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Hyperplane arrangements and their use in control problems

Colloquium talk by
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Abstract

Sets have become a mainstay of control theory. They are applied i.a. in **constrained optimization**, **robust estimation** and **stability analysis**. Nonetheless, specific issues still remain unresolved, e.g.: insufficient flexibility in representing non-convex regions and numerical difficulties at large dimensions.

One way to tackle these issues is via the systematic use of **combinatorial notions like hyperplane arrangements**. These can be used to efficiently describe non-convex domains and shed light on the underlying structure of sets appearing in constrained optimization problems.

Well-suited applications for this approach are: i) **fault tolerant control** schemes which require exact fault detection guarantees; ii) **anti-collision and obstacle avoidance** constraints in **multi-agent formulations**; iii) conditions for exact and approximate **covering of a feasible region**.

With the help of **mixed integer programming** these problems can be put into a manageable form and solved via off-the-shelf tools.

Curriculum Vitae

Florin Stoican has received his Electrical Engineering Degree (Systems and Applied Informatics Specialization) from the Faculty of Automatic Control and Computers, "**Politehnica**" **University of Bucharest**, Romania. He has obtained his PhD in Control Engineering at the Department of Automatic Control, **Ecole Supérieure d'Electricité (SUPELEC)**, Gif sur Yvette, France (École doctorale STITS of University Paris-Sud XI). He was also a postdoctoral research fellow at the Department of **Engineering Cybernetics, NTNU Trondheim**, Norway.

Currently he is **assistant professor at "Politehnica" University of Bucharest** in the Department of Automatic Control and Systems Engineering.

His main interest is the **fault tolerant control of dynamical systems** through the prism of set theoretic elements. Current work involves further research in **set theory** and **constrained optimization** problems.