PhD Lecture

In partial fulfillment of the terms for obtaining the PhD degree, Kasper Søe Luckow will give a lecture on the following subject:

Platforms and Model-Based Analyses for Real-Time Java

on Monday 24th of November 2014, 13:00, in room 0.2.13 at Selma Lagerlöfs Vej 300

Abstract:
Embedded systems play an integral role in today’s society. A subset of these, known as embedded real-time systems, are characterised by operating under timing constraints ensuring the usability or even the safety of the service they provide. Java technology has been envisioned to supersede established development technologies in this domain to accommodate the increasing demand for development of such systems. This demand requires robustness and productivity throughout the entire development process, and the complementation of techniques and tools aiding in the rigorous validation and certification processes imposed on such systems. This thesis considers two aspects: (1) Analysis tools for reasoning on the temporal behaviour of Java real-time systems at code level, and (2) time-predictable platforms with applications in resource-constrained, embedded systems allowing temporal guarantees to be provided for the hosted application.

The main body of the thesis is composed of seven papers: The first paper proposes an analysis tool that provides safe estimates of the Worst Case Execution Time while using a modularly built timing model as a Network of Timed Automata. The timing model accommodates platforms consisting of a software implementation of the Java Virtual Machine. It also presents preliminary design criteria for a timing predictable Java Virtual Machine, which form the basis for the contributions of the second paper that presents the full design and implementation. Additionally, the second paper presents accompanying tools for generating a timing model of the platform. The third paper provides a survey of state-of-the-art in real-time Java identifying the need for tools for the analysis of additional properties. The fourth paper concerns the development of an analysis tool that allows reasoning of additional temporal properties, notably the schedulability of task sets. The fifth paper concerns optimisations and extensions to Symbolic PathFinder. The extension is used in the sixth paper for integrating symbolic execution in the timing analysis tools. The seventh paper contributes with exact and approximate techniques based on symbolic execution for synthesising schedulers that resolve nondeterminism to maximise the probability of reaching a target event.

Members of the assessment committee are Professor Björn Lisper, Mälardalen University, Professor Peter Sestoft, IT University of Copenhagen and Associate Professor Hans Hüttel, Aalborg University. Associate Professor Bent Thomsen is Kasper Søe Luckow’s supervisor. Moderator Associate Professor Lone Leth Thomsen.

All interested parties are welcome. After the defense the department will be hosting a small reception in cluster 3.