

Parallel Completion

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Summary

We have designed and implemented a parallel completion procedure for term rewriting systems, a problem for which the Knuth-Bendix procedure is a well-known sequential solution. Straightforward parallelization of the Knuth-Bendix procedure did not perform well in our experiments, because the outermost loop contains unnecessary serialization. Instead, our parallel procedure is a refinement of inference rules given by Bachmair, Dershowitz and Hsiang. The challenging part of this refinement was the definition of a bookkeeping mechanism that: 1) guaranteed the required liveness property, 2) kept the rewriting system small and inter-normalized, and 3) had low computational overhead and no synchronization bottlenecks. The current implementation runs on the Firefly shared-memory multiprocessor and exhibits nearly linear speedup on some inputs, including problems in group theory. We are currently investigating ports to machines with more processors and physically distributed memory.