

NAG 2-513
IN-63-CR
ABS. ONLY
198601
2P

Viewing Hybrid Systems as Products of Control Systems and Automata

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February, 1992

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.

Acknowledgments

Robert Grossman's research was supported in part by NASA grant NAG2-513, NSF grant DMS-9101089, and the Laboratory for Advanced Computing.

Status

Proceedings of the 31st IEEE Conference on Decision and Control, IEEE Press, 1992, to appear.

(NASA-CR-194792) VIEWING HYBRID
SYSTEMS AS PRODUCTS OF CONTROL
SYSTEMS AND AUTOMATA Abstract Only
(Illinois Univ.) 2 p

N94-23300

Unclass

G3/63 0198601

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