

# TABLE OF CONTENTS

|                                                                                                                                                             |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>A.W.Burks</b><br>A radically non-von-Neumann-architecture for learning and discovery                                                                     | 1   |
| <b>INVITED ADDRESSES</b>                                                                                                                                    |     |
| <b>I.S.Duff</b><br>The parallel solution of sparse linear equations                                                                                         | 18  |
| <b>A.H.Sameh et al.</b><br>Parallel algorithms on the CEDAR system                                                                                          | 25  |
| <b>Ph.Treleaven</b><br>Future parallel computers                                                                                                            | 40  |
| <b>U.Trottenberg</b><br>SUPRENUM - an MIMD multiprocessor system for multi-level scientific computing                                                       | 48  |
| <b>HARDWARE ASPECTS (Session 1.1)</b>                                                                                                                       |     |
| <b>C.Saito, H.Amano, T.Kudoh, H.Aiso</b><br>An adaptable cluster structure of (SM) <sup>2</sup> -II                                                         | 53  |
| <b>G.Ch.Pflug</b><br>Memory conflicts in MIMD-computers - a performance analysis                                                                            | 61  |
| <b>K.-H.Brenner, A.W.Lohmann</b><br>The digital optical computing program at Erlangen                                                                       | 69  |
| <b>C.S.Raghavendra</b><br>HMESH : a VLSI architecture for parallel processing                                                                               | 76  |
| <b>NUMERICAL ALGORITHMS (Session 1.2)</b>                                                                                                                   |     |
| <b>K.K.Lau, X.Z.Qiao</b><br>FFT on a new parallel vector processor                                                                                          | 84  |
| <b>O.Kolp, H.Mierendorff, W.Seidl</b><br>Analysis of multigrid methods for non-shared memory systems<br>by a simple performance model                       | 95  |
| <b>H.Schwandt</b><br>Multitasking algorithms on CRAY computers for interval arithmetic<br>Newton-like methods for a class of systems of nonlinear equations | 104 |
| <b>B.J.Jechev</b><br>Full recursive form of the algorithms for fast generalized Fourier transforms                                                          | 112 |
| <b>SYSTEM SOFTWARE ASPECTS (Session 2.1)</b>                                                                                                                |     |
| <b>R.R.Oldehoeft, D.C.Cann, S.J.Allan</b><br>SISAL : initial MIMD performance results                                                                       | 120 |
| <b>C.Martini, M.Morando, S.Ridella</b><br>Caltech hypercube MIMD computer performances<br>Measurements in a physical mathematical application               | 128 |
| <b>G.Zhang, Y.Hu, Z.Xie</b><br>A new approach to decentralized control of job scheduling                                                                    | 133 |
| <b>J.Milde, T.Plückebaum, W.Ameling</b><br>Synchronous communication of cooperating processes in the M <sup>6</sup> PS multiprocessor                       | 142 |

**NONNUMERICAL ALGORITHMS (Session 2.2)**

|                                                                                                                   |     |
|-------------------------------------------------------------------------------------------------------------------|-----|
| <b>Y.Robert, D.Trystram</b><br>Parallel implementation of the algebraic path problem                              | 149 |
| <b>O.Vornberger</b><br>Implementing branch-and-bound in a ring of processors                                      | 157 |
| <b>N.P.Turkedjiev</b><br>Synthesis of systolic algorithms and processor arrays                                    | 165 |
| <b>R.Böhm, D.Homeister</b><br>Fraktale und ihre Untersuchung mit Parallelrechnung                                 | 173 |
| <b>R.H.Perrott, C.Holt, M.Clint, A.Stewart</b><br>A parallel processing algorithm for thinning digitised pictures | 183 |

**ARCHITECTURAL ASPECTS (Session 3.1)**

|                                                                                                                              |     |
|------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>E.Mähle, K.Moritzen, K.Wirl</b><br>Fault-tolerant hardware configuration management on the multiprocessor system DIRMU 25 | 190 |
| <b>K.von der Heide</b><br>A general purpose pipelined ring architecture                                                      | 198 |
| <b>D.T.Morris, P.M.Dew</b><br>An adaptive parallel algorithm for display of CSG objects                                      | 206 |
| <b>M.K.O.Lee</b><br>A packet based demand/data driven reduction model for the parallel execution of logic programs           | 214 |
| <b>H.-A.Schneider, W.Dilger</b><br>Information processing with associative processors                                        | 222 |
| <b>R.E.Bührer</b><br>A high performance interconnection concept for dataflow- or other closely coupled multiprocessors       | 230 |

**NUMERICAL ALGORITHMS (Session 3.2)**

|                                                                                                                    |     |
|--------------------------------------------------------------------------------------------------------------------|-----|
| <b>A.Polster</b><br>Parallel solution of eigenvalue problems in acoustics on the distributed array processor (DAP) | 239 |
| <b>M.Cosnard, M.Marrakchi, Y.Robert, D.Trystram</b><br>Gauss elimination algorithms for MIMD computers             | 247 |
| <b>M.Vajtersić</b><br>Fast parallel algorithms for eigenvalue and singular value computations                      | 255 |
| <b>L.Qi-wel</b><br>A new parallel algorithm for solving general linear systems of equations                        | 264 |
| <b>A.Uresin, M.Dubois</b><br>Generalized asynchronous iterations                                                   | 272 |

**SYSTEM SOFTWARE & PROGRAMMING LANGUAGE ASPECTS (Session 4.1)**

|                                                                                                                        |     |
|------------------------------------------------------------------------------------------------------------------------|-----|
| <b>P.Brezány</b><br>Parallel compilation on a multiprocessor system                                                    | 279 |
| <b>H.P.Zima, H.-J.Bast, M.Gerndt, P.J.Hoppen</b><br>Semi-automatic parallelization of FORTRAN programs                 | 287 |
| <b>C.Hammer, G.Raebel</b><br>Code generation for partially vectorizable loops in the vectorizing<br>PASCAL-XT compiler | 295 |
| <b>T.Brandes</b><br>Automatic vectorisation for high level languages based on an expert system                         | 303 |

**HARDWARE ASPECTS & NONNUMERICAL ALGORITHMS (Session 4.2)**

|                                                                                                 |     |
|-------------------------------------------------------------------------------------------------|-----|
| <b>S.Momoi, S.Shimada, M.Kobayashi, T.Ishikawa</b><br>Hierarchical array processor system (HAP) | 311 |
| <b>A.A.A.Kader</b><br>OCSAMO - a systolic array for matrix operations                           | 319 |
| <b>M.Kunde</b><br>A general approach to sorting on 3-dimensionally mesh-connected arrays        | 329 |
| <b>Th.Vogell</b><br>Complexity of parallel partitioned algorithms                               | 338 |

**ARCHITECTURAL ASPECTS (Session 5.1)**

|                                                                                                                          |     |
|--------------------------------------------------------------------------------------------------------------------------|-----|
| <b>F.Wagner</b><br>Shuffle/Exchange is the natural interconnection scheme for the parallel<br>Fast Fourier Transform     | 345 |
| <b>O.Lange</b><br>Kronecker products of matrices and their implementation on<br>shuffle/exchange-type processor networks | 353 |
| <b>G.M.Megson, D.J.Evans</b><br>LISA : a parallel processing architecture                                                | 361 |

**NONNUMERICAL ALGORITHMS (Session 5.2)**

|                                                                                                                                                                                      |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>K.D.Thalhofer, K.D.Reinartz</b><br>A classification of algorithms which are well suited for implementations on<br>the DAP as a basis for further research on parallel programming | 376 |
| <b>T.Härder, Ch.Hübel, B.Mitschang</b><br>Use of inherent parallelism in database operations                                                                                         | 385 |
| <b>M.Veldhorst</b><br>Parallel dynamic programming algorithms                                                                                                                        | 393 |
| <b>W.Händler, general chairman</b><br>Multiprocessors: main trends and dead ends                                                                                                     | 403 |

**LATE ARRIVAL**

|                                                                           |     |
|---------------------------------------------------------------------------|-----|
| <b>S.Uchida, invited address</b><br>Toward the parallel inference machine | 404 |
|---------------------------------------------------------------------------|-----|