

2010-03-31

PV35

Modeling, Control, and Optimization of Discrete Event Systems

Modellering, styrning och optimering av händelsebaserade system

Background

The increased rate in which new products are introduced puts high requirements on the production system. One requirement is that the production system should be reconfigurable such that the production system reaches full production capacity shortly after a new product is introduced. This implies high demands on the control system, since the control code is typically generated manually for a specific product and such approach is time-consuming and error-prone and thus costly. One approach to decrease both time consumption and decrease the number of errors in the control code is to use a model-based approach to generate the control code. A production system consists of many sub-systems where the coordination between the sub-systems might be modeled as a discrete-event system. In this course the focus is on using a model-based framework to simulate, analyze, optimize and execute distributed discrete event systems.

Contents

The course covers the recent research in control of discrete event systems, mainly modeling and synthesis aspects. Several modeling frameworks are discussed, such as automata, extended finite automata, formal languages, Statecharts, Petri nets. Analysis and synthesis are performed using the Supervisory Control Theory framework. The use of formal methods in automation. Optimization is based on a time optimization problem formulated as A* and mixed integer linear programming problems. Introduction to flow simulation techniques.

- **Course leader:** Knut Åkesson, Department of Signals and Systems, Chalmers
- **Course material:** Introduction to Discrete Event Systems, Chapter 1-5, C.G. Cassandras, S. Lafortune, Kluwer Academic Publishers, and selected papers
- **Time:** 2010
- **Earnings:** 7,5 credits (7,5 hp)
- **Language:** English
- **Intended participants:** ProViking graduate students, graduate students in automation, control, electrical engineering and computer science as well as engineers from industrial companies.

Organization

- The first meeting, April 12-14 2010, Chalmers
- The second meeting, May 17-19 2010 (preliminary, to be decided on the first meeting), Chalmers
- The third meeting, three days in June 2010 (to be decided on the first meeting), Chalmers

Prerequisites

Familiar with mathematical notation and proof techniques. Programming skills.

Examination

Home assignments that consist of theoretical problems and programming assignments. Written exam. Grading: passed, failed.

How to sign up for the course

Contact Knut Åkesson, knut@chalmers.se, 031-772 37 17.