Time-Delay, Sampled-Data and Networked Control Systems

Time-delay appears naturally in many control systems. It is frequently a source of instability although, in some systems, it may have a stabilizing e
ffect. A time-delay approach to sampled-
data control, which models the closed-loop system as continuous-time with delayed input/output,
has become popular in networked control systems (where the plant and the controller exchange
data via communication network). The beginning of the 21st century can be characterized as the
"time-delay boom" leading to numerous important results. The emphasis of the seminar is on the
Lyapunov-based analysis and design for time-delay, sampled-data and networked control systems.
The course is designed around the text book:
E. Fridman, Introduction to Time-Delay Systems: Analysis and Control. Birkhauser, 2014.
http://www.springer.com/gp/book/9783319093925
Outline
1. Models of systems with time-delay and basic theory. Sampled-data and networked-control systems, traffic flow and drilling pipe models. Classification of time-delay systems, existence of solutions. LTI systems with delay: characteristic equation. Solution of linear non-homogenous equations.
2. Stability and performance analysis. Direct Lyapunov approach: Krasovskii and Razumikhim methods. An LMI approach to stability and performance.
3. Control design: predictor-based control, LQR problem. LMI approach to robust stabilization and H1 control. Systems with saturated actuators.
4. Discrete-time delay systems.
5. Sampled-data and networked control systems: a time-delay approach.

Teacher
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Schedule
January 2017, Tuesday 24th to Thursday 26th, from 9:30 to 12:30

Location:
Aula Máster del DISA, UPV