Gang Cheng

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EMPLOYMENT

03/1995 - now: *Research Scientist*, Northeast Parallel Architectures Center, Syracuse University.
05/1993 - 02/1995: *Jr. Research Scientist,* Northeast Parallel Architectures Center, Syracuse University.
01/1992 - 05/1993: *Research Assistant*, Northeast Parallel Architectures Center, Syracuse University.
08/1991 - 01/1992: *Teaching Assistant*, School of Computer and Information Science, Syracuse University.
04/1991 - 08/1991: *Programmer Analyst*, Information System Support Laboratory, Virginia Tech, VA.
06/1988 - 01/1991: *Research Associate, Senior Software Engineer*, Chengdu Institute of Computer Applications, Chinese Academy of Sciences.
08/1985 - 05/1988: *Research and Teaching Assistant*, Computer Science and Engineering Department, Huazhong University of Science and Technology, China.
06/1983 - 07/1985: *Application Programmer*, Chengdu Institute of Geography, Chinese Academy of Sciences.

EDUCATION

Ph.D., Computer and Information Science, Syracuse University, Syracuse, NY, 08/1991 - 09/1996 (GPA: 3.84/4.0; Advisor: Geoffrey C. Fox).
M.S., Computer Science and Engineering, Huazhong University of Science and Technology, China, 09/1985 - 05/1988 (GPA: 9.7/10.0).
B.S., Computer Science and Engineering, Huazhong University of Science and Technology, China, 09/1979 - 05/1983 (GPA: 9.6/10.0).

AWARDS AND HONORS

- "National Information Infrastructure and High Performance Computing and Communication in the U.S.", *Invited Lectures* at Beijing University of Post and Telecom, Dec. 22 - 30, 1994.
- Obtained US permanent resident via the first category of outstanding researcher, 1994.
- Supercomputing '93 Student Paper Award, *Best student paper* in the area of Graphics Application for "An Interactive Remote Visualization Environment for an Electromagnetic Scattering Simulation on a High Performance Computing System", Supercomputing '93, Portland, Oregon, November, 1993.
- *Graduate Scholarship*, Graduate School, Syracuse University (1991-92).
- Member of Phi Beta Delta - Honor Society For International Scholars, Alpha Sigma Chapter at Syracuse University, 1994 - now.
- Co-developer of a Patent issued by the People's Republic of China. "A New Intelligent Magnetic-card Lock", Patent No.: ZL 92 2 14120.7, May, 1993.
- *Junior Visiting Research Fellow*, Chinese Academy of Sciences (1989-91).
- Member of Chinese Computer Federation (1988 -).
- *Undergraduate Scholarship*, Huazhong University of Science and Technology, China (1980 - 1982).

RESEARCH INTERESTS AND PARTICIPATION

- Internet and WWW Technology
    - o Tango: A Java/WWW-based Collaborative System for Distance Learning and Education (*http://www.npac.syr.edu/tango*)
    - o Integration of RDBMS and WWW for information retrieval and navigation (*http://www.npac.syr.edu/NPACoverview/WebDB.html*)
    - o Prototype Systems for WWW + Oracle (*http://kayak.npac.syr.edu:1963*)

- Parallel and Distributed Computing and Applications
  - o Parallelization of Computational Electromagnetics Applications (*http://www.npac.syr.edu/NPAC1/PUB/gcheng/CEM/home.html*)
  - o Parallel Financial Models (*http://www.npac.syr.edu/NPAC1/PUB/gcheng/finance/home.html*)
  - o InfoMall - A HPCC Technology Transfer Program (*http://www.infomall.org*)
  - o High Performance Fortran (HPF) Applications (*http://www.npac.syr.edu/hpfa/*)

- Data Mining and Parallel and Distributed Relational Database Management Systems
  - o Integration of Parallel RDBMS in WWW (*http://greatwall.npac.syr.edu:1963/PDB*)
  - o Decision Support TPC-D Benchmarking of Parallel RDBMS on Parallel and Distributed Systems
  - o Benchmarking of Data Mining Software on Parallel and Distributed Systems

- Internet Information Discovery and Retrieval
  - o ThinkQuest Web Search System (*http://www.npac.syr.edu/thinkquest/pub*)
  - o WWW Searchable USENET Newsgroup Archives (*http://asknpac.npac.syr.edu*)
  - o Web Search Systems Using Oracle Context Server (*http://kayak.npac.syr.edu:1963/search*)
  - o Web Search Systems Using Oracle Context Server (*http://kayak.npac.syr.edu:1963/search*)

- Scientific Data Visualization and Graphical User Interface
  - o An Interactive Visualization Environment for Financial Modeling (*http://www.npac.syr.edu/users/gcheng/AVS/finance.html*)
  - o Visualization of Electromagnetic Scattering Simulation(*http://www.npac.syr.edu/users/gcheng/CEM/ems.html)*
  - o Visualization of Radar Cross Section Simulation (*http://www.npac.syr.edu/users/gcheng/CEM/home.html*)
  - o Scientific Data Visualization Using Application Visualization System (AVS) (*http://www.npac.syr.edu/users/gcheng/AVS/home.html*)

- Parallel Software Engineering and Meta-Computing
  - o Coarse-Grained Parallelism Using Dataflow Programming Paradigm (*http://www.npac.syr.edu/users/gcheng/AVS/home.html*)
  - o Software Integration in Distributed Computing (*http://www.npac.syr.edu/users/gcheng/homepage/thesis/thesis.html*)
  - o JavaFlow - A Java-based Dataflow Model for WWW and Meta-Computing

- Artificial Intelligence
  - o Functional and Logic Programming Languages and Compilers

EDUCATION EXPERIENCE HIGHLIGHT

I have been involved in the following education programs and applications:

- Supervised two Ph.D. students, eight graduates and three undergraduates in research projects or independent study courses
- Mentor in Research Experiences for Undergraduates Program in High Performance Computing and Communications at Syracuse University
- Prepared curriculum materials for Computational Science Education Program and courses at Syracuse University
- Participated in the Living Schoolbook project to use high performance computing and communications for K-12 education
- Supported the ThinkQuest program to use the Internet as a collaborative, interactive teaching and learning tool

RESEARCH EXPERIENCE HIGHLIGHT

I have participated in several key research and application projects at NPAC in the area of Web/RDBMS, Internet collaboration and distance learning, data mining, parallel databases, financial modeling, computational electromagnetics, four-dimensional data assimilation, climate and weather modeling and geographic information system. Serving as either a researcher, a technical lead or a project leader in those projects, I have obtained broad experience in developing industrial and scientific applications of parallel computing and information processing. Currently I am a database manager and one of the top NPAC technical lead in database management and Web-based information systems.

I am a project leader in a US Air Force Rome Lab funded research project to develop collaboration and interactive visualization systems using Web technologies. I am responsible for project management and direction in system integration technology.

I am the major developer and maintainer of an Internet Web-based Information service provided by NPAC - A Searchable USENET Newsgroups Archives System. I have managed and architected several key information projects at NPAC, including Web/Oracle applications, Web search systems, Oracle-based Web agent, data-mining and parallel database benchmarking.

Working as a DBA and a system administrator, I have participated a project sponsored by an industrial corporation to conduct benchmarking of the state-of-art parallel database technologies on MPP systems, including Oralce 7 parallel software on nCUBE2 and IBM SP2, and DB2 Parallel Edition on IBM SP2.

I was a project leader of a data mining project sponsored by a industrial corporation to investigate advanced data mining software for very large database in commercial applications.

In a financial modeling project funded by DEC and Syracuse University, I developed a set of parallel stock option pricing models on massively parallel systems, including Connection Machines CM2 and CM5, DECmpp-12000, nCUBE2, IBM SP-2 and on networked workstations.

I have developed a high performance computing and visualization system for an electromagnetic scattering(EMS) simulation. In this DARPA-funded project, parallel EMS programs on the CM5 are integrated into an interactive data visualization environment to take the advantages of high performance computing and sophisticated 3D graphical display.

I played an active role in a NASA funded HPCC "Grand Challenge" application project in four-dimensional data assimilation, in which I was responsible for the parallel implementation of a trajectory model and system integration/visualization.

I have actively participated in the NSF Research Experiences for Undergraduates (REU) programs at NPAC, served as a co-advisor of a REU student project in 1993 and gave seminars in 1993 and 1994.

I was a NPAC project leader of a U.S. Air Force Wright Laboratory funded project to develop and implement advanced computational electromagnetics techniques on massively parallel computing architectures. In this large-scale industrial application project, working with an industrial partner, Syracuse Research Corporation, I was responsible for and has involved in all the project phases, including proposal writing to obtain external funding, project management and implementation, research reports preparation and presentation.

I have also actively involved in a variety of other parallel application and educational projects at NPAC, with extensive expertise in design, system integration and implementation of Web and database technologies, MPP software development, algorithm design and programming, network programming, computer graphics, and programming languages.

PUBLICATIONS LIST

Ph.D. Dissertation

- Cheng, G., "A Dataflow-Based Software Integration Model in Parallel and Distributed Computing and

Applications," the School of Computer and Information Science, Syracuse University, September, 1996. (Advisor: Geoffrey C. Fox)

Journal Publications

- Cheng, G., Fox, G. C., "Integrating Multiple Parallel Programming Paradigms in a Dataflow-Based Software Environment," *Concurrency: Practice and Experience*, Vol. 8(9), 667-684, John Wiley & Sons Publisher, Nov. 1996.

- Cheng, G., Fox, G. C., Lin, T. and Haupt, T., "A Computing Framework for Integrating Interactive Visualization in HPCC Applications," accepted to appear in the special issue of *Concurrency: Practice and Experience* - Commercial and Industrial HPC Applications, John Wiley & Sons Publisher, 1997.

- Beca L., Cheng G., Fox G. C., Jurga T., Olszewski K., Podgorny M., Sokolowski P., and Walczak K., "Java Enabling Collaborative Education HealthCare and Computing,", accepted to appear on Concurrency Practice and Experience, John Wiley & Sons Publisher, 1997.

- Cheng, G. and Zhang, Y., "A Functional + Logic Programming Language in Interpretation-Compilation Implementation," *Lisp And Symbolic Computation*: An International Journal, Vol. 5, No. 3, 133-156, 1992, Kluwer Academic Publishers.

- Cheng, G. and Zhang, Y., "A Functional Plus Logic Programming Language," *Mini- and Micro- Computers*, No. 1, Vol. 11, 1990 (in Chinese), pp. 14-19.

Conference Proceedings

- Beca L., Cheng G., Fox G. C., Jurga T., Olszewski K., Podgorny M., Sokolowski P., and Walczak K., "TANGO - a Collaborative Environment for the World-Wide Web," Submitted to and accepted by the Sixth IEEE International Symposium on High Performance Distributed Computing, August 5-8, 1997, Portland, Oregon.

- Beca L., Cheng G., Fox G. C., Jurga T., Olszewski K., Podgorny M., Sokolowski P., and Walczak K., "Web Technologies for Collaborative Visualization and Simulation" in Proc. of the 8th SIAM Conference on Parallel Processing for Scientific Computing, March 16-19 1997, Minneapolis, MN.

- Cheng, G., Sokolowski, P., Podgorny, P., Fox, G. "WWW Search Systems USing SQL*TextRetrieval and Parallel Server for Structured and unstructured Data", Proc. of the 6th Annual Oracle Developers' Conference ECO '96, McLean, VA, April 21-24, 1996.

- Cheng, G., Hawick, K. A., Mortensen, G., and Fox, G., "Distributed Computational Eletromagnetics Systems," Proc. of the 7th SIAM conference on Parallel Processing for Scientific Computing, Feb. 15-17, 1995.

- Shen, X., Cheng, G., Mortensen, Cha, C, and Fox, G., "Parallelization of the Parametric Patch Moment Method Code", Proc. of the 11th Annual Review of Progress in Applied Computational Electromagnetics, March 20-24, 1995, Monterey, CA.

- Cheng, G., Hawick, K. A., Mortensen, G., Fox, G. and Cha, C., "Parallel Implementation of a MoM-based Computational Electromagnetics Application on Intel Machines", in the 93-94 CSCC (Concurrent Supercomputing Consortium) Annual Report, P. Messina (Eds.), 1994.

- G. Cheng, G. Fox, K. Mills and Marek Podgorny, "Developing Interactive PVM-based Parallel Programs on Distributed Computing Systems within AVS Framework," Proc. of the 3rd Annual International AVS Conference, JOIN THE REVOLUTION: AVS'94, Boston, MA, May 2-4, 1994.

- Cheng, G., Fox, G.C. and Hawick, K., "A Scaleable Paradigm for Effectively-Dense Matrix Formulated

Applications," Proc. of the European Conference and Exhibition on High-Performance Computing and Networking (HPCN Europe) 1994, Munich, Germany, April 18-20, 1994.

- Seablom, M., Lyster P., Mills, K., Laszewski, G. and Cheng, G., "The NASA Data Analysis System for Massively Parallel Computers," Proc. of the 1994 SCS Simulation Multiconference, High Performance Computing '94, April 11-15, 1994, La Jolla, CA.

- Mills, K., Shen, X., Cheng, G., Miller, D., "A Massive Data Parallel Program for 3D Proton Dose Distribution," Proc. of the 1994 SCS Simulation Multiconference, High Performance Computing '94, April 11-15, 1994, La Jolla, CA.

- Cheng, G., Lu, Y., Fox, G.C., Mills K. and Haupt, T., "An Interactive Remote Visualization Environment for an Electromagnetic Scattering Simulation on a High Performance Computing System," Proc. of IEEE Supercomputing ‘93, Portland, OR, November 1993, IEEE Computer Society Press, Los Alamitos, CA. (Best student paper award)

- Cheng, G., Sparling, L., Mills, K. and Lyster P., "Four Dimensional Data Assimilation (NASA HPCC): Parallel Trajectory Model," Poster presentation at IEEE Supercomputing ‘93, Portland, OR, November 1993, IEEE Computer Society Press, Los Alamitos, CA.

- Cheng, G., Faigle, C., Fox, G.C., Fumanski, W., Li, B. and Mills, K., "Exploring AVS for HPDC Software Integration: Case Studies Towards Parallel Support for GIS," Proc. of the 2nd AVS Conference AVS'93, Lake Buena Vista, FL, May 1993.

- Cheng, G., Mills, K., Fox, G.C., "An Interactive Visualization Environment for Financial Modeling on Heterogeneous Computing Systems," Proc. of the 6th SIAM Conference on Parallel Processing for Scientific Computing, March 1993, Norfolk, VA, pp. 891-989, Vol. 2.

- Li, B., Mills, K., Csillag, F., Podgorny, M., Vaughn, B. and Cheng, G., "Integration of GRASS with High Performance Parallel Computing Environment," in Proc. of the 8th GRASS GIS Users Conference, Open Grass Foundation, Reston, VA, March 1993.

- Mills, K., Cheng, G., Vinson, M., Ranka, S., and Fox, G.C., "Software Issues and Performance of a Stock Option Pricing Model on the Connection Machine-2 and DECmpp-12000," Proc. of Fifth Australian Supercomputing Conference, World Congress Centre, Melbourne, Australia, December, 1992, pp. 125-134.

- Mills, K., Vinson, M., Cheng, G., "A Large Scale Comparison of Option Pricing Models with Historical Market Data," Proc. of 4th Symposium on the Frontiers of Massively Parallel Computation (McLean, Virginia, October 19-21, 1992), IEEE Computer Society Press, Los Alamitos, California, 1992, pp. 420-426.

- Cheng, G., Huang, S., et al, "An Employee Attendance System with Mag-Card Reader," Microcomputer Applications, pp. 15-18, Vol. 12, No. 4, July, 1991 (in Chinese).

- Huang, X. and Cheng, G., "A Province-Wide Natural Disaster Precaution System: An Application of Geographic Information System to Natural Disaster Reduction," in Proc. of the 2nd International Workshop on GIS, Beijing, pp. 386-391, 1990.

- Cheng, G., Huang, S., et al, "A Highway Toll-Collecting System with Mag-Card Reader," Computer Applications, pp. 10-13, No. 6, 1990 (in Chinese).

- Cheng, G. and Kang, Z., "A Computer-Based Information System on Moving Elements of Debris Flow," in Proc. of the 1st Japan-China Symposium on Landslides and Debris Flows, pp. 195-198, Tokyo, Japan, 1989.

- Cheng, G. and Zhang, Y., "Designing A Knowledge-based Programming Environment with Functional and Logic Paradigms," Computer Applications, pp. 20-25, No. 4, 1989 (in Chinese).

- Cheng, G., "The Implementation of An AI Language Unifying Functional and Logic Paradigms," M.S. Thesis, Computer Science and Engineering Department, Huazhong University of Science and Technology, China, 1988, 77 pps (in Chinese).

- Kang, Z., Hu, P., Cheng, G., "Sorting and Stockpile on Observed Data of Moving Elements of Debris Flow," Mountain Research, pp. 289-294, Vol. 5, No. 4, Dec., 1987 (in Chinese).

- Cheng, G., "Program Understanding," Journal of HUST Graduates, pp. 52-55, No. 1, 1987 (in Chinese).

- Cheng, G., "A New Programming Language TAO integrating LISP, Prolog and Smalltalk," Journal of HUST Graduates, pp. 182-187, No. 1, 1988, and in Proc. of the 8th National Symposium on Artificial Intelligence, 1987 (in Chinese).

Technical Reports

- Cheng, G., Podgorny M., "The High Performance Switch and Programming Interfaces on IBM SP2," Technical Report, SCCS 710, NPAC, Syracuse University, June 1995.

- Fox, G. C., Haupt, T., Mills, K., Mohammed, A. G., Cheng, G., Coddington, P., van Laszewski, G., Lin, N.T., Lu, Y.H., Parashar, M., Yeh, N.K., "Benchmark Suites Development for HPF and FortranD Applications," Parallel Computing Research, Center for Research on Parallel Computation(CRPC), Vol. 1, Issue 1, January 1993, pp. 9.

- Mills, K., Cheng, G., Vinson, M., Ranka, S., and Fox, G.C., "Load Balancing, Communication, and Performance of a Stock Option Pricing Model on the Connection Machine-2 and DECmpp-12000," Technical Report, Syracuse Center for Computational Science-273, 22 pps, March, 1992.

- Cheng, G. and Fox, G. C., "An Interactive Graphic Tool for the Option Price Modeling on DECmpp-12000 Using AVS," Technical Report, Syracuse Center for Computational Science-369, 12 pps, August, 1992.

- Cheng, G. and Fox, G. C., "CM-Fortran Implementation for American (Full) Binomial Approximation of a Stock Option Pricing Model," Technical Report, Syracuse Center for Computational Science-225, 10 pps, December, 1991.

CONFERENCE PRESENTATIONS

- Conference attending at the Oracle Open World, San Francisco, CA, Nov. 11-17, 1996.
- Paper presentation at the 6th Annual Oracle Developers' Conference ECO '96, McLean, VA, April 21-24, 1996.
- Tutorial presentation at the IEEE Supercomputing ‘95, San Diego, CA, Dec. 18-23, 1995.
- Conference attending at the 14th Annual International Oracle User Week, Philadelphia, PA, Sept. 17-22, 1995.
- Tutorial presentation at the 4th IEEE International Symposium on High Performance Distributed Computing, Washington, D.C., August 2-4, 1995.
- Paper presentation at the 6th SIAM (Society for Industrial and Applied Mathematics) Conference on Parallel Processing for Scientific Computing, San Francisco, CA, Feb. 15-17, 1995.
- Paper presentation at the 3nd AVS (Application Visualization System) Conference AVS'94, Boston, MA, May 2-4, 1994.
- Paper presentation at the IEEE Supercomputing ‘93, Portland, OR, November 15-19, 1993.
- Paper presentation at the 2nd AVS Conference AVS'93, Lake Buena Vista, FL, May 24-26, 1993, also served as a panelist in a panel discussion on "Parallel Computing with AVS".
- Paper presentation at the 6th SIAM Conference on Parallel Processing for Scientific Computing, Norfolk, VA, March 22-24, 1993.
- Paper presentation at the 8th National Symposium on Artificial Intelligence, Qingdao, China, May 1987.

EDUCATION ACTIVITIES

- Invited seminar on "Integration of RDBMS and Web Technologies" to Syracuse Research Corporation, April 8, 1995.
- Lectures on "Integration of RDBMS and Web Technologies", "Web Search Systems" to CPS 615, School of Computer and Information Science, Spring and Fall, 1995, NSF REU program at NPAC, summer, 1996.
- "Parallel Oracle 7 and Transaction Processing Benchmarks", to NPAC seminar series, Syracuse University, Feb. 1995.
- "National Information Infrastructure and High Performance Computing and Communication in the U.S.", Invited Lectures at Beijing University of Post and Telecom, Dec. 22 - 30, 1994.
- Seminar on "Parallel Relational Databases", to NPAC seminar series, Syracuse University, Nov. 1995.
- Co-advisor to a student project of the 1993 NSF and GE Research Experiences for Undergraduates (REU) Program in High-Performance Computing. July - August 1993.
- Seminar on "Exploring AVS for Software Integration in High Performance Computing" to the 1993 NSF and GE Research Experiences for Undergraduates (REU) Program in High-Performance Computing, Syracuse University, July 1993.
- Tutorial session on "AVS Geometry Viewer" to the 1993 NSF and GE Research Experiences for Undergraduates (REU) Program in High-Performance Computing, Syracuse University, July 1993.
- Seminar on "Financial Modeling on Heterogeneous Computing Systems" to NPAC seminar series, Syracuse University, March 1993.
- Seminar on "Computational Electromagnetics Applications on Massively Parallel Systems" to NPAC seminar series, Syracuse University, March 1994.
- Teaching Assistant to a undergraduate course, August - Dec. 1991.

Description of Major Research Projects

- Internet Information Systems using Web and RDBMS Technologies
  - o A Searchable USENET Newsgroups Archives System (*http://asknpac.npac.syr.edu*)
  - o A Web Search System using Oracle Context Server
  - o Large-scale Internet information systems using parallel Oracle server and Web servers on an IBM SP2
  - o Oracle7 DBA and Webmaster of two Web/Oracle servers at NPAC
  - o DBA for Oracle 7.3 with parallel server and query options on IBM SP2 and nCUBE2.
  - o http://kayak.npac.syr.edu:1963 is rated a 'must see' site by Oracle
  - o Data mining software and applications
  - o System administrator for IBM RS/6K, IBM SP2 and nCUBE2
  - o Official DB2 Parallel Edition training from IBM

- Java/WWW based Collaborative System for Distance Learning and Military Command & Control

  Using Java, LiveConnect, Plugin, JDBC, Oracle and other Web technologies, we develop a software engineering infrastructure called TANGO (*http://www.npac.syr.edu/tango*) that provides the means of fast integration of Web- and non-Web-applications into a multi-user collaborative environment. It consists two major components: a collaboration runtime consisting of a Java server, a session manager and a local daemon for event routing and logging, session management and user control, and an API for porting standalone programs in Java applet, C/C++ and JavaScript into collaborative applications to run on the runtime.

- Benchmarking of Parallel Database Systems on MPP Machines

  TPC's TPCD benchmark suite for Decision Support System was chosen to benchmark an Oracle 7 RDBMS with parallel server, parallel query and distributed options on shared-nothing MPP architectures, including a nCUBE2 and an IBM SP2. Sizeup (from 100MB to 10GB), scaleup (from 1 to 64 nodes) and speedup tests were conducted. Installation and initial benchmarks of DB2 Parallel Edition on an IBM SP2 were also conducted.

- Benchmarking of a Commercial Data Mining Software on IBM SP2 System

  Lead a team of NPAC researchers to develop, implement and conduct extensive benchmarks and experiments on an IBM SP2 for the "Orchestrate" data mining development environment developed by Applied Parallel Technologies, Inc. Also working as a consultant to APT to provide support/advice in parallel database on SP2 during the project.

- Development and Implementation of Computational Electromagnetics Techniques on Massively Parallel Computing Architectures

  ParaMom, a computational electromagnetics code developed by Syracuse Research Corporation, was ported in explicit message-passing programs to run on an Intel Paragon, an IBM SP2, a CM5, and networked workstation clusters. Using ScaLAPACK/BLACS, the distributed version of parallel linear algebra library LAPACK from ORNL/UTK, excellent program portability, high scalability and good performance were achieved in porting the over 10K Fortran77 sequential code. Validation with all EMCC benchmark cases were conducted, as well as scalability and performance analysis. An out-of-core matrix solver was used and out-of-core algorithms were developed to run large realistic aircraft tests.

- Four Dimensional Data Assimilation (NASA HPCC)

  Collaborated with researchers at NASA/Goddard Space Flight Center and Jet Propulsion Laboratory, data parallel and explicit message passing algorithms of a Lagrangian trajectory model were implemented on CM5 and iPSC/860. Performance of data decomposition and parallel I/O were investigated for this real-time particle simulation application.

- Data-Parallel Implementation of the Microphysics Model in a Weather Modeling System.

  Sequential Fortran77 code of the microphysics part of ARPS, a nonhydrostatic three-dimensional weather predication model developed by CAPS at University of Oklahoma, was ported in Fortran90 to CM5 and DECmpp-12000. Parallel software engineering and performance issues were evaluated for this large-scale application.

- Financial Modeling on Parallel and Distributed Systems

  A set of stock option pricing models are implemented in Fortran90 and ported to massively parallel systems such as CM-2 and CM-5(in CMFortran), DECmpp-12000(in MPFortran and MPL), nCUBE2(in Fortran77+Express), IBM SP-1(in Fortran77+API) and networked workstations (in Fortran77+Express and Fortran77+PVM).

- An Interactive Visualization Environment on a Distributed High Performance System

  Written in C and AVS modules and using financial modeling and electromagnetic scattering simulation as application examples, application's computing modules running on CM2/5, DECmpp-12000, SUN, DEC, IBM workstations are coupled, over a LAN, with network-based GUI in AVS running on a graphical workstation and managed under X-Window. This is a highly portable UNIX-based system.

- A Vector-Based Spatial Database Management and Map Display System

  In Fortran77, Clipper and MS-Window and as a subsystem of the VirGIS (Virginia Geographic Information System) Project at Virginia Tech, this PC-based system allows the user to manage and generate high quality graphics of DLG maps in various ways.

- "LISP+PROLOG" Interpreter-Compiler

  In C, the host of this system is a Lisp interpreter into which a Prolog compiler (as a knowledge base processor), an editor and a debugger are integrated. In this AI language, a user can program in either independent or mixed paradigms of Lisp and Prolog.

- A Highway Toll-Collecting System

  In Intel 8031/8051 assembly and as a firmware in MCS-51(a microchip processor), it handles real-time processing of input signals from magnetic card reader/encoder which are data entry equipment at highway toll-station.

(detailed projects information conducted by G. Cheng at NPAC can be found via NPAC WWW server -- *http://www.npac.syr.edu/homepages/gcheng/gcheng.html*)

PROGRAMMING SKILLS

- C, C++, Java, JavaScript, Perl, Oraperl, HTML, VRML, SQL, PL/SQL, Fortran(Fortran77, Fortran90, HPF), Lisp, Prolog, Pascal, Cobol, Basic, Algol60, 8086/8088 and 8031/8051 Assembly, VHDL.

- X Window(Xlib, X Toolkit, OSF/Motif Toolkit), AVS, Data Explore.

- Oracle 7 (SQLDBA, Pro*C, SQL, PL/SQL, SQL*NET, SQLPLUS, SQL*TextRetrieval, TextServer3 with Context) on IBM RS/6000 and SUN4/10, Oracle 7.3 on IBM SP2 and nCUBE2 (parallel server, parallel query and distributed options), DB2 Parallel Edition on IBM SP2, dBASE-IV/Clipper.

- Web Server Administration (NCSA Mosaic HTTPD, Netscape netsite.), CGI Programming (Java JDK, Perl, JavaScript, C).

- TCP/IP, PVM, Express, MPI, BLACS, ScaLAPACK.

- many other software packages on UNIX-based workstations.

- IBM SP1/SP2(POE, EUI, EUI-H, VT, VSD, HSD), Connection Machine 2/5(CMfortran, C*, Prism, CMMD, CMX11, CMSSL,CMFS/SDA), DECmpp-12000 (MPfortran, MPL, MPPE), nCUBE2(NDB),Intel Paragon, Delta, iPSC/860(NX,ProSolver/DES).

- Shell Programming (csh, perl, ksh, bsh), SUNstation, DECstation, IBM RS6000(UNIX, ULTRIX, AIX), SGI, VAX-11(VMS), IBM-PC(MS-Window, Window95, NT), Macintosh.

RESEARCH DEMONSTRATIONS

- A Searchable Web and Oracle7 based USENET Newsgroup and Mailing List Archives System; A Web Search System with Oracle Text*Retrieval, at the 4th IEEE International Symposium on High Performance Distributed Computing, Washington, D.C., August 2-4, 1995, and at the IEEE Supercomputing ‘95, San Diego, CA, Dec. 18-23, 1995.

- Stock Option Pricing Models on IBM Scalable Parallel Computer SP-1. IBM exhibition booth 702, Supercomputing '93, Portland, Oregon, November 15-19, 1993.

- Financial Modeling and Electromagnetic Scattering Simulation on High Performance Computing Systems over ATM-based WAN NYNET, at a public hearing of U.S. House of Representatives, Committee on Science, Space, and Technology, U.S. Air Force Rome Laboratory, October 25, 1993.

- Option Price Modeling on High Performance Networked Systems, at the conference of "Building Bridges to the Information Age" by New York Telephone and NYNET, Sheraton University Inn and Conference Center, Syracuse University, April 1993, at the 1992 Engineering Open House by the College of Engineering and Computer Science, Syracuse University, March 1992, at the 4th IEEE International Symposium on High Performance Distributed Computing, Washington, D.C., August 2-4, 1995.

- Electromagnetic Scattering Simulation on the Connection Machine CM5, at the 1993 Engineering Open House by the College of Engineering and Computer Science, Syracuse University, March 1993.

- Radar Cross Section Prediction Simulation on IBM SP1, at the 1994 NPAC InforMall Meeting, Syracuse University, March 1994.

MISCELLANEOUS

- Cha, Chung-Chi, Fox, G. C., Mortensen, G. E., Cheng G., Mills, K., "Development and Implementation of Computational Electromagnetics Techniques on Massively Parallel Computing Architectures," Proposal Solicitation to Wright Laboratory, Wright-Patterson AFB with Syracuse Research Corporation, May, 1993 (awarded).

• Journal papers referee for Concurrency: Practice and Experience, Editor, G. C. Fox, 1993 - 1996

• Journal paper referee for Journal of Computer & Software Engineering, Special Issue on Parallel Algorithms and Architectures, 1994.

• Journal paper referee for Integrated Computer-Aided Engineering Journal, Special Issue on High Performance Distributed Computing: Software Tools and Applications, 1994.

• Conference paper referee for the 1994 Scalable High Performance Computing Conference, Knoxville, Tennessee, May 23-25, 1994

• Conference paper referee for the 1994 European CONPAR, March, 1994

REFERENCES

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