Cymer Center for Control Systems and Dynamics

Specification and Optimization of Interconnected Switched Systems with Applications to Robotic Marionettes

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When specifying and designing controllers for complex systems, high-level languages are needed in order to manage the complexity. However, the price one has to pay for this abstraction-level is a lack of physical details that must be provided at a lower level. We address this problem within the context of robotic marionettes by proposing a so-called motion description language for specifying and encoding autonomous puppetry plays in a manner that is faithful to the way puppetry choreography is currently formulated. In particular, what results is a formal language whose strings, when parsed by a dynamical system (the puppet) produces optimized, hybrid control laws corresponding to strings of motions, locations, and temporal durations for each agent. And, even though the global performance objectives are centralized, by locally optimizing (based on so-called team theory for min-max optimization) the timing of the different movements, entire plays can be performed. Experimental results illustrate the operation of the proposed method.

Magnus Egerstedt was born in Stockholm, Sweden, and is an Associate Professor in the School of Electrical and Computer Engineering at the Georgia Institute of Technology, where he has been on the faculty since 2001. He also holds an adjunct appointment in the Division of Interactive and Intelligent Computing with the College of Computing at Georgia Tech and a visiting position with the School of Computer Science and Communication at the Royal Institute of Technology, Stockholm, Sweden. Magnus Egerstedt received the M.S. degree in Engineering Physics and the Ph.D. degree in Applied Mathematics from the Royal Institute of Technology in 1996 and 2000 respectively. He also received a B.A. degree in Philosophy from Stockholm University in 1996. He spent 2000-2001 as a Postdoctoral Fellow at the Division of Engineering and Applied Science at Harvard University. Dr. Egerstedt's research interests include optimal control as well as modeling and analysis of hybrid and discrete event systems, with emphasis on motion planning, control, and coordination of mobile robots, and he serves as an Associate Editor for the IEEE Robotics and Automation Magazine and the IEEE Transactions on Automatic Control. He is the director of the Georgia Robotics and Intelligent Systems Laboratory (GRITS Lab) and the Associate Director of Research at Georgia Tech's Center for Robotics and Intelligent Machines. Magnus Egerstedt is a Senior Member of the IEEE, he received the ECE/GT Outstanding Junior Faculty Member Award in 2005, and the CAREER award from the U.S. National Science Foundation in 2003.