

Hydrogen fast-filling modeling, optimisation and control : simulation files

Installing the CasAdi library

Uncompress the SimulationFiles.zip archive in a folder.

1. Go to : <https://web.casadi.org/get/> and get the latest Casadi version
2. Put the resulting folder (named with "casadi-windows-matlabR2016a-v3.5.5") in the uncompressed folder, in the "Config" sub-folder

Simulations and optimisation files

Please note that not all Matlab files used for the report are provided here. Indeed, lots of testing was performed, and many files were solely developed for plotting purposes, and thus are not interesting in themselves.

In order to run a simulation or an optimisation, simply choose the file of interest and run it. Please not that some of the optimisation procedure are quite time consuming (at least 10-15min for the longest, depending on the computer on which it is run).

AdaptivePID_Simulation.m (Simulation file)

Simulation procedure used to simulate the adaptive IPID controller, itself composed of several simple IPID controllers that have been trained using the *I_PID_Trainer.m* optimisation file in advance. Those are stored in the *Adaptive_PID.xls* file.

BilinearInterpolation.m (function)

Performs a bilinear interpolation from a 2D table, given the actual property to interpolate in, both grid for each of the two dimensions and the query point.

ControlLaw.m (function)

Given a certain variable "flag", this returns the input of a P, PI, PID or IPID controller. Used throughout all simulation and optimisation files.

Dynamics.m (Casadi function)

Dynamics function definition for a Casadi use. It is used throughout all optimisation-based simulation files.

Dynamics_Sim.m (function)

Dynamics function definition for simple simulation use, without any optimisation (thus without Casadi variables).

FreeControlInput.m (Optimisation file)

Optimisation procedure for finding an optimal control input law.

I_PID_Trainer.m (Optimisation file)

Optimisation procedure for finding the optimal coefficients for both the I and PID controllers : K_p , K_i2 , K_d and K_i1 .

OCP_Bounds.m

Provides bounds for the optimisation problems variables. It expects “flag” variables as input because the optimisation bounds are different for each type of optimisation problem.

Parameters.m (setup file)

Defines all physical parameters of the system. It is used throughout all simulation files.

PID_Trainer.m (Optimisation file)

Optimisation procedure for finding the optimal PID coefficients K_p , K_i and K_d .

RK4_Simulation.m (Simulation file)

Simulation procedure used for performing simple system simulation, with fixed parameters and constant input.

Tables.m (function)

Simply loads the tables used in the simulation and optimisation files.