

Call for Papers

The 1st International Workshop on
Reconfigurable Computing Education
(RC education 2006)

March 1, 2006, Karlsruhe, Germany

<http://helios.informatik.uni-kl.de/RCeducation>

held in conjunction with the
IEEE Annual Symposium
on VLSI, March 2–3, 2006,
Karlsruhe, Germany

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The Pervasiveness of
Reconfigurable computing
click

<http://fpl.org/pervasiveness.html>

Motivations

Being the fastest growing segment of the microelectronics market, FPGAs have become mainstream already years ago in all kinds of embedded systems. More recently FPGAs and other Reconfigurable Computing (RC) platforms are rapidly moving into practically every application area, such as automotive, aerospace, defense, medical, chemistry, molecular biology, physics, astrophysics, high performance computing, supercomputing, and many other areas. Each of these application domains has only a limited view of computing and takes it more as a mere technique than as a science on its own. Consequences are, that it makes it difficult to bridge the cultural and practical gaps. Given this fragmentation, it can be rather hard to investigate, since there are so many different actors and departments involved. Including and programming reconfigurable platforms in the design of embedded systems as well as embedded real-time systems and all other application areas requires skills at least from computer science, and electronics. Currently it requires to involve experts from different backgrounds, with dissenting points of view, not only for test and verification of such designs, if at all possible, being very expensive and delaying significantly the introduction of products.

Rapidly growing complexity and pervasiveness of RC-based multi-paradigm devices leads to a major productivity crisis. On the other hand RC is an efficient approach to cope with the accelerating VLSI design crisis. While the economic importance of RC and its FPGAs is widely acknowledged, but the strategic dimension of RC has not been appreciated until recently, academia has failed to pay sufficient attention to the education of a community of high-quality system designers and configware programmers using such platforms. This has motivated a recent but growing interest in the question of educating specialists in this domain and this has also been recognized as a particularly difficult problem.

We need to counter the current trend, where specialization is the target of education systems. We need to go toward interdisciplinary CS-related curricula for unifying the discipline since it has become evident that fundamental problems are shared across several different application domains. It is the goal of this first workshop to bring together researchers, educators, and industrial representatives to discuss the pros and cons and to share design, research, and education experiences in Reconfigurable Computing and a wide variety of its applications. RC-based design involves not only hardware-software co-design. What is really needed is the much more interdisciplinary approach of hardware-configware-software co-design, not only as a design practice, but also as part of CS, CE, and EE curricula, both graduate and undergraduate.

Although configware engineering is a discipline of its own, fundamentally different from software engineering, and, a configware industry is already existing and growing, it is mainly ignored by our curricula. Modern FPGAs have all 3 paradigms on board of the same VLSI chip: hardwired accelerators, microprocessors (and memory banks), and FPGAs, and we need software and configware to program the same chip. To cope with the clash of cultures we need interdisciplinary curricula merging all these different backgrounds in a systematic way. We need innovative lectures and lab courses supporting the integration of reconfigurable computing for progressive curricula. The workshop intends to provide a forum for presenting surveys, experiences, new educational approaches, and, for an exchange of opinions and ideas.

Contributions are sought in the following areas:

Developing the foundations as a major departure from the current, separated structure of CS, of CE, and of EE:

- solving communication problems betw. people from different cultures
- observations of the education landscape in embedded system domain
- courses bridging a large variety of cultures and practices.
- the role of CS by providing a unifying view on various computing models
- curricula as larger bodies of knowledge, rather than courses and modules

Designing RC-based new courses and new curricula:

- new curricula, new curriculum recommendations, consortium activities
- national differences in curricula and interdepartmental issues (CS/ECE)
- courses unifying the discipline across different application domains
- RC-based embedded systems curricular design and implementation
- courses for teaching hardware / configware / software co-design
- definition of RC-based computer science and engineering curricula

Teaching Reconfigurable Computing (RC*) for bridging inter-cultural barriers:

- courses to solve industrial needs regarding RC-based* education
- teaching RC for system-on-chip, mixed-signal, IP-based design,
- teaching hardware-to-configware migration & software-to-configware migration
- early common model introduction based on dichotomy of machine paradigms
- contrasting software performance vs. configware interconnect requirements
- teaching algorithmic cleverness needed for ILP-to-FPGA migration
- contrasting imperative versus transport-triggered high-level languages
- contrasting data-stream-based* vs. instruction-stream-based models & languages
- contrasting configware languages / compilers vs. software languages / compilers
- contrasting software operating system (OS) versus configware OS principles
- contrasting diverse domain-specific taxonomies of algorithms
- courses integrating a range of topics spread across many different areas
- RC integrated in CS, CE or EE graduate and undergraduate education
- educational infrastructure: design and IP libraries, CAD tool access,
- new approaches to introductory and to advanced courses
- textbook selection, interdisciplinary textbook development
- RC-based university programs by industry
- RC-based and unifying lab courses
- survey papers

Courses including FPGA / Reconfigurable Computing application to areas such as:

- physics / astrophysics
- computational chemistry
- computational biology
- molecular biology
- DNA processing
- medical applications
- biomedical engineering
- defense, aerospace
- consumer electronics
- industrial electronics
- automotive
- mobile devices
- computer systems
- embedded systems
- signal processing
- real-time systems
- telecommunication
- networking
- fault-tolerant systems
- image processing
- multimedia systems
- computer graphics
- the n-body problem
- cryptography
- term rewriting systems
- artificial neuronal networks
- embedded soft processors
- supercomputing systems
- supercomputing application areas
- many other application areas

Paper Submission and Deadlines

Full papers, which will be peer-reviewed. Authors should send a two-column PDF version of their papers to the submission site provided by the workshop web site

Submissions should be no more than six pages long. The cover page should include (1) title, (2) authors and affiliation, (3) e-mail address of the contact author, and (4) an abstract.

Submission deadline: November 27, 2005

Selected papers will be published in the IEEE CCOMPUTER magazine.

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(to be confirmed)

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*) NOTE: here the term "data-stream" is used as defined for systolic arrays or other pipe networks: featuring data-transport-triggered execution in contrast to instruction-stream-driven execution. "RC" stands for "Reconfigurable Computing" and for using FPGAs.