Code Transformation for Orthogonal Optimization

Scientific Achievement:

The code transformation component of the orchestration tools chain (FLASH-X) performs platform specific composition of source code, hardware dependent optimizations, and translating a control flow description of computations to code that interfaces with a runtime system.

Significance and Impact:

The code generator is key to efficient performance portability because it customizes an application instance for a specific platform without the need for writing error-prone lower-level source code.

Research Details:

The code generator (in prototyping stage) maps control flow execution model to a data flow description and creates code for interfacing with a runtime system:

1. Inputs: Control flow of operations in a concise DSL at multiple levels of the code ("recipes") and optimization hints
2. Generate a hierarchy of task graphs to allow processing and optimizations at variable granularities
3. Process task graph and generate code as output using a template metaprogramming like approach

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