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Viewing Hybrid Systems as Products of Control Systems and Automata

R. L. Grossman and R. G. Larson
University of Illinois at Chicago

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Abstract

The purpose of this note is to show how hybrid systems may be modeled as products of nonlinear control systems and finite state automata. By a hybrid system, we mean a network of consisting of continuous, nonlinear control system connected to discrete, finite state automata. Our point of view is that the automata switches between the control systems, and that this switching is a function of the discrete input symbols or letters that it receives. We show how a nonlinear control system may be viewed as a pair consisting of a bialgebra of operators coding the dynamics, and an algebra of observations coding the state space. We also show that a finite automata has a similar representation. A hybrid system is then modeled by taking suitable products of the bialgebras coding the dynamics and the observation algebras coding the state spaces.

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