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A segment-swapping approach for executing trapped computations.

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Summary: We consider the problem of supporting goal-level, independent and-parallelism (IAP) in the presence of non-determinism. IAP is exploited when two or more goals which will not interfere at run time are scheduled for simultaneous execution. Backtracking over non-deterministic parallel goals runs into the well-known trapped goal and garbage slot problems. The proposed solutions for these problems generally require complex low-level machinery which makes systems difficult to maintain and extend, and in some cases can even affect sequential execution performance. In this paper we propose a novel solution to the problem of trapped nondeterministic goals and garbage slots which is based on a single stack reordering operation and offers several advantages over previous proposals. While the implementation of this operation itself is not simple, in return it does not impose constraints on the scheduler. As a result, the scheduler and the rest of the run-time machinery can safely ignore the trapped goal and garbage slot problems and their implementation is greatly simplified. Also, standard sequential execution remains unaffected. In addition to describing the solution we report on an implementation and provide performance results. We also suggest other possible applications of the proposed approach beyond parallel execution.

Keywords: parallelism; logic programming; trapped computations; backtracking; performance
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