of Connecticut,
Storrs, CT 06268, USA*

A Quanser IP02 under-actuated inverted pendulum is stabilized using full state feedback and LQR gains. Except we deploy two rationally independent delays in the feedback lines. Analytically determined stability bounds in the domain of the delays are tested. The experiments validate the results of the CTCR Paradigm (Cluster Treatment of Characteristic Roots). Some nonlinear effects especially in the form of stiction are also considered.

Homicidal Chauffeur Game using Feedback with Multiple Time Delays

Presenters: Qingbin Gao, Rudy Cepeda-Gomez, Nejat Olgac

ALARM Lab - Department of Mechanical Engineering, University of Connecticut,
Storrs, CT 06268, USA

Computer game displays the capabilities of the CTCR Paradigm (Cluster Treatment of Characteristic Roots). An auto-piloted chauffeur is chasing after an evader in an open parking lot, using a PD-type feedback control. But the feedback lines are affected by two independent delays (one in position errors, and the other one in velocity errors). The user is given the complete authority to try to save the evader from capture. CTCR declares the destiny. Combinations of the delays which render a stable dynamics (i.e., capture) which turns out to be independent of the escape strategies.