Modeling and Control of Hybrid Systems

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Abstract

Hybrid systems are heterogeneous systems that exhibit both continuous dynamics (difference or differential equations) and discrete dynamics (automata, logic transitions and switching, piecewise linear mappings, quantized commands, etc.). In this talk we introduce a modeling framework for hybrid systems that is directly tailored to the synthesis of stabilizing model predictive controllers based on combinatorial optimization and multiparametric programming. We show that hybrid optimal control laws can be computed in closed-form and that they are piecewise affine state-feedback functions, a very attractive feature for fast-sampling applications. We also propose the combined use of convex programming and constraint satisfaction techniques as an efficient approach to solve complex optimal control problems for hybrid systems. The effectiveness of the techniques will be illustrated through a few industrial case studies.

References

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[2] A. Bemporad and N. Giorgetti. A SAT-based hybrid solver for optimal control of hybrid systems. In R. Alur and G.J. Pappas, editors, *Hybrid Systems: Computation and Control*, Lecture Notes in Computer Science. Springer-Verlag, 2004.

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Software Tools

Software tools related to the contents of the talk are available for download at http://www.dii.unisi.it/hybrid/tools.html