

Implementation and Analysis of a Navier-Stokes Algorithm on Parallel Computers

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Summary:

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The results of the implementation of a Navier-Stokes algorithm on three parallel/vector computers are presented. The object of this research is to determine how well, or poorly, a single numerical algorithm would map onto three different architectures. The algorithm is a compact difference scheme for the solution of the incompressible, two-dimensional, time-dependent Navier-Stokes equations. The computers were chosen so as to encompass a variety of architectures. They are the following: the MPP, an SIMD machine with 16K bit serial processors; Flex/32, an MIMD machine with 20 processors; and Cray/2. The implementation of the algorithm is discussed in relation to these architectures and measures of the performance on each machine are given. The basic comparison is among SIMD instruction parallelism on the MPP, MIMD process parallelism on the Flex/32, and vectorization of a serial code on the Cray/2. Simple performance models are used to describe the performance. These models highlight the bottlenecks and limiting factors for this algorithm on these architectures. Finally, conclusions are presented. Fatoohi, Raad A. and Grosch, Chester E. Langley Research Center NAS1-18107; RTOP 505-90-21-01...

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