Introduction to control theory

ECTS : 6

Volume horaire : 28

Description du contenu de l'enseignement :

This course focuses on an introduction to systems and control theory. It concerns the study of a dynamical system affected by an input signal which we aim at designing to modify the system behavior. It will focus on nonlinear Ordinary Differential Equations (ODEs), but will also include an introduction to the control of Partial Differential Equations.
We will start by reviewing stability notions of nonlinear ODEs (Lyapunov theorems, sufficient and necessary stability conditions, spectral criteria for linear systems, Input-to-State Stability,…). Then, we will study the concepts of controllability/observability of dynamical systems and move to stabilization of equilibrium points, with the presentation of a few control design methodologies (backstepping, forwarding, optimal control, Lie Bracket methods...).
The class will be concluded by a few session on the extension of these concepts to infinite-dimensional linear control systems, namely, Partial Differential Equations. Examples will include in-domain and/or boundary control of the heat equation and the wave equation.
The course will be taught at École des Mines.

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