DAGS: Distribution agnostic sequential Monte Carlo scheme for task execution time estimation

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ABSTRACT
This paper addresses the problem of stochastic task execution time estimation agnostic to the process distributions. The proposed method is orthogonal to the application structure and underlying architecture. We build the time varying state space model of the task execution time. In the case of software pipelined tasks, to refine the estimate quality, the state-space is modeled as Multiple Input Single Output (MISO) system by taking into account the current execution time of the predecessor task. To obtain nearly Bayesian estimates, irrespective of the process distribution, the sequential Monte Carlo method is applied which form the recursive solution to reduce the overheads and comprises of time update and correction steps. We experimented on three different platforms, including multicore, using the time parallelized H.264 decoder: a control dominant computationally demanding application and AES encoder: a pure data flow application. Results show that estimates obtained by our method are superior in quality and are up to 68% better in comparison to others.

INDEX TERMS
+ INSPEC
  ◦ Controlled Indexing
    Bayes methods, Monte Carlo methods, multiprocessing systems, stochastic processes, task analysis
  ◦ Non Controlled Indexing
    AES encoder, Bayesian estimation, data flow, distribution agnostic sequential Monte Carlo scheme, multicore systems, multiple input single output system, software pipelined tasks, state space model, stochastic task execution time estimation, time parallelized H.264 decoder

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