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Algebraic program semantics for supercomputing. (English) Zbl 1390.68171


Summary: The competition for higher performance/price ratio is pushing processor chip design into the manycore age. Existing multicore technologies such as caching no longer scale up to dozens of processor cores. Even moderate level of performance optimisation requires direct handling of data locality and distribution. Such architectural complexity inevitably introduces challenges to programming. A better approach for abstraction than completely relying on compiler optimization is to expose some performance-critical features of the system and expect the programmer to handle them explicitly. This paper studies an algebra-semantic programming theory for a performance-transparent level of parallel programming of array-based data layout, distribution, transfer and their affinity with threads. The programming model contributes to the simplification of system-level complexities and the answering of crucial engineering questions through rigorous reasoning.

For the entire collection see [Zbl 1269.68023].

MSC:

68N19 Other programming paradigms (object-oriented, sequential, concurrent, automatic, etc.)
68Q55 Semantics in the theory of computing

Keywords:

algebra-semantic programming theory; parallel programming

Software:

CUDA; Chapel; cuFFT; Accelerate; Parray

Full Text: DOI

References:


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