IVL and (R)IVL -- An experimental SPMD Compiler for SSE, AVX, and MIC/ Knights*, and its Application in a High-Quality (R)endering Framework

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Abstract

Unleashing the full potential of modern CPUs requires making good use of the architecture's parallelism in terms of both multi-core and, ever more importantly, SIMD. In this talk, we first introduce IVL, an experimental SPMD compiler in which the user writes a scalar program that the compiler then maps to SIMD by running a separate instance of this program in each SIMD lane. IVL uses a scalar C(++)-like syntax with some simple additional keywords to express parallelism and data layouts, and currently has back-ends for SSE, AVX, and MIC/ Knights*, as well as support for "device offload" where host and device code run on different devices (eg, on a separate KNF card). To demonstrate the power of this framework we then briefly summarize results from (R)IVL, a complete real-time-high-quality renderer in which all rendering code has been written exclusively in IVL, and that is fully portable between SSE, AVX, and MIC.

Ingo Wald holds a PhD in engineering from Saarland University and is currently a research scientist at Intel Labs. After his PhD, he first worked was a post-doctoral research associate at the Max Planck Institute for Informatics in Saarbruecken, Germany, after which he joined the Scientific Computing and Imaging Institute (SCI) and School of Computing at the University of Utah as a Research Assistant Professor. His work concentrates on all aspects of real time ray tracing and photo-realistic rendering, high-performance graphics, throughput computing, and hard- and software architectures for high-performance computing.

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