The Transdisciplinary Responsibility of CS Curricula

(keynote panel address) Reiner Hartenstein, IEEE life fellow
TU Kaiserslautern - http://hartenstein.de/RC/

Abstract. Google's yaw-dropping hit rates illustrating the pervasiveness, Reconfigurable Computing (RC) delivers the success story of the century. First having been launched by embedded system design adopting FPGAs, now a huge second wave has reached a wide variety of engineering and scientific computing communities as well as supercomputing. From FPGA usage as accelerators, speed-up factors by up to four orders of magnitude and more have been reported, as well as floor space requirements and electricity invoice amounts reduced by one order of magnitude and more. Embedded supercomputing and the desktop personal supercomputer is near.

Algorithmic cleverness is the secret of success, based on software to configware migration mechanisms, striving away from memory-cycle-hungry instruction-stream-based computing paradigms. The main hurdles on the way to heart-stopping new horizons of cheap highest performance are CS-related educational deficits. Each application domain takes it more as a mere domain-specific technique than as a computing science issue. This fragmentation makes it very difficult to bridge the cultural and practical gaps, since there are so many different actors and departments involved.

To obtain the payoff from RC we need a new understanding of computing and supercomputing. For bridging the translational gap, the software / configware chasm, we need to think outside the box. RC is not a kinky variety of hardware design. In fact, RC is a highly powerful new computing culture transforming hardware / software co-design into configware / software co-engineering.

Since the von Neumann paradigm is going to loose its dominance by emerging reconfigurable main processors using hardwired von Neumann co-processors as auxiliary clerks, it is time for a curricular upgrade. To meet their transdisciplinary responsibility CS curricula will have to introduce new perspectives and fundamentals for a transdisciplinary unification in dealing with problems, which are shared across many different application domains. This major new direction in science will determine how academic and industrial computing application will look in ten years from now or earlier.