Dependence Analysis of Unstructured While Loops

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Abstract
We propose a method that permits one to determine whether there exist dependences in a simple but unstructured while-loop. Traditional methods attempt to treat while-loops as for-loops. This requires the existence of loop-induction variables which may not exist or may be difficult to find. Our method assumes no loop-induction variables. It is based on the assumption that all references to arrays are syntactically and semantically valid. This is a minimal assumption to make about any program whose performance is to be optimized in some manner. The basic idea is formulated assuming the loop body of the while-loop is a basic block. More complicated loop-bodies can then be handled as well. The paper concludes with a worked-out example that demonstrates the attractiveness of our method.

1. Introduction and Motivation
Dependence analysis is central to automatic vectorization and parallelization; all vectorizing and parallelizing compilers rely on it, in that it provides the basis (and justification) for the code restructuring that leads to the exploitation of parallelism.