Optimal Control

Integrated Master Degree in Mechanical Engineering

Scientific Area of Control, Automation, and Industrial Informatics
Spring Semester 2017/2018

Laboratory Projects

Upon completion of the initial phases of the project that each group selected, where dynamical models for the underlying systems were developed, it is now required to formulate and solve optimal control and estimation problems. Then, the solutions must be validated in simulation. The groups able to complete successfully this phase can choose to pursue the validation of the solutions proposed in real laboratorial prototypes.

Phase III

The following tasks should be accomplished in the third phase of this project:

i) Identify partial goals of the control system to be developed

For each goal:

1. Identify the inputs, outputs, and propose a functional to be optimized;
2. Design an (sub-) optimal controller;
3. Check that the solution works, in the simulator developed in phases I and II, both for the linearized versions and for the nonlinear model;
4. Check if all state variables are available. If that is not the case, formulate and solve an (optimal) observer/estimator;
5. Check that the controller/observer solution works, again for both linear and nonlinear versions;
6. Verify its performance, under realistic disturbances (noise or external). Ideally the disturbances should match those in the real system/sensor package;

ii) Discuss and implement the conditions to switch among goals of the project.

A written report, three slides in Powerpoint, and Matlab/Simulink (version 2014a) scripts should be delivered upon conclusion of this phase.

February 2018