

Boleslaw K. Szymanski, Rensselaer Polytechnic Institute
Claire and Roland Schmitt Distinguished Professor of Computer Science
Director, Network Science and Technology (NeST) Center
IEEE Fellow; Editor-in-Chief: *Scientific Programming*
Foreign Member, *National Academy of Science*, Warsaw, Poland

Education

M.Sc. (Electronics) – Faculty of Electronics and Information Technology,
the Warsaw University of Technology, Warsaw, Poland, 1973
Ph.D. (Computer Science) – The Institute of Computer Science,
the Polish Academy of Sciences, Warsaw, Poland, 1976

Professional Career

Warsaw University of Technology, Warsaw, Poland
1973-1975 Assistant Professor
Institute of Scientific, Technical, and Economic Information, Warsaw, Poland
1976-1978 Researcher
1979, Fall Postdoctoral Researcher at University of Aberdeen, UK
1979-1982 Head of Information System Division
University of Pennsylvania, Philadelphia, PA
1982-1985 Visiting Assistant Professor, Computer and Information Science
Rensselaer Polytechnic Institute, Troy, NY
1985-1989 Associate Professor of Computer Science
1993-1994 Acting Department Chair, Department of Computer Science
1997-2001 Associate Dean for Information Technology
1997-2002 Chair of Information Technology Research Board
1990-2007 Professor of Computer Science
2003-2006 Founding Director, Center for Pervasive Computing and Networking
2007-present Claire and Roland Schmitt Distinguished Professor
2009-present Director, ARL NS CTA Social Cognitive Network Academic Research Center
2010-present Founding Director, Network Science and Technology Center

Professional Society Memberships, Honors, Awards and Activities

Elected Foreign Member, National Academy of Science, Warsaw, Poland, 2009
Awarded Wilkes Medal, British Computer Society, 2009
Appointed the Claire and Roland Schmitt Distinguished Professor, RPI, 2007
William H. Wiley 1866 Distinguished Faculty Award, RPI, 2003
IEEE Fellow (since 1999), Computer Society of IEEE: member since 1982
ACM National Lecturer(1988-89), Association for Computing Machinery: member since 1982

Editor-in-Chief: *Scientific Programming* (since 2000)
Area Editor: *SIMULATION: Transactions of The Society for Modeling & Simulation International* (2003-2007)
Member of the Editorial Board: *Computing & Informatics* (since 2009)
Member of the Editorial Board: *Scalable Computing: Practices & Experience* (since 2005)
Member of the Editorial Board: *Computer Science Journal, Krakow, Poland* (since 2010)
Guest Editor: *ACM SIGAPP Applied Computing Review* (1996),
Journal of Parallel Algorithms and Applications (1996), *Scientific Programming* (1996, 1998)
Member of the Editorial Board: *Parallel and Distributed Computing Practices* (1999-2004)

First Prize in SuCuPar93, international parallel computation competition, Mannheim, Germany, 1993
NASA Certificate of Recognition for development of technical innovation, 1997
Gold Medal at the International Olympiad in Mathematics, 1968

Chair, The Third Workshop on Compilers, Languages and Run-Time Systems, Troy, NY, May, 1995

Co-Chair, Program Committee, 1st Annual Conference of Information Technology Alliance,
Washington, DC, September 2007

General Co-Chair, Auctions, Market Mechanisms and their Applications Conferences:
Boston, MA, May 2009, New York, NY, 2011 (in preparation)

Vice-Chair, NSF-RPI Workshop on Pervasive Computing and Networking, Troy, NY, April 2004

Vice-Chair of Program Committee, Parallel Programming and Applied Mathematics, Poland, 2005 - present

Chair, Network Simulation Track, European Modeling and Simulation Symp., Barcelona, Spain, 2006

Tutorials: SCSC'02, IEEE ICA3PP'96, ACM SAC'96, ISC'88

A member of the Working Group of EU Ubiquitous Data Mining Initiative, 2006-2007

Entrepreneurship and Industrial Consulting

Optimaret, Inc., Newtonville, NY (2004), co-founder and President

Premonitia, Inc., Waltham, MA (2001), co-founder

EnterNet Inc., Troy, NY (2000), co-founder

CCCC, Philadelphia, PA (1983-88), chief scientific officer and consultant

Consulting: Gauda, Inc., San Jose, CA; Emerson, Inc., St. Louis, MO; International Medical Programs,
Albany, NY; Cardiomag Imaging, Schenectady, NY; IBM Corp., Poughkeepsie, NY; Research and
Development Center, General Electric, Schenectady, NY; United Nation Development Office,
Vienna, Austria

Senior Scientific Advisor to Create-Net, European Research Consortium in Trento, Italy since January 2005

Scientific Advisor to Gauda Inc, since June 2006

Scientific Advisor to Quantum-PI Inc, since August 2007

University Administrative Leadership and Experience

Founding Director of the Network Science and Technology (NeST) Center (started in 2010). The center unites research of the ARL Social Cognitive Network Academic Research Center and the RPI Pervasive Computing and Networking Center. The combined research program focuses on fundamental research and engineering of natural and technological networks, ranging from social and cognitive networks to computer networks. The scientific understanding of network structures and the dynamic processes arising in them, combined with the novel designs of protocols for communication and algorithms for applications, will enable experts in fields ranging from sociology, to biology, medicine, physics, computer science and engineering and transportation engineering to apply the results of the center research in their specific disciplines.

Director of the ARL NS CTA Social Cognitive Network Academic Research Center. (started in 2009, became a part of NeST in 2010). The center has been awarded in the nation-wide competition between multi-campus teams of researchers in 2009 as a part of the ARL Network Science Collaborative Technology Alliance. The research team that I led included ten faculty at RPI and 19 professors and researchers at Harvard, MIT, NYU, Indiana, Northeastern, Northwestern, CUNY and IBM. With unique focus on technologically based social and cognitive networks, broad and diverse research team and funding of up to 10 years, the center is likely to define research agenda in this area in the next several years.

Founding Director of the Center for Pervasive Computing and Networking (started in 2003, became a part of NeST in 2010). The center involves 12 faculty at RPI with research spanning computer networking, sensor networks, embedded system software and computer security. The research program expanded research activities at RPI in those areas and ushered the Center into the ARL International Technology Alliance led by the IBM Corp.

Associate Dean for Information Technology (1997-2001). A principal member of the team that created the Information Technology Program at RPI and developed the IT curriculum; chair of Computer Science department faculty search that hired eleven assistant professors from top schools since 1997, all of whom won prestigious NSF Career's Awards; chair of the "Future of School of Science" panel and principal author of a report that identified Information Technology, Biotechnology and Energy as the three strategic directions for the school in 1999 (two of those were selected as growth initiatives at RPI and the third was adopted later by the entire university); led the successful integration of research in Information Technology involving the Schools of Engineering, Science and Humanities & Social Science.

Chair of the Information Technology Research Board:(1997-2002). Advisor to the Vice-President for Research and the Vice-Provost for Information Technology on strategic directions of IT research for the university.

Founding Member of Scientific Computing Research Center (SCOREC) (since 1988). The center focuses on adaptive solvers for partial differential equations and multiscale and multiphase simulations. Co-author and co-Principal Investigator in major SCOREC grants.

Research Interests

Social networks and network science. Computer networks: sensor network, mobile networks, and network management and simulation. High performance computing: parallel computation, run-time optimization of parallel and distributed object-oriented programs. Algorithm design and verification for parallel and distributed systems.

Research Highlights

Network Synchronization with Processing and communication Delays. This problem was posed in 1930's in the context of a simple two-node system. We established stability criteria for a network of arbitrary size and connectivity with homogeneous delay at all nodes analytically and heterogeneous delays numerically. Interesting result is that a network becomes unstable with both too little and too much connectivity between nodes, and the stability can be restored in the later case by cutting some of the connections (*Phys. Rev. Lett.* **105** 068701).

Lecture Hall Algorithm. Using broadcast, we designed an algorithm that finds an object among n objects in $O(1)$ time. We used it for routing in sensor networks (Wilkes Medal for the best paper in vol. 51 of *The Computer Journal*, 2008:511-522).

Lookback-based protocols for PDES: *Lookback*, determined by the maximum impact time of all processed events that are locally irrecoverable, has proven to be an effective tool in expressing semantics that endows the component with an ability to change the past locally. Proposed in 2001, lookback was the first new protocol for parallel discrete event simulations introduced since the 1980's when the Time Warp was discovered (*Proc. PADS*, 2003:3-10).

Complexity of Node Counting: We established that despite good performance in many environments, the *Node Counting algorithm* for robot navigation in unknown environments is not of polynomial complexity (*Annals of Mathematics and Artificial Intelligence*, **31**, 2001:41-76). It was an open problem in the robotics community.

Mutual Exclusion: In 1982, Lamport posed a problem of Mutual Exclusion on arbitrary hardware and proposed a solution with $n!$ (n factorial) variables for n processes. By designing the solution now called *Szymanski's Mutual Exclusion*, we showed that just five variables are enough (*Proc. Jerusalem Conf. on IT*, 1990:110-117). This algorithm has often been used as a benchmark for verification systems.

Synchronized Distributed Termination: We presented a general solution to this problem in *IEEE Trans. SE* 1985:1136-1140. In 2007, by combining this algorithm with the Mazurkiewicz algorithm for distributed communication from 1997, Chalopin et. al. (*Proc. SOFSEM*, LNCS, **4362** Springer, 2007:200-211) obtained the most general version of the distribution termination that works on all graphs on which such termination can be detected.

Developed Systems

MilkyWay@home A BOINC based system computes trajectories of star streams pulled into Milky-Way from nearby galaxies. With nearly 100,000 users that collectively enable over 2 PFLOPS computational speed, it the fastest BOINC-based computational project as of 2010 comparable to fastest supercomputers in existence (*Parallel and Distributed Computational Intelligence*, Springer, 2010:63-90).

Sensor network simulator, SENSE: This is a composable free software that is used in sensor network research all over the world (*Advances in Pervasive Computing and Networking*, Springer, 2004:249-267).

Genesis network simulator: Using the fixed-point solution based methodology allows this simulator to combine packet level simulation of local details with coarse-grained global synchronization. Genesis fills the gap between fluid flow network models that are fast but imprecise, and especially for wireless networks, and precise but difficult to parallelize packet level simulations (*Computer Networks*, 2006:2028-2053).

Equational Programming Language, EPL: The language and its compiler included array syntax and subscript expressions that later influenced High Performance Fortran and other parallel programming languages (*Parallel Functional Languages and Compilers*, Addison-Wesley, 1991).

Research Grants

Current Grants

1. *International Technology Alliance*, (PI), the IBM consortium funded by the Army Research Laboratory, May 2006 - May 2016.
2. *Community Stability and Social Engineering in Large-Scale Social Networks: Employing Individual-Based Models for Opinion Dynamics to Detect and Destabilize Communities*, (PI) Office of Naval Research, March 2009 - September 2012.
3. *Optimizing Robustness of Large-Scale Information and Infrastructure Networks*, (PI) Defense Threat Reduction Agency, July 2009 - July 2012.
4. *Citizens Science: Enabling Computational Probabilistic Methods for Organism's Transcriptional Regulatory Network Using Voluntary Computing Platforms*, (PI) National Science Foundation, September 2009 - December 2011.
5. *Social Cognitive Network Academic Research Center*, (Director) Army Research Laboratory, September 2009 - September 2014.

6. *MetPetDB: A Database for Metamorphic Geochemistry*, (co-PI) National Science Foundation, August 2010 - August 2013.

Past Research Grants

7. *Equipment for Parallel Scientific Computation*, (co-PI) Army Research Office and Air Force Office of Scientific Research, September 1987.
8. *Parallel Scientific Computation*, (co-PI) Army Research Office, June 1986 - May 1989.
9. *Solution of Partial Differential Equations on Parallel Computers Using an Equational Language*, (co-PI) National Science Foundation, August 1987 - January 1990.
10. *Development of a Definitional Language Processor for Real-Time Applications*, (sole PI) Office of Naval Research, July 1986 - September 1990.
11. *Parallel Scientific Computation*, (co-PI) Army Research Office, May 1990 - April 1991.
12. *Research Experience in Computer Science for Undergraduates*, (Co-PI) National Science Foundation, June 1989 - May 1992.
13. *Adaptive Solutions of Partial Differential Equations on Parallel Computers Using an Equational Language*, (co-PI) National Science Foundation, April 1990 - September 1992.
14. *Computing Environments for Mathematical Applications*, (co-PI) National Science Foundation October 1988 - September 1993.
15. *Travel Grant*, (sole PI) National Science Foundation, 1990.
16. *IBM Faculty Development Grant*, (sole PI) IBM Corp, July 1992 - June 1995.
17. *Software Tools for Adaptive Parallel Computation*, (sole PI) Office of Naval Research, December 1992 - January 1996.
18. *Programming Paradigms in Run-Time Support of Parallelism for Irregular Computations*, (sole PI) NASA GRFP, July 1993 - June 1996.
19. *Acquisition of HP 9000 workstation with C++ and Fortran90 compilers*, (sole PI) Hewlett-Packard, June 1996.
20. *Domain Specific Parallel Adaptive Scientific Computations*, (co-PI) National Science Foundation, July 1993 - June 1997.
21. *Travel Grant*, (sole PI) National Science Foundation, 1994.
22. *Parallel Software Tools for Spatial Modeling of Ecological Systems*, (sole PI) National Science Foundation, July 1994 to June 1997.
23. *Acquisition of Instrumentation to Facilitate Large Scale Parallel Computation*, (co-PI) National Science Foundation Instrumentation Grant, August 1997.
24. *Mobile Agents in Distributed Computing*, (sole PI) IBM Shared University Research, February 1998 - December 1999.
25. *Proactive Problem Avoidance and QoS Guarantees for Large Heterogeneous Networks*, (co-PI) DARPA Next Generation Internet, October 1997 - September 2000.

26. *Network Management and Control Using Collaborative On-Line Simulation*, (co-PI) DARPA Next Generation Internet, August 1998 - May 2000.
27. *Understanding Human Joint Mechanics through Advanced Computational Models*, (co-PI) National Science Foundation HPCC, September 1993 - August 2000.
28. *Equipment for Distributed Network Laboratory*, (sole PI) IBM Corp., Shared University Research, October 2000.
29. *Agent-based Middleware for Network Management*, (sole PI) IBM Corp., Shared University Research, January 1999 - December 2000.
30. *A High-Performance Problem-Solving Environment for Optimization and Control of Chemical and Biological Processes*, (co-PI) National Science Foundation October 1995 - May 1997.
31. *A High-Performance Problem-Solving Environment for Optimization and Control of Chemical and Biological Processes*, (co-PI) National Science Foundation June 1997 - May 2001.
32. *Scalable Instrumentation and Database Approach to Performance Analysis of Parallel Scientific Applications*, (sole PI) NASA GRFP, July 1999-June 2001.
33. *Mapping Results of Continuous Simulations onto Spatially Explicit Parallel Distributed Event Simulations*, (co-PI) National Science Foundation KDI July 1998 - September 2003.
34. *Metacomputing: Nomadic and Parallel Computation Over the Internet*, (sole PI) IBM Corp., Shared University Research, January 2000 - December 2001.
35. *Scalable Online Network Modeling and Simulation*, (PI) DARPA Network Modeling and Simulation, June 2000 - January 2005.
36. *Scalable Network Performance Modeling and Prediction for Network Management*, (sole PI) CISCO URP Grant, June 2001 - July 2003.
37. *Performance Mining of Large-Scale Data-Intensive Distributed Object Applications*, (co-PI) National Science Foundation NGS Program, September 2001 - August 2005.
38. *Techniques for Resource Discovery, Monitoring and Allocation in SmartGrids*, (sole PI) IBM Corp., November 2002 - February 2004.
39. *Automatic Classification of Magnetocardiograms*, (SI) National Science Foundation SBIR Phase I, Cardiomag Imaging Inc., January - June 2003.
40. *Automatic Classification of Magnetocardiograms*, (SI) National Science Foundation SBIR Phase II, Cardiomag Imaging Inc., February 2004 - August 2006.
41. *Simulation and Analysis of Large Scale Complex Systems*, (co-PI) National Science Foundation CISE Research Infrastructure, August 2003 - July 2007.
42. *CLEANER: Collaborative Research: Riverscope: Large Scale Engineering Analysis Network For Environmental Research on the Hudson River*, (co-PI) National Science Foundation, August 2004 - July 2007.
43. *US-EC Cooperative Activities: Interactive Service Negotiation and Adaptive Delivery Platform for IP-Based Communications*, (sole PI) National Science Foundation, September 2004 - August 2008.

44. *Uncovering Hidden Groups that Support IED Activities*, (PI) Office of Naval Research, March 2006 - March 2009.
45. *Astroinformatics: Data-Driven Discovery of the Milky Way Origin and Evolution from the Sloan Digital Sky Survey*, (co-PI) National Science Foundation, August 2006 - July, 2010.
46. *Development of a Database System for Metamorphic Geochemistry*, (co-PI) National Science Foundation, August 2006 - August 2010.

Ph.D. Graduates (listed with thesis title and current positions)

- Jeanette Bruno: “Analyzing Conditional Data Dependencies in an Equational Language Compiler,” 1989;
the McNaughton Award for the best CS graduate student (1989);
Senior Researcher, Corporate Research and Development Center, GE, Schenectady, NY.
- Balaram Sinharoy: “Optimizing Iterative Algorithms for Distributed-Memory Machines,” 1992;
the McNaughton Award for the best CS graduate student (1992);
Chief Engineer (Power Series Processors), Future Directions Division, IBM Corp., Poughkeepsie, NY.
- Can Ozturan: “Distributed Environment and Load Balancing for Adaptive Unstructured Meshes,” 1995
(co-advisor with J. Flaherty);
Professor, Bogazici University, Istanbul, Turkey.
- Charles Norton: “Object Oriented Paradigms in Scientific Computing,” 1996;
Principal Scientist, Jet Propulsion Laboratory, NASA, Pasadena, CA.
- Ewa Deelman: “Performance Optimization of Parallel Discrete Event Simulation of Spatially
Explicit Problems,” 1997;
Associate Professor, University of Southern California, and
Group Leader at the International Science Institute, Los Angeles, CA.
- Wesley Kaplow: “Compile-Time and Run-Time Methods for Cache Optimization in Scientific Codes,” 1998;
Senior Technology Director, Qwest Communications, Whippany, NJ.
- Mohan Nibhanapudi: “Adaptive Parallel Computations on Network of Workstations,” 1998;
Researcher, Yahoo!
- William Maniatty: “High-Performance Computing Ecological Modeling,” 1998;
the Gerhardt Prize for the outstanding graduate student in Science and Engineering (1997);
the McNaughton Award for the best CS graduate student (1998);
Assistant Professor, SUNY Albany.
- Jeffrey Nesheiwat: “Instrumentation Data Base Approach to the Analysis of Large Parallel and Object
Oriented Scientific Applications,” 2000;
Researcher, Oracle, Inc.
- Gang Chen: “New Methods for Parallel Discrete Event Simulation,” 2003;
the McNaughton Award for the best CS graduate student, 2003;
Researcher, MathWorks, Boston, MA.
- Alan Bivens: “Distributed Framework for Deploying Machine Learning in Network Management
and Security,” 2003;
Researcher, IBM TJ Watson Laboratory, Poughkeepsie, NY.
- Yu Liu: “Loosely-Coordinated, Distributed, Packet-Level Network Simulation,” 2004;
Researcher, SyncSort Incorporated, NJ.
- Houda Lamahemedi: “Decentralized Data Management Framework for Data Grid,” 2005;
Researcher, Oracle, Inc., Portland, OR.
- Bouchar Bouqata: “VOGUE: A Novel Variable Order-Gap State Machine for Modeling Sequences,” 2006;
Researcher, GE Research and Development Center, Schenectady, NY.
- Paul Evangelista: “The Unbalanced Classification Problem: Detecting Breaches In Security,” 2006;
Associate Professor, US Military Academy, West Point, NY.
- Joel Branch: “Opportunistic Routing and Middleware Composition for Sensor and Actuator Networks,” 2007;

the McNaughton Award for the best CS graduate student 2007;
Researcher, IBM TJ Watson Laboratory, Hawthorne, NY.

Juong-Sik Lee: “Recurrent Auctions in E-Commerce,” 2007;
Researcher, Nokia Research Center, Palo Alto, CA.

Qiming Lu: “Propagation, Cascades, and Agreement Dynamics in Complex Communication and Social Networks,” 2009;
Researcher, Fermi Lab, Batavia, IL.

Travis Desell: “Asynchronous Global Synchronization for Massive-Scale Computing,” 2009;
Postdoc at the Network Science and Technology Center, RPI, Troy, NY.

Eyuphan Bulut: “Opportunistic Routing Algorithms in Delay Tolerant Networks,” 2011;
Senior Engineer, Mobile Internet Technology Group, Cisco, Richardson, TX.

Supervised 72 M.S. theses. Member of 57 Ph.D. committees at RPI, University of Pennsylvania; Temple University; Technical University of Nova Scotia, Canada; Gerona University, Spain, McGill University, Montreal, Canada and Dartmouth College, Hanover, NH. .

Strong commitment to diversity resulted in development of a methodology of involving students from underrepresented minorities in research. Supervised Ph.D. theses of five women and three African American students as well as one student with disability.

Teaching Experience

- Graduate courses: Computer Operating Systems, Theoretical Issues in Operating System Design, Parallel Programming Languages, Theory of Compiler Design.
- Undergraduate courses: Parallel Programming, Operating Systems, Operating System Fundamentals, Compiler Design, Programming Languages, Discrete Structures, Fundamentals of Computer Science.
- Several graduate and undergraduate special topics courses in networking, distributed and parallel computing.

University Service

- Founder and Director of the University-wide Network Science and Technology (NEST) Center (since January 2010)
- Director of the Social Cognitive Network Academic Research Center (since 2009)
- Director of the Center for Pervasive Computing and Networking (since 2003)
- Associate Dean for Information Technology (1997 - 2001)
- Chair of Information Technology Research Board (1997 - 2002)
- member of Faculty Council (1989-1991), Faculty Compensation Committee (1991-93), and Faculty Planning Committee (2003-2006);
- chair of departmental committees on: Graduate Curriculum in Operating Systems, Enrollment Committee, Search Committee, Best Teacher Award, Ph.D. Preliminary Exam, Planning Committee, Chair Search Committee, Graduate Curriculum;
- member of departmental committees: New Staff, Graduate Curriculum, Laboratory, Planning Committee;

Patents

1. *Discrete event simulation system and method*, granted 07/17/2007, US Patent Number 7,246,054 (with Gang Chen), RPI.
2. *Network Management and Control using Collaborative On-Line Simulation*, granted 4/22/2008 US patent number 7,363,285 (with S. Kalyanaraman, K. Vastola, N. Sikdar, J. Jiang, Y. Tao, D. Harrison, B. Mo, B. Sikdar and H.T. Kaur), RPI.
3. *Use of Machine Learning for Classification of Magneto Cardiograms*, granted June 22, 2010, US patent number 7,742,806, (with Karsten Sternickel and Mark Embrechts), CardioMag Imaging, Inc.
4. *Method for Classifying Cardiography Data*, granted June 22, 2010, China Patent (with Karsten Sternickel and Mark Embrechts), CardioMag Imaging, Inc.
5. *Fast Network Simulation Using Network Decomposition*, applied for US Patent on December 19, 2003, based on U.S. Provisional Application Serial No. 20040088148, published on 05/06/2004, (with Bin Mo), RPI.
6. *Apparatus and method for conducting a recurring auction using a participant retention mechanism*, applied for US Patent on October 25, 2005, USPTO 11/258,476, (with Juong-Sik Lee), Optimaret, Inc.

Selected Publications (out of more than 300)

Books Edited

1. B.K. Szymanski, *Parallel Functional Languages and Compilers*, Addison-Wesley, ACM Press Frontier Series, New York, 1991.
2. B.K. Szymanski, *Trends in Parallel Processing*, UNIDO Emerging Technology Series, Vienna, 1996, 84 pp.
3. B.K. Szymanski and B. Sinharoy, *Languages, Compilers and Run-Time Systems for Scalable Computers*, Kluwer Academic Publishers, 1996, 335 pp.
4. B.K. Szymanski and B. Yener, *Advances in Pervasive Computing and Networking*, Springer, New York, 2005, 296 pp.
5. S. Das, M. Ostrovsky, D.M. Pennock, and B.K. Szymanski, *Auctions, Market Mechanisms and Their Applications*, Springer, New York, NY, 2009, 107 pp.

Selected Journal papers

6. J. Dobosz, M. Halski, and B.K. Szymanski, "JOSK Compiler for ODRA/1304 Computers," *Archiwum Automatyki i Telemekhaniki*, **20**(3):301-310, 1975 (in Polish).
7. J. Bankowski, J. Dobosz, K. Fialkowski, M. Halski, T. Sarnecki, and B.K. Szymanski, "Survey of Program Optimization Methods," *Informatyka* **10**(5):3-6, 1975 (in Polish).
8. J. Bankowski, J. Dobosz, K. Fialkowski, M. Halski, T. Sarnecki, and B.K. Szymanski, "MERA-BASIC Language Implementation," *Informatyka* **11**(7):2-5, 1976 (in Polish).
9. B.K. Szymanski, "An Optimum Length of Fixed-Size Multiword List Items," *Bulletin de l'Academia Polonaise des Sciences*, Ser. Scien. Techn., **25**(9):89-93, 1976.
10. J. Bankowski, J. Dobosz, K. Fialkowski, M. Halski, T. Sarnecki, and B.K. Szymanski, "BASIC Language for MERA-305 Minicomputers," *Informatyka* **12**(3):1-4, 1977 (in Polish).
11. A. Minczuk and B.K. Szymanski, "A Representation of an Electric Power Distribution Graph," *Archiwum Elektrotechniki* **27**(2):367-380, 1978 (in Polish).
12. B.K. Szymanski, "Trends in Development of Relational Model of Data," *Informatyka* **14**(6):36-39, 1979 (in Polish).

13. I. Domaszewska, and B.K. Szymanski, "Translator of a Language for CAD of Electric Power Distribution Networks," *Elektryka* **55**:35-45, 1979 (in Polish).
14. A. Minczuk, and B.K. Szymanski, "Optimization of Computer Representation of Electric Power Distribution Networks," *Elektryka* **55**:47-55, Warsaw, 1979 (in Polish).
15. B.K. Szymanski, "Relationinterface fur die Informationsdatenbanken," *Dokumentation/Information*, **45**:84-101, special issue on XI Colloquium on Information und Documentation, Oberhof, Germany, 1979 (in German).
16. J. Bankowski and B.K. Szymanski, "JOSK—A Syntax Description Language," *Weiterbildungszentrum fur Mat. Kyb. und Rechentechn.* **38**(1):85-115 UT Dresden, Germany, special issue on Int. WG4 Meeting on Definition and Implementation of Specialized Languages, Budapest, Hungary, 1979.
17. S. Kujarczyk, and B.K. Szymanski, "Double-Chaind List Structure for Electric Power Distribution Network," *Przegląd Elektrotechniczny* **56**(11):477-479, 1980 (in Polish).
18. B.K. Szymanski, "Relational Interface to ISIS Databases," *Aktualne Problemy Informacji and Dokumentacji* **25**(5/6):22-28, 1980 (in Polish).
19. J. Bankowski, J. Dobosz, S. Romanski, B.K. Szymanski and E. Zabza-Tarka, "Software for Relational Access to CDS/ISIS Files," *Informatyka* **16**(1):17-21, 1981 (in Polish).
20. J. Bankowski, J. Dobosz, K. Fialkowski, M. Halski, T. Sarnecki, and B.K. Szymanski, "JOSK Language—Towards Automatic Translator Generation," *Information Systems*, **5**(2):158-159, 1980.
21. J. Dobosz and B.K. Szymanski, "An Implementation of a Relational Interface to an Information System," *Information Systems*, **6**(3):219-228, 1981.
22. H. Rybinski and B.K. Szymanski, "Multilevel Information System—Toward More Flexible Information Systems," *Information Processing and Management*, **17**(4):277-290, 1981.
23. K. Fialkowski, H. Rybinski, and B.K. Szymanski, "Information Flow in National System of Scientific, Technical and Organizational Information," *Int. Forum on Information and Documentation*, **7**(2):28-30, 1982.
24. M. Sulej and B.K. Szymanski, "Design of a Specialized Hardware Device for Data Selection and Transformation," *Microprocessing and Microprogramming*, **10**(4):255-259, 1982.
25. J. Dobosz, S. Romanski, B.K. Szymanski, and E. Zabza-Tarka, "Relational Access to Data in Information System: Research, Development and Applications," *Nauchno-Tekhnicheskaya Informatsiya* **16**(4):4-9, Ser. 2, 1982 (in Russian), English translation in *Automatic Documentation and Mathematical Linguistics*, **16**(2):54-63, 1983.
26. B.K. Szymanski, Y. Shi, and N. Prywes, "Synchronized Distributed Termination," *IEEE Transactions on Software Engineering*, **SE-11**(10):1136-1140, October 1985.
27. J. Tseng, Y. Shi, B.K. Szymanski, and N. Prywes, "Real-Time Software Life Cycle with the MODEL System," *IEEE Transactions on Software Engineering*, **SE-12**(2):358-373, February 1986.
28. N. Prywes, Y. Shi, B.K. Szymanski, and J. Tseng, "Supersystem Programming with Model," *IEEE Computer*, **19**(2):50-60, February, 1986.
29. B.K. Szymanski, "Parallel Programming with Recurrent Equations," *Int. Journal on Supercomputer Applications*, **1**(2):44-74, 1987.
30. Y. Shi, N. Prywes, A. Pnueli, and B.K. Szymanski, "Very High Level Concurrent Programming," *IEEE Transactions on Software Engineering*, **SE-13**(8):1038-1046, September 1987.
31. B.K. Szymanski and N. Prywes, "Efficient Handling of Data Structures in Definitional Languages," *Science of Computer Programming*, **10**(3):221-245, 1988.
32. B. McKenney and B.K. Szymanski, "Generating Parallel Code for SIMD Machines," *ACM Letters on Programming Languages and Systems*, **1**(1):59-73, March 1992.
33. B.K. Szymanski and B. Sinharoy, "Complexity of the Closest Vector Problem in a Lattice Generated by (0,1)-Matrix," *Information Processing Letters*, **42**(3):121-126, May 1992.

34. W. Maniatty, B. Sinharoy, and B.K. Szymanski, "Efficiency of Data Alignment on MasPar," *ACM SIG-PLAN Notices*, **28**(1):48-51, January 1993, special issue with *Proc. II Workshop on Languages, Compilers, and Run-Time Environments for Distributed Memory Multiprocessors*, Boulder, CO, September 1992.
35. B.K. Szymanski, "Parallel Computers and Their Industrial Applications," *Microelectronics Monitor*, **45/46**:76-82, 1994.
36. B.K. Szymanski and T. Caraco, "Spatial Analysis of Vector-Borne Disease: A Four Species Model," *Evolutionary Ecology*, **8**(3):299-314, 1994.
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274. S. Adali, R. Escriva, M.K. Goldberg, M. Hayvanovych, M. Magdon-Ismael, B.K. Szymanski, W.A. Wallace and G. Williams, "Measuring Behavioral Trust in Social Networks," *Proc. IEEE International Conference on Intelligence and Security Informatics, ISI'10*, pp. 150-152, Vancouver, Canada, May 23-26, 2010.
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279. J. Xie, B. Szymanski, M.J. Zaki, "Learning Dissimilarities for Categorical Symbols;" 4th International Workshop on Feature Selection in Data Mining, FSDM'2010, June 21st, 2010, Hyderabad, India, *Journal of Machine Learning Research (JMLR) Workshop and Conference Proceedings*, 10:95-104, 2010.

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285. S.C. Geyik, E. Bulut and B.K. Szymanski, "PCFG Based Synthetic Mobility Trace Generation," *Proc. IEEE Global Communications Conference, IEEE GLOBECOM 2010*, Miami, FL, December 6-10, 2010.
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290. Travis Desell, Malik Magdon-Ismail, Boleslaw K. Szymanski, Carlos A. Varela, Benjamin A. Willett, Matthew Arsenaault, and Heidi Newberg. "Evolutionary N-Body Simulations to Determine the Origin and Structure of the Milky Way Galaxy's Halo using Volunteer Computing," *Proc. 5th Workshop on Desktop Grids and Volunteer Computing Systems, PCGrid at the 25th IEEE International Parallel & Distributed Processing Symposium*, May 16, 2011, pp. 1888-1895.
291. Eyuphan Bulut and Boleslaw K. Szymanski, "On Secure Multi-copy based Routing in Compromised Delay Tolerant Networks," *Proc. Workshop on Privacy, Security and Trust in Mobile and Wireless Systems at the IEEE International Conference on Computer Communications and Networks, ICCCN, Maui, Hawaii, July 31, 2011*, pp. 1-7.
292. Sahin Geyik, Boleslaw K. Szymanski, Petros Zerfos, and Abbe Mowshowitz, "Sensor Service Selection through Switch Options," *Proc. 8th International Conference on Service Computing, IEEE SCC*, Washington, DC, July 4-9, 2011, pp. 717-724.
293. Jierui Xie and Boleslaw K. Szymanski, "Community Detection Using Neighborhood Strength Driven Label Propagation Algorithm," *Proc. IEEE Network Science Conference*, West Point, NY, June 22-24, 2011, pp. 198-195.
294. X. Zhuo, Q. Li, G. Cao, Y. Dai, T. La Porta and B.K. Szymanski, "Social-based Cooperative Caching in DTNs: A Contact Duration Aware Approach," *Proc. 8th IEEE International Conference on Mobile Ad-hoc and Sensor Systems, MASS*, 2011, to appear.

295. T. Desell, L. Newberg, M. Magdon-Ismail, B.K. Szymanski, and W. Thompson. "Finding Protein Binding Sites Using Volunteer Computing Grids," *Proc. International Congress on Computer Applications and Computational Science CACS 2011*, Jakarta, Indonesia, November 15-17, 2011, to appear.
296. J. Xie, B.K. Szymanski, and X. Liu. "SLPA: Uncovering Overlapping Communities in Social Networks via A Speaker-listener Interaction Dynamic Process," *Proc. Data Mining Technologies for Computational Collective Intelligence Workshop* at ICDM 2011, Vancouver, CA, December 11-14, 2011, to appear.

Invited Papers

297. J. Baron, E. Lock, N. Prywes, and B.K. Szymanski, "An Argument for Nonprocedural Languages," in *The Role of Language in Problem Solving I*, R. Jernigan, B.W. Hamil and D.M. Weintraub (eds), Elsevier Science Publishers (North-Holland), New York, NY, 1985, pp. 127-145.
298. N.S. Prywes and B.K. Szymanski, "Software Development of Parallel Processing in a Distributed Computer Architecture," in *Supercomputing Systems: Architecture, Design and Performance*, S.P. Kartashev and S.I. Kartashev (eds), Van Nostrand Reinhold, New York, NY, 1990, pp. 271-291.
299. C. Ozturan, J.E. Flaherty, and B.K. Szymanski, "Scalable Software Tools for Adaptive Scientific Computations," *Trans. Tenth Army Conference on Applied Mathematics and Computing*, West Point, NY, July 1992, ARO Report 93-1, pp. 159-172.
300. B.K. Szymanski, "Scalable Software Tools for Parallel Computations," NATO Workshop on High Performance Computing, published in *Software for Parallel Computation*, J.S. Kowalik and L. Grandinetti (eds), NATO ASI Series F, Vol. 106, Springer Verlag, Berlin, 1993, pp. 76-90.
301. B.K. Szymanski, J. Hicks, R. Jagannathan, V. Sarkar, D. B. Skillicorn and R. K. Yates, "Is There a Future for Functional Languages in Parallel Programming?" Panel Summary, published in *Proc. IEEE Computer Society 1994 Int. Conference on Computer Languages*, Toulouse, France, May 16-19, 1994, IEEE Computer Society Press, Los Alamitos, CA, pp. 299-304, 1994.
302. B.K. Szymanski, "Specifying Parallel Programs in Functional Language: the EPL Experience," DIMACS Meeting on Specification of Parallel Programs, published in *Specification of Parallel Algorithms*, G. Blelloch, M. Chandy, and S. Jagannathan (eds), DIMACS Series in Discrete Mathematics and Theoretical Computer Science, Vol. 18, American Mathematical Society, Providence, RI, 1994, pp. 201-223.
303. J.E. Flaherty, R.M. Loy, M.S. Shephard, B.K. Szymanski, J.D. Teresco and L.H. Ziantz, "Predictive Load Balancing for Adaptive Finite Element Computation," *Proc. Int. Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA'97)*, Las Vegas, NV, June 30-July 3, 1997, Vol. I, pp. 460-469, CSREA, 1997.
304. B.K. Szymanski and C. Norton, "Monitoring Scientific Computations—An Object-Oriented Approach," *Proc. 2nd Int. Conference on Parallel Processing & Applied Mathematics - PPAM'97*, Zakopane, Poland, September 1997, Vol. I, pp. 104-116.
305. V. Decyk, C. Norton, and B.K. Szymanski, "Experiences with Object Oriented Parallel Plasma Simulations," Plenary talk, *Proc. Computing in High Energy Physics'95*, Rio de Janeiro, Brazil, September 18-22, 1995, Ronald Shellard and Trang D. Nguyen (eds), World Scientific, Singapore, 1996, pp. 26-30, also Technical Report PPG-1552, Institute of Plasma and Fusion Research, University of California, Los Angeles, CA, September 1995.
306. J.E. Flaherty, R.M. Loy, P.C. Scully, M.S. Shephard, B.K. Szymanski, J.D. Teresco and L.H. Ziantz, "Load Balancing and Communication Optimization for Parallel Adaptive Finite Element Methods", *Proc. XVII Int. Conference of Chilean Computer Science Society*, Valparaiso, Chile, November 1997, pp.246-255, IEEE Computer Society, Los Alamitos, CA.
307. P.H. Fry and B.K. Szymanski, "Metacomputing: Parallel Computation Over the Internet," *Proc. Third Int. Conference on Parallel Processing and Applied Mathematics, PPAM99*, Kazimierz Dolny, Poland, September 1999, pp. 17-31.
308. G. Chen, H. Lamehamedi, A. Vargun, and B.K. Szymanski, "Web-Enabled and Speculative High Performance Computing," *Proc. Int. SGI User's Conference, SGI2000*, Cracow, Poland, October, 2000, AGH Press, Cracow, 2000, pp. 75-90.

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310. M. Hulber, D. Dillenberger, and B.K. Szymanski, "Scalable Distributed Java Workload Manager," *Int. Workshop on Performance-Oriented Program Development for Distributed Architectures*, PADDA2001, Munich, Germany, April 2001.
311. G. Chen and B.K. Szymanski, "A Component Model for Discrete Event Simulation," *Parallel Processing and Applied Mathematics*, 4th International Conference, PPAM 2001 Naleczow, Poland, September 9-12, 2001 (Revised Papers), September 2001, Lecture Notes in Computer Science, Vol. 2328, Springer Verlag, Berlin, June 2002, pp. 580-594.
312. K. Fialkowski and B.K. Szymanski, "Model of Pattern Processing Based on a Conceptor," *Virtual Worlds Simulations*, WMC'03, Orlando, FL, January, 2003.
313. K. Mandani and B.K. Szymanski, "Integrating Distributed Wireless Simulation Into Genesis Framework," *Summer Computer Simulation Conference*, Montreal, Canada, July 2003, pp. 203-209.
314. B. Szymanski and Y. Liu, "Loosely-Coordinated, Distributed, Packet-Level Simulation of Large-Scale Networks," *Proc. Winter Simulation Conference, WSC03*, New Orleans, LA, December 2003, pp. 712-720.
315. B. Szymanski, C. Varela, J. Cummings and J. Napolitano, Dynamically Reconfigurable Scientific Computing on Large-Scale Heterogeneous Grids, *Proc. 5th International Conference PPAM03*, (Revised papers) R. Wyrzykowski, J. Dongarra, M. Paprzycki and J. Wasniewski (Eds.), Lecture Notes in Computer Science, Vol. 3019, Springer Verlag, Berlin, Germany, pp. 419-430.
316. Y. Liu and B. Szymanski, "Distributed Packet-Level Simulation for BGP Networks under Genesis," *Proc. Summer Computer Simulation Conference*, July 2004, SCS Press, San Diego, CA, pp. 271-278.
317. K. El Maghraoui, B.K. Szymanski, and C. Varela "An Architecture for Reconfigurable Iterative MPI Applications in Dynamic Environments," *Proc. 6th Int. Conf. Parallel Programming and Applied Mathematics*, Lecture Notes in Computer Science, Vol. 3911, Springer, 2006, pp. 258-271.
318. B.K. Szymanski, K. El Maghraoui, T. Desell and C. Varela, "The Effects of Heterogeneity on Asynchronous Panmictic Genetic Search," *Proc. 6th International Conference on Parallel Processing and Applied Mathematics (PPAM07)*, Gdansk, Poland, Lecture Notes in Computer Science, vol. 4967, Springer, Berlin/Heidelberg, 2008, pp. 457-468.
319. C. Morrell, S.C. Geyik, T. Babbitt, and B.K. Szymanski, "Biologically Inspired Self-Healing Routing with Preferred Path Selection," *Bio-Inspired Computing and Communication*, Lecture Notes in Computer Science, vol. 5151, 2008, pp. 229-240, invited plenary presentation at Bio-wire 2007, Cambridge University, Cambridge, U.K.
320. K. T. Desell, A. Waters, M. Magdon-Ismail, B.K. Szymanski, C. Varela, M. Newby, H. Newberg, A. Przystawik, and D. Anderson, "Accelerating the MilkyWay@Home Volunteer Computing Project with GPUs," *Parallel Processing and Applied Mathematics*, Lecture Notes in Computer Science, Springer, vol. 6067, Berlin/Heidelberg, 2010, pp. 276-288, invited plenary presentation at PPAM09, Wroclaw, Poland, September 2009.
321. "A Robust Asynchronous Newton Method for Massive Scale Computing Systems," *Proc. 2011 International Conference on Computational Intelligence and Software Engineering CiSE 2011*, Wuhan, China, December 9-11, 2011, invited plenary presentation.

Selected Invited Talks

- Academic Institutions in US: Case Western University, Cleveland, OH; Dartmouth College, Hanover, NH; Drexel University, Philadelphia, PA; Duke University, Durham, NC; Florida A&M University, Tallahassee, FL; Hartford Graduate Center, Hartford, CT; Harvard University, Boston, MA; Information Science Institute, Los Angeles, CA; Kent State University. Akron, OH; Michigan Technological University, Hancock, MI; New York University, New York, NY; Notre Dame University, Notre Dame, IN; Northwestern University, Evanston, IL Notre Dame University, Notre Dame, IN; Ohio State University, Columbus, OH; Queens College, New York City, NY; Rensselaer Polytechnic Institute, Troy, NY; Rice University, Houston, TX; Stanford University, Stanford, CA; SUNY, Albany, NY; Texas A&M University, College Station,

TX; University of Alabama, Birmingham, Alabama; University of California, Berkeley, CA; University of California, Los Angeles, CA; University of Central Florida, Orlando, FL; University of Delaware, Newark, DE; University of Florida, Gainesville, FL; University of Maryland, College Park, MD; University of North Carolina, Charlotte, NC; University of Pennsylvania, Philadelphia, PA; University of Southern California, Los Angeles, CA; University of Tennessee, Knoxville, TN; Worcester Polytechnic University, Worcester, MA; Wright State University, Fairborn, OH; Yale University, New Haven, CT;

- Academic Institutions outside US: Academia Sinica, Taipei, Taiwan; AGH, Krakow, Poland; Australian National University, Canberra, Australia; Budapest University of Economic Sciences, Hungary; Cambridge University, Cambridge, U.K.; Canterbury University at Christchurch, New Zealand; Chinese University of Hong Kong, Hong Kong; Deakin University at Geelong, Australia; Deakin University at Melbourne, Australia; Ecole TCA, Paris, France; Fibonacci Institute of Foundations of Computer Science, Trento, Italy; Hungarian Academy of Sciences, Budapest, Hungary; Imperial College, London, U.K.; Indian Computer Society, New Delhi, India; McGill University, Montreal, Canada; Oxford University, Oxford, U.K.; Peking University, Beijing, China; Poznan Polytechnic, Poznan, Poland; Tokyo University, Tokyo, Japan; University of Gerona, Spain; University of Sao Paulo, Sao Paulo, Brazil; University of Science and Technology, Hong Kong; University of Vienna, Vienna, Austria; Warsaw Technical University, Warsaw, Poland; Weizmann Institute of Science, Rehovot, Israel, Western Cape University, Cape Town, South Africa;
- Governmental and Industrial Laboratories: Boeing Computing Services, Seattle, WA; CISCO Systems, San Jose, CA; General Electric Aerospace Division, Pittsfield, MA General Electric Research Center, Schenectady, NY); Hewlett Packard, Language Laboratory, Chelmsford, MA; IBM Almaden Research Laboratory, San Jose, CA; IBM Future Direction Division, Poughkeepsie, NY; IBM Haifa Research Group, Israel; IBM Hursley Park, UK; IBM Myers Corners Laboratory, NY; IBM T.J. Watson Laboratory, White Plains, NY; IBM Zurich Research Laboratory, Switzerland; ICASE, NASA Langley Research Center, Hampton, VA; Jet Propulsion Laboratory, Pasadena, CA; Lawrence Livermore National Laboratory, Livermore, CA; Lucent Technologies, Whippany, NJ; NASK, Warsaw, Poland; Naval Research Laboratory, Washington, DC; Naval Research Laboratory, Undersea Warfare System Center, New London, CT; Oak Ridge National Laboratory, Oak Ridge, TN; Office of Naval Research, Washington, DC; Raytheon BBN Technologies, Boston, MA; Rome Air Force Laboratory, Rome, NY; Sandia National Laboratory, Albuquerque, New Mexico; Sony Computer Science Laboratory, Tokyo, Japan; Sun Research Laboratory, Burlington, MA; Create-Net, Trento, Italy.