Tutorial Form

Title Probabilistic Worst Case Execution Time Analysis
Presenter Dr. Guillem Bernat
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Requested level Both PhD level and more senior researchers.
Background General Real-Time Systems knowledge. No previous knowledge on WCET analysis required but recommended.

Abstract

A large number of problems in the development and deployment of embedded real-time systems have its roots on timing problems. The approach of end-to-end measurement of the code is error prone and costly, but most importantly, it may be unsafe as the method may fail to accurately find potential long execution times that may result in timing errors found too late in the development cycle or even after deployment. The tutorial will present the theory and tools for the determination of the worst-case execution time of programs based on an integration of measurement and static timing analysis.

Traditional static analysis techniques try to find the longest path in a program by analysing the code only (without running it). They may find a safe upper bound of the value, however for modern processors the level of pessimism is such that may result in useless results. On the other hand, end to end measurement observes the execution time by actually running the programs under different test conditions. The measurement based WCET analysis combines the best features of both approaches by determining the execution time of small program sections by direct observation through measurement, but using static analysis techniques to determine analytically the longest path of a program. In addition, the approach allows not only to provide a single value of the WCET but a probability distribution of the possible WCET values.

The tutorial will illustrate the main concepts of probabilistic WCET analysis and demonstrate it through a case study using the MarteOS Real-Time operating system using the pWCET toolset.

Presenter summary

Dr. Guillem Bernat graduated in 1992 in Computer Science from the Universitat de les Illes Balears. He later got his PhD from the same University in 1998. He was a lecturer at its Department of Computer Science from 1992 until 1999 when he was appointed as a research fellow at the Department of Computer Science at the University of York. In 2000 he was appointed as Senior Research Fellow. Since 2001 he is a lecturer at the same department. He is also Managing Director of Rapita Systems Ltd., a spin-off company of the University of York.

Guillem Bernat is interested in wide variety of aspects of real-time systems, in particular all issues related to probabilistic analysis of real-time systems including timing analysis, scheduling algorithms and their analysis and flexible scheduling architectures.

Why you should participate in this tutorial?