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Researchers investigated several supercomputer architectures in the context of assessing their performance in solving PDE provlems. Main results are: assessed various classes of paralled and vector supercomputers and parallel software issurs toward solving PDE problems; developed a multipipeline networking technique for compound vector processing, developed an orthogonal multiprocessor for large-grain scientic computations; improved paralled efficiency of a domain decomposition method, the DD algorithm. Some representative publications are: "Advance Paralled Processing with Supercomputer Architectures", K. Hwang; "Multipipeline Networking for Compound Vector Processing", K. Hwang, Z. Xu; "An Orthogonal Multiprocessor for Large-Grain Scientific Computations.", K. Hwang, P. Tseng, D. Kim.

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FINAL TECHNICAL REPORT

Principal Title: Supercomputers for Solving PDE Problems

Principal Investigator: **Dr. Kai Hwang**
University of Southern California

AFOSR Grant Number 86-00088
Date: November 1, 1988

The research conducted from October 1, 1985 to March 31, 1988 is reported below. We have investigated several supercomputer architectures in the context of assessing their performance in solving PDE problems. The main results obtained are listed below. Details of these research findings can be found in the attached publications, identified by author name and year in parenthesis.

1. We have assessed various classes of parallel and vector supercomputers, ranging from cray series to minisupercomputers, and parallel software issues towards solving PDE problems as reported in Hwang (1987).

2. We have developed a multipipeline networking technique for compound vector processing as reported in Hwang and Xu (1988).

3. An orthogonal multiprocessor (OMP) architecture is developed for large-grain scientific computations, which include the implementation of parallel linear system solvers and PDE machines, as reported in Hwang, Tseng and Kim (1989). item A new parallel PDE algorithum is developed by combining the Schwartz alternating procedure and the multigrid method for solving elliptic problems on an Alliant FX18 multiprocessor as reported in Hwang and Wang (1988).

4. Parallel efficiency of a domain decomposition method is reported by Proskurowski and Haghoo (1988). The efficiency analysis is based on running the DD algorithum on an Intel Personal Supercomputer (iPSC) at the USC Parallel and Distributed Computing Laboratory.