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Architecture Adaptive Computing Environment

Architecture Adaptive Computing Environment (aCe) is a software system that includes a language, compiler, and run-time library for parallel computing. aCe was developed to enable programmers to write programs, more easily than was previously possible, for a variety of parallel computing architectures. Heretofore, it has been perceived to be difficult to write parallel programs for parallel computers and more difficult to port the programs to different parallel computing architectures. In contrast, aCe is supportable on all high-performance computing architectures. Currently, it is supported on LINUX clusters. aCe uses parallel programming constructs that facilitate writing of parallel programs. Such constructs were used in single-instruction/multiple-data (SIMD) programming languages of the 1980s, including Parallel Pascal, Parallel Forth, C*, *LISP, and MasPar MPL. In aCe, these constructs are extended and

implemented for both SIMD and multiple-instruction/multiple-data (MIMD) architectures. Two new constructs incorporated in aCe are those of (1) scalar and virtual variables and (2) pre-computed paths. The scalar-and-virtual-variables construct increases flexibility in optimizing memory utilization in various architectures. The pre-computed-paths construct enables the compiler to pre-compute part of a communication operation once, rather than computing it every time the communication operation is performed.

This program was written by John E. Dorband of Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810.

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Computing Fault Displacements From Surface Deformations

Simplex is a computer program that calculates locations and displacements of subterranean faults from data on Earth-surface deformations. The calculation involves inversion of a forward model (given a point source representing a fault, a forward model calculates

the surface deformations) for displacements, and strains caused by a fault located in isotropic, elastic half-space. The inversion involves the use of nonlinear, multiparameter estimation techniques. The input surface-deformation data can be in multiple formats, with absolute or differential positioning. The input data can be derived from multiple sources, including interferometric synthetic-aperture radar, the Global Positioning System, and strain meters. Parameters can be constrained or free. Estimates can be calculated for single or multiple faults. Estimates of parameters are accompanied by reports of their covariances and uncertainties. Simplex has been tested extensively against forward models and against other means of inverting geodetic data and seismic observations.

This work was done by Gregory Lyzenga, Jay Parker, and Andrea Donnellan of Caltech and Wendy Panero of Ohio State University for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

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