



NICTA Course Module Modelling, Verification and Control of Real-Time Systems

Dr. Franck Cassez

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NICTA course modules build toward meeting the course requirement which is part of PhD expectations at certain partner universities, and which forms a part of a NICTA Enhanced PhD program.

- Modules are designed for short intensive delivery, usually over a few days.
- A module may be coordinated by a member of academic staff from a university, by a NICTA researcher, or by a visiting researcher to NICTA or an associated university.
- Modules are designed so that coordinators do not have to commit to regular lecture times spanning an entire session.
- A typical module requires a commitment of 50 hours of work, 15-20 contact hours, reading, assignments and assessment. Such a module meets approximately one-third of the requirements for a postgraduate masters (or higher) level course.
- With the approval of Heads of School modules may accumulate to satisfy coursework requirements. Postgraduate Coordinators can advise on the precise administrative processes by which this is achieved.

Modelling, Verification and Control of Real-Time Systems

Background

Real time systems form the basis on which to build many embedded systems which have to interact with the external world. They also are employed for many engineering systems in telecommunications, signal processing, control, robotics, mechatronics etc. Predicting their behaviour is an essential part of their design.

Coordinator

Dr. Franck Cassez (<http://www.irccyn.fr/franck/>)

Course Description

In this short course I will describe models (timed and hybrid automata), algorithms (model-checking) and tools (UPPAAL, UPPAAL-TiGA, PHAVer) for the verification and control of timed systems. The short course will cover fundamental theoretical results about timed and hybrid automata, recent advances in the field and also present state-of-the-art tools for the analysis of timed systems. It will thus provide a solid basis for students who are interested in theoretical aspects and/or software engineering applications of this area.

Brief Course Outline

1. Modeling and Verification of Real-Timed Systems
 - Timed Automata (TA)
 - timed language and TA
 - semantics of TA
 - fundamental verification problems (language inclusion, reachability)
 - Timed Temporal Logics
 - model-checking of TA against TCTL
 - Extensions of Timed Automata
 - Rectangular Automata, semantics and expressiveness
 - Hybrid Automata (HA), semantics and expressiveness
 - Symbolic Algorithms for Verifying Timed Systems
 - Data Structures, DBM and Polyedra
 - Symbolic Algorithms, for TA, for HA
2. Fault-Diagnosis and Control of Real-Time Systems
 - Fault-Diagnosis of TA
 - Control of Timed Automata, safety and reachability control
 - Control Under Partial Observation
3. Advanced Topics
 - Cost Optimal Verification Problems, Reachability & Mean Cost
 - Cost Optimal Control Problems
 - Efficient Algorithms for safety and reachability control of TA implementation if UPPAAL-TiGA

- Implementability Problems for TA
4. Tools for the analysis of Real-Time Systems
- UPPAAL for verification TA
 - UPPAAL-TiGA for Control of TA
 - PHAVer for analysing HA

How to enrol Download a Registration Form from the Education web site <http://www.nicta.com.au/education/advancedict> and return it to:

Chrisanthy.Theodosakis@nicta.com.au

Please discuss your enrolment with your supervisor and postgraduate coordinator.

When

28 September - 1 October, 2009, 9.00 am - 5.00 pm each day

The course will be conducted in Sydney. You will be advised of the location, which will also be displayed on the web site.