

Thomas C. Hartrum

Resume

December 11, 2002

1 Biographical Information

1.1 Demographic

Name: Thomas C. Hartrum

Birth: May 19, 1945, Cambridge, OH

Current Employment:

Department of Computer Science and Engineering
Wright State University
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1.2 Education

Bachelor of Electrical Engineering, The Ohio State University, 1969.

Master of Science, The Ohio State University, 1969 (Electrical Engineering).

Doctor of Philosophy, The Ohio State University, 1973 (Electrical Engineering).

Master of Business Administration, Wright State University, 1979.

1.3 Professional History

Sep 1, 2000 to present: *Research Assistant Professor, Wright State University (WSU)*. Teaches undergraduate and graduate level courses in computer engineering and computer science, primarily in software engineering and distributed software systems. Conducts sponsored research and publishes technical articles. Develops courses as appropriate.

Oct 1, 1987 to Sep 30, 2000: *Associate Professor of Electrical Engineering;*

Sep 25, 1977 to Sep 30, 1987: *Assistant Professor of Electrical Engineering,*

Air Force Institute of Technology (AFIT). Teaches graduate level courses in computer engineering and computer science, currently in software engineering and distributed software systems. Conducts sponsored research and publishes technical articles. Advises master's and PhD level research students. Develops courses and curricula as appropriate. Performs administrative duties in advising classes, serving on academic committees, writing student evaluations (training reports), etc.

Jun 1990 to Jun 1992: *Chief, Computer Science and Engineering Division,*
Department of Electrical and Computer Engineering,

Air Force Institute of Technology (AFIT). Responsible for the management of the computer half of the Department of Electrical and Computer Engineering. Supervisor for twenty-four faculty members. Responsible

for planning and coordinating curriculum development, both graduate and continuing professional education. Responsible for coordinating faculty and student research.

Apr 1997 to Sep 2000: *Part-time Faculty, Department of Computer Science and Engineering, Wright State University.* Taught courses in software engineering and in C++ programming.

Jun 1989 to Dec 1997: *Part-time Faculty, Department of Engineering Management, University of Dayton.* Taught courses in economic analysis for engineers and operations research. Appointed Adjunct Professor of Engineering Management & Systems, June 19, 1995.

Jun 1985 to Dec 1999: *Partner, Stockholder, and President of Ohio Digital Systems, Inc.* Part time consulting. Design and prototyping of bit-slice microprogrammed systems. Development and teaching of continuing education courses in microprogram design. Not currently active.

Apr 1975 to Sep 1977: *Project Engineer, Bionics and Biodynamics Division, Aerospace Medical Research Laboratory, Wright-Patterson AFB OH.* Planned and performed basic research and exploratory development of digital hardware design, computer interfacing, and simulation software in support of speech recognition and radar target classification.

Sep 1971 to Mar 1975: *Project Engineer, Communications/Automatic Data Processing Laboratory, U.S. Army Electronics Command, Ft Monmouth NJ.* (Active duty, U. S. Army). Planned, supervised, and performed advanced development of digital laser communications systems and computer simulation of laser beam stabilization.

2 Scholarly Activities

2.1 Teaching:

Since becoming full-time at Wright State University, I have taught several offerings of four courses, two in software engineering (six offerings), one in the design of information technology systems (three offerings), and one in distributed systems (two offerings). In twenty-three years of service to AFIT I taught over 90 offerings of over 35 different regular courses as well as over 40 individual special studies. These represent a broad range of technical areas including Computer Performance Evaluation, Database Systems, Computer Architecture, Computer Operating Systems, and Software Engineering. I have also taught such diverse courses as Queueing Theory, Computer Graphics, and Computer Resource Management as the need arose. My primary concentration over the past ten years has been in software engineering.

In addition, as an adjunct, I taught several offerings of Software Engineering and C++ Programming at Wright State University, as well as several offerings of Engineering Economic Analysis and Operations Research for the University of Dayton.

Student critiques are always very good in the courses I have taught. A summary of courses taught is attached.

2.2 Research

While at AFIT, I successfully advised five PhD and over 95 MS students. I was research advisor for AFIT's first PhD student in computer systems. A list of selected theses advised is attached.

PhD Theses Advised

Timothy G. Kearns, *A Methodology Based on Analytical Modeling for the Design of Parallel and Distributed Architectures for Relational Database Query Processors*, Dec. 1987. AFIT's first computer science PhD.

Paul D. Bailor, *A Theory for Graph-Based Language Specification, Analysis, and Mapping with Application to the Development of Parallel Software*, Sep. 1989. Co-advised with Dr. Gary Lamont.

Scott A. DeLoach, *Formal Transformations from Graphically-Based Object-Oriented Representations to Theory-Based Specifications*, Sep. 1996.

Ricky E. Sward, *Extracting Functionally Equivalent Object-Oriented Designs from Imperative Legacy Code*, Sep. 1997.

Thomas M. Schorsch, *Formal Representation and Application of Software Design Information*, Sep. 1999.

2.2.1 Software Engineering

My primary research interest since 1992 has been in software engineering, particularly in the development of Computer-Aided Software Engineering (CASE) tools based on formal methods. This work was originally begun at AFIT under funding from the Strategic Defense Initiative Office (SDIO). In 1992 work on software engineering approaches to model development along with parallelization of battle simulation for the Joint Modeling and Simulation System (J-MASS) resulted in \$100,000. This effort resulted in \$138,450 in 1993 and 1994, and led to the establishment of the Knowledge Based Software Engineering (KBSE) research group. From 1996 through 1998 I received \$150,000 from Rome Laboratory, now part of the Air Force Research Laboratory (AFRL), for work on the use of formal methods in software engineering. From 1998 through September 2000, I was co-investigator on three projects involving the formal-based development of multi-agent systems: an AFIT project funded for one year by the Air Force Office of Scientific Research (AFOSR) for \$23,000; a three-year joint project with Wright State University (WSU) and the University of Connecticut funded by AFOSR with total AFIT funding of \$89,000; and a joint project with WSU, AFIT, and the Air Force Research Lab (AFRL) funded by the Dayton Area Graduate Studies Institute (DAGSI) with total AFIT funding of \$95,000. From October 2000 through June 2001 I continued at WSU under the joint project with AFIT and AFRL funded by DAGSI. Overall this work resulted in 25 MS theses and four PhD dissertations at AFIT for which I was research advisor along with two PhD dissertations and numerous MS theses for which I was a committee member.

2.3 Publications

Publication list is attached.

2.4 Professional and Scholarly Awards and Honors

- The Outstanding Civilian Career Service Award, awarded 30 Sept. 2000 for service as Associate Professor of Electrical Engineering at the Air Force Institute of Technology (AFIT).
- Associate Professor Emeritus of Electrical Engineering at the Air Force Institute of Technology (AFIT), awarded 30 Sept. 2000.
- AFIT Department nominee for 1994 Professor Ezra Kotcher Award.
- AFIT Department nominee for 1990 Professor Ezra Kotcher Award.
- Awarded 1st Runner-up for Best Paper, NAECON '87.
- Awarded the U. S. Army's Meritorious Service Medal for development of the AN/TVC-4 Atmospheric Laser Communication system and assessment of beam stabilization techniques for vehicular mounted lasers, 1975.

2.5 Memberships

- Eta Kappa Nu
- Tau Beta Pi
- Institute of Electrical and Electronic Engineers (IEEE)

2.6 Service to Professional Organizations

- Active at various times in local IEEE Controls Society, Engineering in Medicine and Biology Chapter, and Computer Society.
- Served on Executive Committee of Dayton Section IEEE.
- Served as Vice Chairman (1977) and Chairman (1978), Engineering in Medicine and Biology Chapter, Dayton Section IEEE.
- Served as Chairman, IEEE Control Society Chapter, Dayton Section IEEE, through December 1980.
- Session Moderator for *Technology in Medicine*, NAECON 78.
- Co-taught mini-course *Applications of Microprocessors*, NAECON 79 and NAECON 80.
- Co-taught mini-course *Computer Performance Evaluation*, NAECON 80.
- Session Organizer and Moderator for *Advanced Software Tools*, NAECON 88.
- Session Organizer and Moderator for *Advanced Software Tools and Methodology*, NAECON 89.
- Reviewer for several conferences and refereed journals.

3 Computer Languages

I have taught courses in C, C++, Java, Ada-83, Ada-95, assembly language, Refine (wide spectrum formal language), and microprogramming languages. I have also used Fortran, Basic, Lisp, Prolog, and Pascal. I have modeled using UML (and the CASE tool Rational Rose), and the formal language *Z*.

Course Summary

Quarters	COURSE	TITLE	Offerings
AFIT			
FA 79 - FA 80	EE 6.47	Queueing in Computer Systems	2
FA 81 - FA 82	EE 6.48	Computer Resource Management	2
SP 83	EE 6.52	Computer Performance Measurement Evaluation	1
WI 78 - SP 82	EE 7.52	Computer Performance Evaluation	8
FA 83	EE 7.52	Advanced Computer Performance Evaluation	1
FA 84	EE 5.89	Operating Systems and File Structures	1
SP 78	EE 6.89	Digital Systems II	1
SP 79 - WI 82	EE 6.89	Operating Systems and Data Structures	3
FA 97 - SU 00	CSCE 689	Advanced Operating Systems	4
FA 78 - SU 84	EE 6.46	Data Base Systems	3
WI 86 - SU 87	EENG 646	Computer Data Base Systems	2
SP 85	MA 7.46	Advanced Database Management Systems	1
SU 78	EE 4.45	Introduction to Computers	1
SP 90	EENG 450	Introduction to Logic Design	1
SU 91 - SU 93	CSCE 588	Computer Systems Architecture	3
WI 81	EE 6.87	Minicomputer/Microprocessor Laboratory	1
WI 90	EENG 688	Intermediate (Parallel) Computer Architecture	1
SU 83	EE 6.94	Microprogramming	1
FA 77 - SP80	EE 6.90	Digital Language Laboratory	3
FA 80 - SP 83	EE 6.90	Real-Time Programming Laboratory	6
FA 83 - SP 85	EE 6.90	Software Systems Laboratory	5
SU 85 - SU 86	EENG 690	Software Systems Laboratory	3
WI 78	EE 6.45	Digital Systems Software	1
FA 91	CSCE 592	Software Engineering	1
FA 86 - SP 89	EENG 593	Software Engineering	9
SP 90	EENG 593	Systems & Software Analysis	1
FA 98 - FA 99	CSCE 593	Introduction to Software Engineering	2
FA 91 - WI 98	CSCE 594	Software Analysis & Design II	13
WI 94 - SP 98	CSCE 595	Software Systems Engineering	6
WI 99 - WI 00	CSCE 694	Advanced Software Engineering	2
SP 88	EENG 696	Adv Software Engr Lab	1
WI 97	CSCE 793	Formal Methods in Software Engineering	1
SU 96	CSCE 893	Knowledge-Based Software Engineering	1
WI 81	EE 4.90	Design Project	1
FA 86	EENG 599	SS	1
SP 78 - SU 00	CSCE 699	SS	22
WI 85 - FA 89	EENG 650	Special Topics in Digital Systems	5
WI 86 - SU 93	EENG 850	Advanced Digital Systems	2
SU 85 - FA 96	EENG 899	SS	8
UD			
WI 96	ENM 521	Operations Research I	1
SU 89 - FA 97	ENM 530	Cost & Economic Analysis for Engrs	16
WSU			
FA 98 - SP 99	CEG 330/530	Object-Oriented Programming in C++	2
FA 90	CEG 460/660	Introduction to Software Engineering	1
SP 97 - FA 02	CEG 460/660	Introduction to Software Engineering	12
FA 01	CEG 461/661	Object-Oriented Programming and Design	1
FA 00 - FA 02	CEG 255	Introduction to the Design of Information Technology Systems	5
WI 01 - WI 02	CEG 435/635	Distributed Computing and Systems	2
SP 02 - FA 02	CEG 760	Advanced Software Engineering	2

Selected Theses Advised

- Vincent S. Hibdon (GCS-95D), An Object-Oriented, Formal Methods Approach to Organizational Process Modeling.
- Scott A. DeLoach (DS-96J), Formal Transformations from Graphically-Based Object-Oriented Representations to Theory-Based Specifications.
- Pedro A. Linhares Lima (GCS-96J), A Methodology for Reengineering Relational Databases to an Object-Oriented Database.
- Timothy Karagias (GCS-96D), Elicitation of Formal Software Specifications from an Object-Oriented Domain Model.
- Ricky E. Sward (DSG-97S), Extracting Functionally Equivalent Object-Oriented Designs from Legacy Imperative Code.
- Gary L. Anderson (GCS-99M), An Interactive Tool for Refining Software Specifications from a Formal Domain Model.
- John A. Kissack (GCS-99M), Transforming Aggregate Object-Oriented Formal Specifications to Code.
- Penelope A. Noe (GCS-99M), A Structured Approach to Software Tool Integration.
- Emilia M. Colonese (GCS-99J), Methodology for Integrating the Scenario Databases of Simulation Systems.
- Frank C. D. Young (DSG-99J), Timed Safety Automata and Logic Conformance.
- Thomas M. Schorsch (DSG-99S), Formal Representation and Application of Software Design Information.
- Michael R. Ashby (GE-00M), Tool-Based Integration and Code Generation of Object Models.
- David W. Marsh (GCE-00M), Formal Object State Model Transformations for Automated Agent System Synthesis.
- Musa Serdar Arslan (GCE-00J), A Methodology for Integrating Tools in a Web-Based Environment.
- Joseph C. Pearson (GCS-00J), An Improved Algorithm for Translating Relational Schemas into an Object Model.
- Joel C. Nonnweiler (GCS-01M), Software Domain Model Integration Methodology for Formal Specifications.

Publications

Refereed Archival Technical Journal Articles:

Nathaniel J. Davis IV, David L. Mannix, Wade H. Shaw, and Thomas C. Hartrum, "Distributed Discrete-event Simulation Using Null Message Algorithms on Hypercube Architectures," *Journal of Parallel and Distributed Computing*, Vol. 8, No. 4, April, 1990, pp. 349–357.

Robert C. Shock and Thomas C. Hartrum, "A Classification Scheme for Software Modules," *The Journal of Systems and Software*, 42(1998), pp. 29–44.

Scott A. DeLoach and Thomas C. Hartrum, "A Theory-Based Representation for Object-Oriented Domain Models," *IEEE Transactions on Software Engineering*, Vol. 26, No. 6, June, 2000, pp. 500-517.

Books:

Thomas C. Hartrum, "Parallel Computer Architectures," Chapter 12 in *Critical technologies for National Defense*, edited by J. S. Przemieniecki, Amer. Inst. of Aeronautics and Astronautics, Washington, D.C., 1991, pp. 185–197.

Refereed Conference Proceedings Article:

Thomas C. Hartrum, "Computer Implementation of a Parametric Model for Biped Locomotion Kinematics," *Proc. 1973 Carnahan Conference on Electronic Prosthetics*, UKY BU104, Univ. of Kentucky, Lexington, KY, November 1973, pp. 99–118.

Thomas C. Hartrum, Gary B. Lamont, Walter D. Seward, and Duard S. Woffinden, "Considerations for Graduate Software Engineering Education: An Air Force Perspective," *Proceedings of the Workshop on Software Engineering Education - 1986: The Educational Needs of the Software Community*, Software Engineering Institute, Carnegie-Mellon Univ., Pittsburg, PA, February 1986. Also in *Software Engineering Education*, Springer-Verlag, New York, 1987, pp. 87–97.

Mark L. Huson and Thomas C. Hartrum, "An Empirical Analysis of Parallelization Decisions Affecting Parallel Simulation Performance," *Proc. of the Fifth Distributed Memory Computing Conference*, Vol. 2, Charleston, SC, April, 1990, pp. 1261–1270.

Paul Bailor, Gary B. Lamont, and Thomas C. Hartrum, "Graph-Based Language Specification, Analysis, and Mapping with Application to the Development of Parallel Systems," *Proc. of the 5th Knowledge-Based Software Assistant Conference*, Syracuse, NY, Sep, 1990, pp. 72–86.

JoAnn M. Sartor, Gary B. Lamont, Robert J. Hammell II, and Thomas C. Hartrum, "Mapping Precedence-Constrained Simulation Tasks for a Parallel Environment," *Proc. of the Sixth Distributed Memory Computing Conference*, Portland, OR, April, 1991, pp. 72–86.

Paul D. Bailor and Thomas C. Hartrum, "Educating Model-Based Software Engineers," *Proceedings of the 1992 SEI Conference on Software Engineering Education*, San Diego, CA, Oct. 1992, pp. 287-297.

Thomas C. Hartrum and Paul D. Bailor, "Teaching Formal Extensions of Informal-Based Object-Oriented Analysis Methodologies," *Proceedings Software Engineering Education (7th SEI CSEE Conference)*, San

Antonio, TX, Jan. 1994, Springer-Verlag *Lecture Notes in Computer Science* 750, pp. 389–409.

Ronald C. Comeau, Thomas A. Breeden, Kim Kanzaki, David L. Sonnier, Thomas C. Hartrum, Eric Christensen, “Parallel Simulation of Structural VHDL Circuits on Intel Hybercubes,” *Proc. International Conference on Simulation and Hardware Description Languages (SHDL)*, Tempe, AZ, Jan. 1994.

Paul D. Bailor, Thomas C. Hartrum, David R. Luginbuhl and Mark A. Roth, “Integrated Technology for the Development of Software Composition Systems,” *Software Systems in Engineering 1995*, PD-Vol. 67, Energy and Environmental Expo 95, Jan. 1995, Houston, TX, pp. 75–86.

Kevin Kapp, Thomas C. Hartrum, and Tom Wailes, “An Improved Cost Function for Static Partitioning of Parallel Circuit Simulations Using a Conservative Synchronization Protocol,” *Proc. of the 9th Workshop on Parallel and Distributed Simulation (PADS '95)*, Lake Placid, NY, June, 1995, pp. 78–85.

Scott DeLoach, Paul Bailor, and Thomas Hartrum, “Representing Object Models as Theories,” *Proc. of the 10th Knowledge-Based Software Engineering Conference (KBSE '95)*, Boston, MA, Nov. 1995, pp. 28–35.

Joel F. Hurford and Thomas C. Hartrum, “Improving Conservative VHDL Simulation Performance by Reduction of Feedback,” *Proc. of The 10th Workshop on Parallel and Distributed Simulation (PADS '96)*, Philadelphia, PA, May, 1996, pp. 196–201.

James B. Hiller and Thomas C. Hartrum, “Conservative Synchronization in Object-Oriented Parallel Battlefield Discrete Event Simulations,” *The 11th Workshop on Parallel and Distributed Simulation (PADS '97)*, Castle Lockenhaus, Austria, June, 1997, pp. 12–19.

Ricky E. Sward and Thomas C. Hartrum, “Extracting Objects from Legacy Imperative code,” *Proc. 12th IEEE Int'l Conf. on Automated Software Engineering*, Incline Village, NV, November, 1997, pp. 98–106.

Other Publications:

Thomas C. Hartrum, *The Concept of a Radar Camera*, Feasibility Study Report, Proj. No. 355-0012, Battelle Memorial Institute, Columbus, OH, August 1967.

Thomas C. Hartrum, *Fault Detection in Sequential Logic Circuits*, M.S. Thesis, The Ohio State Univ., Columbus, OH, March 1969.

Thomas C. Hartrum, *Preliminary Measurement of the Motion of Stationary Vehicles Due to Personnel Movements*, Engineering Report for Task No. 1X6.63723.0101.02.02, Comm/ADP Lab, U.S. Army Electronics Command, Ft. Monmouth, NJ, August 1972.

Thomas C. Hartrum, *Computer Implementation of a Parametric Model for Biped Locomotion Kinematics*, PhD Dissertation, The Ohio State Univ., Columbus, OH, June 1973.

Thomas C. Hartrum, “Stabilization Requirements for a Narrow Beam Laser Communicator Mounted on a 2-1/2 Ton Military Vehicle,” *Proc of 6th DoD Conference on Laser Technology*, U.S. Air Force Academy,

CO, March 1974.

Thomas C. Hartrum, *Stabilization of Optical Communication Systems*, Report ECOM-4229, U.S. Army Electronics Command, Ft. Monmouth, NJ, July 1974.

Thomas C. Hartrum, *Stabilization Techniques for Vehicle Mounted Optical Systems*, Report ECOM-4313, U.S. Army Electronics Command, Ft. Monmouth, NJ, May 1975.

Thomas C. Hartrum, "A Stochastic Electronic Model of a Neuron," *Proc. of 29th Annual Conference on Engr. in Medicine and Biology*, Vol. 18, Boston, MA, November 1976, p. 276.

Thomas C. Hartrum and Robert A. Burckle, "The Stochastic Syncoder as a Neuron Model," *Proc. of IEEE 1977 National Aerospace & Electronics Conf.*, Dayton, OH, May 1977, pp. 251–258. Also as *Tech Report AMRL-TR-72-18* (AD A037510), Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH.

Thomas C. Hartrum and Robert A. Burckle, "A Unique Modulation System Based on a Neural Concept of Signal Encoding," *Proc. of 30th Annual Conference on Engr. in Medicine and Biology*, Vol. 19, Los Angeles, CA, November 1977, p. 143.

Thomas C. Hartrum and Jimmy W. Thompson, "The Application of Clustering Techniques to Computer Performance Modeling," *Proc. of 15th Annual Computer Performance Evaluation User's Group (CPEUG 79)*, San Diego, CA, October 1979, pp. 147–161. Also in *Annual Computer Performance Management Users Group Meeting-Minutes*, Gunter AFS, AL, April 1980, pp. 91–96.

Thomas C. Hartrum, "CPESIM - A Teaching Tool for CPE," *Annual Computer Performance Management Users Group Meeting-Minutes*, Gunter AFS, AL, April 1980, pp. 97–100.

Thomas C. Hartrum, Vincent D. Mortimer, Jr., J. Ryland Mundie, Donald Osborne, and James C. Rock, *The C-Squared System: A General-Purpose Neuron Network Model*, Aerospace Medical Research Laboratory Technical Report AFAMRL-TR-80-84, AFAMRL, Wright-Patterson AFB, OH, September 1983, 66 pages.

Thomas C. Hartrum and Gregory Magavero, "The Application of Multivariate Statistical Techniques to Computer Performance Evaluation Using Simulated Data," *Proc. of 19th Annual Computer Performance Evaluation User's Group (CPEUG 83)*, San Francisco, CA, October 1983.

Thomas C. Hartrum and Charles W. Hamberger, "Development of a Distributed Data Dictionary System for Software Development," *Proc. of IEEE 1986 National Aerospace & Electronics Conf.*, Vol. 3, Dayton, OH, May 1986, pp. 648–655.

Timothy G. Kearns and Thomas C. Hartrum, "Rapid Data Retrieval Concepts for Expert Database Systems," *Proc. of IEEE 1987 National Aerospace & Electronics Conference*, Vol. 3, Dayton, OH, May 1987, pp. 740–747. [Received 1st Runner-up for Best Paper].

Thomas C. Hartrum and Gary B. Lamont, "Development of a Comprehensive Software Engineering Environment," *Proc. of the 1st Annual Workshop on Space Operations and Robotics (SOAR 87)*, (NASA Conference Publication 2491), Houston, TX, August 1987, pp. 31–38.

Thomas C. Hartrum and Brian J. Donlan, "HYPERSIM: Distributed Discrete-Event Simulation on an iPSC," *The Third Conf. on Hypercube Concurrent Computers and Applications*, Vol. I, Pasadena, CA, Jan, 1988, pp. 745–747.

Thomas C. Hartrum and Brian J. Donlan, "Distributed Battle-Management Simulation on a Hypercube," *Proc. of the SCS Multiconference on Distributed Simulation*, Simulation Series Vol. 19, No. 3, San Diego, CA, Feb, 1988, pp. 3–7.

Thomas C. Hartrum, Ted D. Connally, and Steven. E. Johnson, "An Interactive Graphics Editor with Integrated Data Dictionary for *IDEF₀* Structured Analysis Diagrams," *Proc. of IEEE 1988 National Aerospace and Electronics Conference*, Vol. 2, Dayton, OH, May, 1988, pp. 765–770.

Virgil. H. Cook, Jr., Thomas C. Hartrum, James W. Howatt, and Duard S. Woffinden, "A Framework for Evaluating Software Development Methods," *Proc. of IEEE 1988 National Aerospace and Electronics Conference*, Vol. 2, Dayton, OH, May, 1988, pp. 667–669.

Edward T. Poore, Jr., and Thomas C. Hartrum, "A Decision Support System for Distributed Data Allocation in Support of *C³* Systems," *Proc. of IEEE 1988 National Aerospace and Electronics Conference*, Vol. 3, Dayton, OH, May, 1988, pp. 1050–1056.

Nathaniel J. Davis IV, David L. Mannix, Wade H. Shaw, and Thomas C. Hartrum, "Distributed Discrete-event Simulation Using a Null Message Algorithm with Event Lists On the Intel Hypercube," *Proc. of the Fourth Conference on Hypercubes, Concurrent Computers, and Applications*, Monterey, CA, Mar, 1989, pp. 399–406.

Patrick. D. Barnes and Thomas. C. Hartrum, "A Decision-Based Methodology for Object-Oriented Design," *Proc. of IEEE 1989 National Aerospace and Electronics Conference NAECON 1989*, Vol. 2, Dayton, OH, May, 1989, pp. 534–541.

Walter. J. Lemanski and Thomas. C. Hartrum, "An Assessment of the Development of a Tracking System using Concurrent Ada," *Proc. of IEEE 1989 National Aerospace and Electronics Conference NAECON 1989*, Vol. 2, Dayton, OH, May, 1989, pp. 466–473.

Thomas. C. Hartrum, Thomas C. Mallery, and Jeffrey W. Foley, "Evaluating User Satisfaction of an Interactive Computer Program," *Proc. of IEEE 1989 National Aerospace and Electronics Conference NAECON 1989*, Vol. 2, Dayton, OH, May, 1989, pp. 508–514.

Gerald R. Morris, Thomas C. Hartrum, and Mark A. Roth, *An Abstract Data Model for the IDEF Graphical Analysis Language*, Technical Report AFIT/EN-TR-90-1, Dept. of Electrical and Computer Engineering, Air Force Institute of Technology, WPAFB, OH, Jan, 1990.

Billy R. Hodges, Michael C. Proicou, and Thomas C. Hartrum, "A Distributed Kernel for VHDL Simulation," *Proc. of IEEE 1990 National Aerospace and Electronics Conference NAECON 1990*, Vol. 1, Dayton, OH, May, 1990, pp. 215–220.

Kenneth A. Austin, Gerald R. Morris, Nealon F. Smith, and Thomas C. Hartrum, "An Entity-Relationship Modeling Approach to *IDEF₀* Syntax," *Proc. of IEEE 1990 National Aerospace and Electronics Conference NAECON 1990*, Vol. 2, Dayton, OH, May, 1990, pp. 641–645.

Thomas C. Hartrum, Ann Lee, JoAnn Sartor, "Parallel Simulation Speedup on the iPSC/2," *Proc. of the Intel Supercomputer Users' Group National Users' Conf.* Irvine, CA, Aug 1990, pp. 9–32.

William J. DeRouchev and Thomas C. Hartrum, "A Remote Visual Interface Tool for Simulation Control and Display," *Proc. of IEEE 1991 National Aerospace and Electronics Conference NAECON 1991*, Vol. 2,

Dayton, OH, May, 1991, pp. 954–959.

H. Carter, R. Vemuri, P. A. Wilsey, J. Aylor, R. Waxman, and T. Hartrum, “High Speed Acceleration of VHDL Simulation, Synthesis, and ATPG: Overview of the QUEST Project,” *Spring 1991 VHDL Users’ Group*, April 1991, pp. 85–90.

Paul R. Work, Gary B. Lamont, Richard Norris, and Thomas C. Hartrum, “New Computational and Communications Results with the NX-2 3.3 Operating System on the Intel iPSC/860,” *Proc. of the 1991 Intel Supercomputer User’s Group Conference*, Dallas, TX, October, 1991, p. 13.

Thomas C. Hartrum and Paul Bailor, “A Formal Extension to Object-Oriented Analysis Using Z,” *Tech Report AFIT/EN/TR-94-07*, Air Force Institute of Technology, Wright-Patterson AFB, OH, Oct. 1994, 94 pages, A290911.

Thomas C. Hartrum, Robert J. Hunt, and Michael D. Sarchet, “Modeling Wing Level Operations Using Formal Object Models,” *Proc. of IEEE 1995 National Aerospace and Electronics Conference (NAECON 1995)*, Vol. 2, Dayton, OH, May, 1995, pp. 699–706.

Vincent S. Hibdon and Thomas C. Hartrum, “An Air Force Organization Process Model Using Formal Software Engineering Techniques,” *Proc. of IEEE 1996 National Aerospace and Electronics Conference (NAECON 1996)*, Vol. 2, Dayton, OH, May, 1996, pp. 482–489.

Thomas C. Hartrum and Timothy Karagias, “Generation of Object-Oriented Formal Software Specifications,” *Proc. of IEEE 1997 National Aerospace and Electronics Conference (NAECON 1997)*, Vol. 2, Dayton, OH, July, 1997, pp. 660–667.

Thomas C. Hartrum and Scott A. DeLoach, “Design Issues for Mixed-Initiative Agent Systems,” *Mixed-Initiative Intelligence Workshop, 16th Nat’l Conf. on Artificial Intelligence (AAAI-99)*, July 18, 1999, Orlando, FL, pp. 40–44.

T. C. Hartrum and R. P. Graham, Jr., “The AFIT Wide Spectrum Object Modeling Environment: an AWSOME Beginning,” *Proc. of IEEE 2000 National Aerospace and Electronics Conference (NAECON 2000)*, Dayton, OH, Oct. 2000, pp. 35–42.

P. A. Noe and T. C. Hartrum, “Extending the Notation of Rational Rose 98 for use with Formal Methods,” *Proc. of IEEE 2000 National Aerospace and Electronics Conference (NAECON 2000)*, Dayton, OH, Oct. 2000, pp. 43–50.

Thomas C. Hartrum and Joel C. Nonnweiler, “Software System Integration Methodology using Formal Specifications,” *Proc. of the 44th IEEE 2001 Midwest Symposium on Circuits and Systems (MWSCAS 2001)*, Dayton, OH, Aug. 2001, Vol. 2, pp. 674–677.

David W. Marsh and Thomas C. Hartrum, “Automated Synthesis of Distributed Agents Using Transformations of Formal Specifications,” *Proc. of the 13th Midwest Artificial Intelligence and Cognitive Science Conference (MAICS 2002)*, Chicago, IL, Apr. 2002, pp. 7–14.