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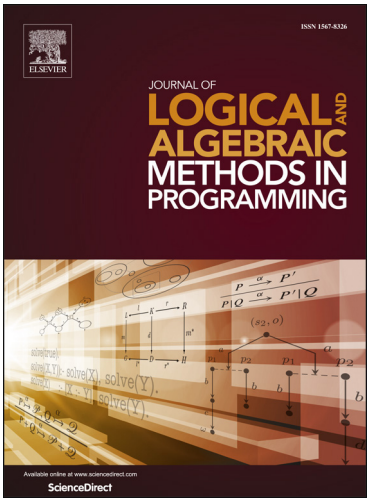

Best-by-simulations: A framework for comparing efficiency of reconfigurable architectures on workloads with deadlines

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Best-by-Simulations: A Framework for Comparing Efficiency of Reconfigurable Architectures on Workloads with Deadlines

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Abstract

Energy consumption is a major concern in multicore systems. Perhaps the simplest strategy for reducing energy costs is to use only as many cores as necessary while still being able to deliver a desired quality of service. Motivated by earlier work on a dynamic (heterogeneous) core allocation scheme for H.264 video decoding that reduces energy costs while delivering desired frame rates, we formulate *operationally* the general problem of executing a sequence of actions on a *reconfigurable machine* while meeting a corresponding sequence of *absolute deadlines*, with the *objective of reducing cost*.

Using a transition system framework that associates costs (e.g., time, energy) with executing an action on a particular resource configuration, we formulate a very simple version of *simulation relations* for cumulative cost transition systems. This notion of simulation forms the basis for specifying deadline/budget-conformant executions, and appropriate notions for comparing such executions. We believe these simulation-based notions can provide the basis for an operational theory of optimal cost executions and performance guarantees for approximate solutions, in particular relating the notion of simulation from transition systems to that of competitive analysis used for, e.g., online algorithms.

Keywords: reconfigurable architectures; deadlines; dynamic reconfiguration; simulation relations; efficiency; cumulative monoid; online algorithm; competitive analysis.