RAY ZIMMERMAN

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PROFESSIONAL INTERESTS

Software tools for electrical engineering, especially related to research and education. Market design and operational issues in the restructured electric power industry.

EDUCATION

Ph.D. in Electrical Engineering, Cornell University, Ithaca, NY **January 1995**

Major/minor field: electric power / computer science, numerical algorithms
Thesis: "Comprehensive Distribution Power Flow: Modeling, Formulation, Solution Algorithms and Analysis"
Developed a formulation and efficient solution algorithms for the distribution power flow problem, taking into account the detailed and extensive modeling necessary for use in the distribution automation environment of a real world electric power distribution system.

M.S. in Electrical Engineering, Cornell University, Ithaca, NY **May 1992**

Major/minor field: electric power / computer science, numerical algorithms
Thesis: "Network Reconfiguration for Loss Reduction in Three-Phase Power Distribution Systems"
Designed and implemented a network reconfiguration program based on simulated annealing for reducing real power losses in unbalanced radial three-phase distribution systems.

B.S. magna cum laude in Electrical Engineering, Drexel University, Philadelphia, PA **June 1989**

Major/minor field: computer engineering / signal processing
Grade-Point Average: 3.93 (4.00 scale), ranked 7th in class of 224
Senior Design Project: "Structural Design and Implementation of an Anechoic Chamber and a Data Acquisition and Processing System for Drexel's Antenna Laboratory"
Designed and implemented data acquisition and control program with graphical user interface for fully automated, computer-controlled far field antenna laboratory.

PROFESSIONAL EXPERIENCE

Cornell University, Ithaca, NY **August 1989 – present**

Research Associate — November 1997 – present
Visiting Scientist — August 1995 – November 1997

Investigated the behavior of markets for the supply of electric power in a restructured power industry using "live" market participants and full non-linear constrained optimal power flow models. Designed, implemented, and maintained *POWERWEB* (see http://www.pserc.cornell.edu/powerweb/), a distributed, interactive, Internet-based platform for experimental evaluation of electricity supply markets. Initiated and lead in the design and implementation of *MATPOWER* (see http://www.pserc.cornell.edu/matpower/), a collection of MATLAB-based optimal power flow tools suitable for research and educational use.

Postdoctoral Associate — January 1995 – June 1995

Taught distribution power flow for senior level course on distribution automation. Wrote major portions of final project report for large industry sponsored research project on distribution automation. Prepared several papers for publication.

Research Assistant — August 1993 – January 1995

Developed, implemented and analyzed distribution power flow techniques. Extended existing formulations and algorithms and introduced new variations to handle the comprehensive modeling required in the context of real world distribution automation.

System Administrator — August 1992 – May 1994

Administered an undergraduate computing facility of networked Macintosh workstations for the electrical engineering department. Implemented a zero-maintenance strategy to keep all workstations in a consistent, usable state without sacrificing access and flexibility for the users. Acted as Macintosh consultant in the department.

Teaching Assistant — August 1989 – May 1993

Assisted with junior level systems courses for one year and senior level digital signal processing course, including laboratory sessions, for one year. Head TA for second year circuits course for two years.

Drexel University, Philadelphia, PA **June 1989 - August 1989**

Software Engineer

Continuation of Senior Design Project. Designed and implemented data acquisition and control program with graphical user interface for fully automated, computer-controlled far field antenna laboratory.

PROFESSIONAL EXPERIENCE *continued*

Asociación Cristiana Agape, Buenos Aires, Argentina **June 1988 - September 1988**
Volunteer Software Engineer
Developed relational database application for a church of 2000 members using a compiled dBase language. Became fluent in Spanish. Met my wife.

UNISYS Corporation, Tredyffrin, PA **June 1987 - December 1987**
Engineering Assistant
Designed and tested display and test circuits. Assisted engineers in digital board layout and documentation. Maintained hardware for personal computers and mainframe maintenance consoles.

Evaluation Associates, Bala Cynwyd, PA **June 1986 - December 1986**
Programmer
Developed cost analysis worksheet/database using Lotus 1-2-3. Performed various programming tasks on IBM PC, Macintosh, and Unix. Located and ordered electronic components for prototype card design.

IBM Corporation, Research Triangle Park, NC **June 1985 - December 1985**
Quality Assurance Technician
Assisted engineers in Quality Assurance Department in diagnosis of problems found in network controllers during thermal cycle tests. Assumed responsibility for card recall/rework operation.

COMPUTER SKILLS

Programming Languages
Java, C, Perl, HTML, SQL, JavaScript, MATLAB, Pascal, dBase, BASIC.

Operating Systems
Windows (3.1/95/98/NT), Unix (Solaris, SunOS, HP-UX), MacOS (since 1984 original).

Internet Related
Development of database driven application servers on Unix platforms, with HTML and Java applet user interfaces.

HONORS AND AWARDS

National Science Foundation Graduate Fellowship, Honorable Mention, 1989
Dupont Graduate Research Fellowship, Honorable Mention, 1989
Election to the Honor Society of Phi Kappa Phi, 1989
Who's Who Among Students in American Universities and Colleges, 1989
Harry E. Muchnic Scholarship, 1987
Election to Tau Beta Pi Honor Society for Engineers, 1987
Eastman-Kodak Company Scholarship, 1986
Member, Eta Kappa Nu Honor Society for Electrical Engineers, 1986
Member, Phi Eta Sigma National Honor Society for Freshmen, 1985

AFFILIATIONS

The Institute of Electrical and Electronics Engineers

SELECTED PUBLICATIONS

"Energy Auctions and Market Power: An Experimental Examination", with J. Bernard, R. Thomas, W. Schulze, Proceedings of the 32nd Annual Hawaii International Conference on System Sciences, Jan 7-10, 1999, Maui, Hawaii.

"A Web-Based Platform for Experimental Investigation of Electric Power Auctions", with R. Thomas, D. Gan, C. Murillo-Sánchez, Decision Support Systems, Vol. 24, Nos. 3 & 4, January 1999, pp. 193-205.

"A Uniform Price Auction with Locational Price Adjustments for Competitive Electricity Markets", with R. Ethier, T. Mount, W. Schulze, R. Thomas, Electrical Power and Energy Systems, Vol. 21, 1999, pp. 103-110.

"Stability-Constrained Optimal Power Flow", with D. Gan, R. Thomas, accepted for publication in IEEE Transactions on Power Systems.

"Experimental Results for Single Period Auctions", with J. Bernard, R. Ethier, T. Mount, W. Schulze, D. Gan, C. Murillo-Sánchez, R. Thomas, Proceedings of the 31st Annual Hawaii International Conference on System Sciences, Jan. 6–9, 1998. Kona, Hawaii.

"Fast Decoupled Power Flow for Unbalanced Radial Distribution Systems", with H. D. Chiang. IEEE Transactions on Power Systems, Vol. 10, No. 4, November 1995, pp. 2045-2052.

REFERENCES

Available upon request.