MASSIVELY PARALLEL PROCESSING APPLICATIONS IN BLAST SIMULATION

SCHRAML,S.J.;HISLEY,D.M.

In an attempt to bring complex three dimensional numerical simulations of blast phenomena into the realm of production computing, the U.S. Army Research Laboratory (ARL) has begun a research program to evaluate the merits of a relatively new computing technology known as Massively Parallel Processing. The two most predominant types of distributed memory, massively parallel architectures are Single Instruction / Multiple Data (SIMD) and Multiple Instruction / Multiple Data (MIMD). A SIMD architecture employs a large number of relatively simple processors which simultaneously execute identical instructions on different parts of the data in order to solve the problem. Conversely, MIMD computers use a smaller number of more powerful processors which can operate independently of each other on separate parts of the problem. These two types of architectures require radically different styles of programming to obtain optimum performance for the application.

Evaluation of the massively parallel computing technology has been conducted by adapting the BRL-QlD hydrocode to several different types of massively parallel computer platforms. The BRL-QlD code is a quasi one-dimensional, finite difference, single material, polytropic gas fluid dynamics code used primarily for simulating flow in shock tubes. This code offers both explicit and implicit algorithms for solution of the governing equations. This paper documents the implementations and computational performance of both the implicit and explicit algorithms of the BRL-QID code on SIMD and MIMD massively parallel computers.