AALBORG UNIVERSITY

Center for Indlejrede Software Systemer

PhD defence

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Automation & Control
Department of Electronic Systems

Time & Place

Monday, October 5, 2009 at 13.00
Aalborg University, Niels Jernes Vej 14, 4-111

Title

Automated Controller Synthesis for non-Deterministic Piecewise-Affine Hybrid Systems

Abstract

Motivated by the emerging field of satellite formation control and in particular the challenge of designing fault tolerant controllers for these formations this thesis presents an automatic control synthesis method which can be used to design a satellite formation control strategy able to handle actuator faults.

Specifically, a novel approach to automated controller synthesis for Piecewise-Affine Hybrid Systems (PAHS) is presented, which can generate controllers for systems with non-deterministic discrete inputs such as faults. The method builds on control to facet properties of affine systems on polytopes to create a discrete game abstraction of the PAHS which is converted to a timed game. If a feasible a winning strategy for the game exists the resulting strategy is refined into a piecewise-affine control law.

The method has been implemented in a Matlab toolbox which automatically can compute controllers for a PAHS with a corresponding reach/avoid/stay specification by using UppAal Tiga to specify and find winning strategies for the discrete game abstraction.

Assessment Committee

Professor Jakob Stoustrup, Aalborg University, Denmark (chairman)
Professor Karl-Erik Årzén, Lund University, Sweden
Associate Professor Maurice Heemels, Technische Universiteit Eindhoven, The Netherlands

Supervisors

Professor Thomas Bak, Aalborg University, Denmark
Associate Professor Jan Dimon Bendtsen, Aalborg University, Denmark

Moderator

Associate Professor Anders la Cour-Harbo, Aalborg University, Denmark

After the defence there will be a reception in C3-205

All are welcome!