Laboratoire de Conception et d'Intégration des Systèmes

SpeechPizza

Wednesday, 29 November 2023
12:00 - 13:00, D011
lcis.grenoble-inp.fr

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(PhD candidate within CO4SYS team working with Ionela Prodan and Laurent Lefèvre)

Title: PSO-Based Adaptive NMPC for Uranium Extraction-Scrubbing Operation in Spent Nuclear Fuel Treatment Process

Abstract: This work addresses the particularities of adaptive optimal control of the uranium extraction-scrubbing operation in the PUREX (Plutonium, Uranium, Reduction, EXtraction) process. The process dynamics are nonlinear, high dimensional and have limited online measurements. In addition, the process mathematical model is not explicitly available; analysis and developments are based on a simulation program called PAREX, which was validated with laboratory and industrial data. The control objective is to stabilize the process at a desired solvent saturation level, guaranteeing constraints and handling disturbances. The developed control strategy relies on optimization-based methods for computing control inputs and estimates, i.e., Nonlinear Model Predictive Control (NMPC) and Nonlinear Moving Horizon Estimation (NMHE). The designs of these two associated algorithms are tailored for this process's particular dynamics and are implemented through an enhanced Particle Swarm Optimization (PSO) to guarantee constraints satisfaction. Software-in-the-loop simulations using PAREX show promise for experimental validation.

Bogdan Gheorghe bogdan.gheorghe@upb.ro
(PhD candidate at UPB (University Politehnica of Bucharest), Romania, in collaboration with LCIS)

Title: On complexity reduction in a variable terminal set setpoint-tracking MPC scheme

Abstract: Model predictive control (MPC) is one of the most popular control techniques due to the many variations and overall robustness. Its capacity to account for constraints and costs explain its popularity in control.
This work proposes an enhancement to the feasible-reference tracking MPC formulation to reduce its computational cost. The improvements come from avoiding to explicitly use the vertex-based representation of the variable terminal set in testing its inclusion in the constraint set. We considered both polytopic and zonotopic formulations. For the later we have also proposed a positive invariant zonotopic approximation of the maximal positive invariant set.

The science behind pizza!

The volunteers for giving a short talk the next editions should not hesitate to contact asap ionela.prodan@lcis.grenoble-inp.fr.