DEPARTMENT OF COMPUTER SCIENCE

THE UNIVERSITY of York

Real-Time Systems Group

The Real-Time Systems Research Group is now one of the largest academic research groups in the world focusing on the engineering of real-time systems.

Aim of the Group: To undertake fundamental research, and to bring into engineering practice modern techniques, methods and tools.

What is Real-Time?

A system is defined as being *real-time* if it is required to respond to input stimuli within a finite and specified time interval. The stimuli being either an event at the interface to the system or some internal clock tick that is, at least notionally, coordinated with the passage of time in the system's environment. Real-time systems are found in a wide range of applications areas, from simple domestic appliances to multi-media systems, large scale process control and safety critical avionics. In some systems the required response times are measured in milliseconds, in others it is seconds or even minutes. Nevertheless they all have deadlines that must be satisfied. In the production of real-time systems, it is insufficient to use testing of the final system to ensure compliance its with the timing requirements. A comprehensive and systematic approach to specification, design, implementation and analysis is required.

By what means can a system utilise free resources at run-time, to increase system utility, but still be guaranteed to meet its fundamental timing constraints?

Can a computational model for real-time systems be defined that is effective in terms of schedulability analysis, but can also be formally specified and implemented?

Areas of Activity

The overall goal of the group is to facilitate the design, construction, analysis and maintenance of potentially complex systems which have real-time constraints. The work of the group spans a wide range of topics associated with timing analysis, system design, programming languages, operating system kernels, and reconfigurable hardware.

How can we implement, in combinations of software and hardware, complex real-time systems to meet timing and resource constraints?

Projects and Funding

Areas of application of our work include space and avionic systems, engine controllers, automobile control and multi-media systems. Work has been funded by the EPSRC and DTI, BAE SYSTEMS, European Union, European Space Agency (ESA), NASA, QinetiQ, Rolls Royce Aeroengines, DTI, the Health and Safety Executive (HSE), Sun Microsystems, Philips Research, MicroSoft.

To what extent can real-time systems be made architecture neutral?

Further Information

Further information and research papers can be accessed on the World Wide Web at URL http://www.cs.york.ac.uk/rts. To discuss educational and research opportunities contact Alan Burns (Email: Alan.Burns@cs.york.ac.uk, phone: +44 1904 432779) or Andy Wellings (Email: Andy.Wellings@cs.york.ac.uk, phone: +44 1904 432742) at The Department of Computer Science, University of York, Heslington, York YO10 5DD, United Kingdom.

Design Synthesis

Static Code Analysis

Worst-case Execution Time (WCET) Analysis

Search-Based Engineering

Distributed & Parallel Architectures

Concurrent Object-Oriented Languages

Design Methods

Probabilistic Theories of Time

Communications

Sensor Networks

Real-Time Java

Fault Tolerance

Technology Transfer

Kernels

Embedded Systems

Reconfigurable Hardware

Portable Code

Ada

Neil Audsley: Design, analysis and implementation of embedded real-time systems; hardware/software co-design, FPGAs, kernels and toolsets. Senior Lecturer.

Mohammed Al Rahmawy: Mobile real-time systems: Research Student

Iain Bate: WCET, platform optimisation, co-design issues (HW/SW and control/scheduling), industrial applications: Lecturer.

Adam Betts: WCET Analysis: Research Student.

Guillem Bernat: Scheduling theory, worst-case execution time analysis, probabilistic techniques for timing analysis: Lecturer.

Alan Burns: Scheduling theory, languages, architectures including kernels and communication protocols, dependability: Professor.

Rob Davis: Flexible real-time scheduling: Senior Research Fellow

Paul Emberson: Automating architecture trade-off using scenarios: Research Assistant

Ian Gray: High-Level hardware synthesis: Research Student

Min Seong Kim: Real-time event handling, RTSJ: Research Student

Nick Lay: Reliability of real-time embedded systems: Research Student

Addul Haseeb Malik: Real-time memory management, NUMA architectures: Research Student

Amine Marref: Hardware sensitive WCET calculation: Research Student

Osmar Marchi dos Santos: Real-time fault tolerance, RTSJ: Research Student

Ameet Patil: Application-specific real-time resource management: Research Student

Tom Richardson: Real-time component engineering: Research students

Zheng Shi: Networks on chip: Research Student

Ioanna Symeous: Sensor nets, logic: Research Student

Jonathan Tate: sensor nets, resource-aware system management: Research Student

Alex Wood: WCET and machine learning: Research Student

Paul Usher: Distributed real-time operating systems. Research Student.

Michael Ward: Compilation of Ada to reconfigurable hardware. Research Fellow.

Andy Wellings: Languages, Real-time Java, Ada, kernels, safety kernels, architecture-neutral systems, distributed programming. Professor.

Jack Whitham: Reconfigurable architectures for embedded systems: Research Student

Rob White: Optimisation, architectures. Part-time Research Student.

Ke Yu: System-level real-time operating system simulation: Research Student

Kun Wei: Time bands for real-time systems: Research Assistant

Attila Zabos: Mode-change protocols, flexible scheduling: Research Assistant

Alexandros Zerzelidis: Architecture-neutral real-time systems, .Net. Research Student.

Fengxiang Zhang: Real-time scheduling: Research Student

Muhammad Zubair: Reconfigurable and evolvable hardware: Research Student

Areej Zuhily: Worst-case response time analysis: Research Student