Oded<sub>o</sub> Maler (Ed.)

## Hybrid and Real-Time Systems

International Workshop, HART'97 Grenoble, France, March 26-28, 1997 Proceedings



## Table of Contents

Tutorial: Verifying Liveness Properties of Reactive Systems Amir Pnueli	1
Tutorial: The Lyapunov Method Zvi Artstein	2
Relating High-Level and Low-Level Action Descriptions in a Logic of Actions and Change <i>Erik Sandewall</i>	3
A New Algorithm for Discrete Timed Symbolic Model Checking Juergen Ruf and Thomas Kropf	18
State Clock Logic: A Decidable Real-Time Logic Jean-François Raskin and Pierre-Yves Schobbens	33
From Quantity to Quality Thomas A. Henzinger and Orna Kupferman	48
Short Presentations:	
Verifying Periodic Task-Control Systems Vlad Rusu	63
A Case Study in Timed CSP: The Railroad Crossing Problem Luming Lai and Phil Watson	69
Analysis of Slope-Parametric Hybrid Automata Frédéric Boniol, Augusto Burgueño, Olivier Roux and Vlad Rusu	75
Comparing Timed C/E Systems with Timed Automata R. Huuck, Y. Lakhnech, L. Urbina, S. Engell, S. Kowalewski and J. Preussig	81
Design Tools for Hybrid Control Systems M.S. Hajji, J.M. Bass, A.R. Browne and P.J. Fleming	87
Invited Talk: On-line, Reflexive Constraint Satisfaction for Hybrid Systems: First Steps Michael S. Branicky	93
Invited Talk: Hybrid Control Issues in Air Traffic Management Systems Shankar Sastry	108

Multiobjective Hybrid Controller Synthesis John Lygeros, Claire Tomlin and Shankar Sastry	109
Modeling a Time-Dependent Protocol Using the Circal Process Algebra Antonio Cerone, Alex J. Cowie, George J. Milne and Philip A. Moseley	124
Using HYTECH to Verify an Automotive Control System Thomas Stauner, Olaf Mueller and Max Fuchs	139
Safety Verification for Automated Platoon Maneuvers: A Case Study Ekaterina Dolginova and Nancy Lynch	154
Verifying Hybrid Systems Modeled as Timed Automata: A Case Study Myla Archer and Constance Heitmeyer	171
Using an Object-Oriented Methodology to Bring a Hybrid System from Initial Concept to Formal Definition David Sinclair	186
A Digital Real-Time Simulator for Rail-Vehicle Control System Testing Peter Terwiesch, Erich Scheiben, Anders J. Petersen and Thomas Keller	199
Hybrid Flow Nets for Hybrid Processes Modeling and Control Jean-Marie Flaus and Guy Ollagnon	213
Representation of Robust and Non-robust Solutions of Nonlinear Discrete-Continuous Systems Boris M. Miller	228
Controller Design of Hybrid Systems Stefan Pettersson and Bengt Lennartson	240
Invited Talk: What Can We Learn from Synchronous Data-Flow Languages? Paul Caspi	255
Invited Talk: Verification of Real Time Chemical Processing Systems Adam L. Turk, Scott T. Probst and Gary J. Powers	259
Functional Specification of Real-Time and Hybrid Systems Olaf Mueller and Peter Scholz	273

VIII

Relating Time Progress and Deadlines in Hybrid Systems Sébastien Bornot and Joseph Sifakis	286
Semantics and Verification of Extended Phase Transition Systems in Duration Calculus Xu Qiwen	301
Weak Refinement for Modal Hybrid Systems Carsten Weise and Dirk Lenzkes	316
Robust Timed Automata Vineet Gupta, Thomas A. Henzinger and Radha Jagadeesan	331
Data-Structures for the Verification of Timed Automata Eugene Asarin, Marius Bozga, Alain Kerbrat, Oded Maler, Amir Pnueli and Anne Rasse	346
Synthesizing Controllers for Hybrid Systems Deepak Kapur and R.K. Shyamasundar	361
Control Synthesis for a Class of Hybrid Systems Subject to Configuration-Based Safety Constraints Michael Heymann, Feng Lin and George Meyer	376
Short Presentations:	
Hybrid Dynamic Programming Wolf Kohn and Jeffrey B. Remmel	391
Invariance Principle in Hybrid Systems Modeled by Mixed Mappings Toshimitsu Ushio	397
Hybrid Systems Described by the Complementarity Formalism A.J. van der Schaft and J.M. Schumacher	403
Generalized Linear Complementarity Problems and the Analysis of Continuously Variable Systems and Discrete Event Systems Bart De Schutter and Bart De Moor	409
Invited Talk: SHIFT: A Language for Simulating Interconnected Hybrid Systems Pravin Varaiya	415
Author Index	417

IX