The results of this grant are: (a) development and analysis of new methods and methodologies for solving PDEs on parallel machines, (b) development of mapping strategies of PDE computations to parallel machines, (c) development of knowledge bases for parallel PDE solvers, (d) development of a facility for visualization, collection and analysis of performance data, (e) development of a machine independent object-oriented knowledge interface for specifying PDE computations and solvers, and (f) performance evaluation of PDE solvers on Intel and NCUBE hypercube machines. The feasibility of the proposed ideas was established and usable prototypes have been developed.
In this report we list the personnel that worked under the previous AFOSR grant, the publications completed and describe the states of various projects. The results under this contract include:

(a) development and analysis of new methods and methodologies for solving PDEs on parallel machines,

(b) development of mapping strategies of PDE computations to parallel machines,

(c) development of knowledge bases for parallel PDE solvers,

(d) development of a facility for visualization, collection and analysis of performance data,

(e) development of a machine independent object-oriented knowledge interface for specifying PDE computations and solvers, and

(f) performance evaluation of PDE solvers on Intel and NCUBE hypercube machines.

We have demonstrated the feasibility of our proposed ideas and have developed usable prototypes.

Personnel

Work on this grant has involved the following people:
John R. Rice* (Co-PI)  Professor of Computer Science
Elias N. Houstis* (Co-PI)  Professor of Computer Science
Apostolos Hadjidimos*  Visiting Professor of Computer Science
Catherine E. Houstis  Visiting Assoc Professor of Computer Science
Manolis Vavalis*  Postdoc
Mo Mu*  Postdoc
George Vanecek  Postdoc
Panos Papachiou*  Software Engineer
Nicholas Chrisochoides*  Ph.D. candidate
Sanjiva Weerawarana*  Ph.D. candidate
Ko Yang Wang*  Postdoc
Sang Bae Kim  Ph.D. candidate
Scott McFadden  Ph.D. candidate
Jing Yu Liao  Ph.D. candidate
T. Ku  Ph.D. candidate (Civil Engineering)
Hyeran Byun  Ph.D. candidate
Pelayia Varodoglu  M.S. candidate
Jim Berniger  M.S. candidate
Athanasios Gaitatzes  M.S. student
Margaret Gaitatzes  M.S. student
Meletis Samartzis*  Visiting Research Associate
Stavros Kortesis  Visiting Scholar

Those names with stars have received some direct AFOSR support, the others have research support from related projects.

Publications

We list the publications that have resulted from the past three years of work supported by the AFOSR. These include:

5 Books edited
7 Journal papers
11 Papers submitted for journal publication
18 Conference papers
11 Technical reports

Some of the technical reports contain work that will be submitted to journals or conferences.
A. Books


B. Papers and Reports


17. A. Hadjidimos and Y.G. Saridakis, Modified successive overrelaxation (MSOR) and equivalent 2-step iterative methods for collocation matrices, *Journal of Computational and Applied Mathematical*, (accepted for publication).


34. J. R. Rice, R. Vichnevetsky, and E.N. Houstis, Second international conference on expert systems for numerical computing. CSD-TR-963, Computer Science Department, Purdue University, March (1990).


36. A. Hadjidimos and Y.G. Saridakis, Modified successive overrelaxation (MSOR) and equivalent 2-step iterative methods for collocation matrices. CSD-TR-965, Computer Science Department, Purdue University, March (1990).

37. M. Mu and J.R. Rice, PARALLEL SPARSE: Data structure and organization. CSD-TR-974, Computer Science Department, Purdue University, April (1990).


40. A. Hadjidimos, E.N. Houstis, J.R. Rice and E.N. Vavalis, On the iterative solution of line spline collocation schemes for elliptic PDEs. CSD-TR-768, Computer Science Department, Purdue University, May (1990).


42. E.N. Houstis and J.R. Rice, Parallel ELLPACK PDE solving system. CSD-TR-912, Computer Science Department, Purdue University, October (1989).


C. Conference Involvement of PIs

We list those conference presentations made personally by the PIs (E. Houstis and J. Rice) and recap their involvement in organizing conferences and workshops. Other conference presentations were made by co-authors; these are not listed here.

**PAPERS PRESENTED**

Paper 21 was presented at the conferences: (a) *IMSL User's Group-North America*, Ann Arbor, May 1989; (b) *Symposium on Scientific Software*, Beijing, China, June 1989. (Rice)


Paper 25 was presented at the *Domain Decomposition* conference, Moscow, May 1990. (Houstis)

Paper 27 was presented in the European ESPRIT project Pygmilian on Neural Computing, London, U.K., June 1990. (Houstis)
Paper 37 was presented in the Congress on Computation and Applied Mathematics, Belgium, June 1990. (Houstis)


Papers 17 and 18 were presented at the International Conference on Supercomputing, St. Malo, France, June 1989. (Houstis)


Paper 20 was presented at the conference on Iterative Methods for Large Linear Systems, Austin, TX, October 1988. (Rice)

Paper 28 was presented at the conference on the Integration of Numeric and Symbolic Computing, Saratoga Springs, July 1990. (Houstis).

Paper 29 was presented at the conference on Unstructured Scientific Computations on Scalable Multiprocessors, Nags Heads, NC, October 1990. (Rice).

Paper 31 was presented at the Paris conference on Symbolic and Numeric Methods (Rice)

Paper 40 was presented at the International Conference on Supercomputing, Kologne, Germany, June 1991. (Houstis)

Paper 48 will be presented at the IFIP TC 2 working conference, Karlsruhe, Germany, Sept. 1991. (Houstis)

Paper 7 was presented in the 3rd IMACS World Congress, Dublin 1991.

OTHER CONFERENCE PRESENTATIONS

J.R. Rice, Collaborating Modules for Solving PDEs, Seventh International Conf. on Modeling and Simulation, IMACS, August 1989.


CONFERENCE AND WORKSHOP ORGANIZATIONS

E. Houstis, Member of Program Committee for International Supercomputing Conferences 1990 and 1991.


E. Houstis, Member of the Programming Committee and Editor of the IFIP WG2.5 Conference on Programming Environments for High-Level Scientific Problem Solving, Germany, September 1991.

J. Rice, Member of the Program Committee of the IFIP WG2.5 Conference on Programming Environments for High-Level Scientific Problem Solving, Germany, September 1991.


E. Houstis program committee chairman for North America and editor of the International Conference for Supercomputing, Kologne, Germany 1991.