Course on LMIs for optimization and control

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http://www.eeci-igsc.eu/venues/

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Description

This is a course for graduate students or researchers with a background in linear control systems, linear algebra and convex optimization.

Outline and lecture notes

The beginning of the course (mathematical background on convex cones, semidefinite optimization, moments and sums of squares) closely follows the lecture notes:

- D. Henrion. Optimization on linear matrix inequalities for polynomial systems control. International Summer School of Automatic Control, Grenoble, France, September 2014.

Then the course focuses on:

- polynomial optimization, see these slides and notes;
- maximal positively invariant sets, see these slides and notes;
- polynomial optimal control, see these slides and notes.

The material on polynomial optimal control and HJB inequalities can be found in this document:

- D. Henrion, E. Pauwels. Linear conic optimization for nonlinear optimal control. Chapter 10 on pages 121-134 in S. Ahmed, M. Anjos, T. Terlaky (Editors). Advances and Trends in Optimization with Engineering Applications. MOS-SIAM series, SIAM, Philadelphia, 2017.

The material on approximating the maximal positively invariant sets of polynomial control systems can be found in this document:

- M. Korda, D. Henrion, C. N. Jones. Convex computation of the maximum controlled invariant set for polynomial control systems. SIAM Journal on Control and Optimization, 52(5):2944-2969, 2014.

Illustrative Matlab codes using YALMIP and GloptiPoly can be found here: demo1.zip, demo2.zip, demo3.zip.

Homeworks and exam

Homeworks are given during the course. A written examination can be organized. Certificates of attendance are granted upon completion of the course with less than 3 hours' absence.