Presentation Abstract

Verified Translation Validation Technique for OSCAR Automatically Parallelizing Compiler

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A parallelizing compiler transforms a source program aggressively to obtain a highly parallelized program. The parallelized program must preserve the semantics of the source program. However, an aggressive transformation might violate the semantics due to involuntary embedded bugs in a compiler. These compiler bugs are hard to investigate because of the complexity of a parallelizing compiler. In this presentation, we propose a verified transformation validation technique for OSCAR parallelizing compiler. The proposed technique can validate the correctness of a program transformation by comparing the semantics of a source program with that of a transformed program. We use a partial order relationship between tasks in a program as a program semantics. The compiler first decomposes a source program into multiple tasks hierarchically. Before and after each program transformation in the compiler, it analyses the earliest executable conditions, which represent both data and control dependences among tasks. Then, partial order relationships among tasks are obtained from the earliest executable conditions, and finally the validator compares them obtained from before and after the transformation to check the correctness of it. We also verify the validator mechanically by Coq. We define the theorems for Coq to prove the correctness of the proposed validator.

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