RESEARCH MASTER INTERNSHIP

Department of Mathematics, Informatics, Automatics

Supervisor :

Joel Bordeneuve-Guibé

Location : Toulouse, campus ENSICA

Tél. : 05 61 33 91 24

E-mail : joel.bordeneuve@isae.fr

Robust LPV control of a flexible structure

Robust control of flexible structures is still a challenging problem, especially when some flexible modes are either badly modeled or time varying. A classical way of addressing the control problem consists in considering these flexible modes as uncertainties, thus allowing including them explicitly in the process model.
Linear Fractional Transformations (LFTs) are a general, flexible and powerful way to represent uncertainty in systems. The idea of using LFT-based uncertainty descriptions (denoted as Linear Fractional Representations (LFRs)) is to keep separated what is known from what is unknown by expressing the process model as a feedback connection of a nominal plant and the uncertainty description. An LFR defines a set of process models and the real process is assumed to lie inside this model set.

This internship addresses the real time control of a torsional plant (http://www.ecpsystems.com/dynamics_torplant.htm). The torsional mechanism represents many physical plants including rigid bodies, flexibility in drive shafts, gearing and belts, and coupled discrete vibration with actuator at the drive input and sensor collocated or at flexibly coupled output (non-collocated). Thus the plant models may range from a simple double integrator to a fourth order case with two lightly damped poles and either two or no zeros.

The main steps of the internship are:

- The development and the validation of an appropriate LFR describing the whole system with its uncertainties
- The design of a suitable LPV controller matching the desired performances
- The real time implementation of the controller on experimental plant
- The analysis of the obtained results and the comparison with former controllers (linear controller, adaptive controller, etc.)

10 % Theoretical Research	60 % Applied Research	30 % Experimental Research

Possibility to go on a Ph.D.: o No o Yes

APPLICANT PROFILE

Knowledge and required level :

Modern and Robust Control

Matlab/Simulink