

Julie A. Adams

Curriculum Vitae

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Assistant Professor of Computer Science
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RESEARCH INTERESTS

My research interests are in the areas of human-robotic interaction and distributed artificial intelligence for multiple robot teams. My human-robotic interaction research focuses on designing and developing interaction and visualization capabilities that permit a single human to supervise a large number of heterogenous robots. In particular, my research has focused on developing visualization algorithms that integrate feedback from multiple types of robotic platforms, external data sources, and humans into a system of interfaces that support a spectrum of human-robotic interaction roles. My research in the area of artificial intelligence develops distributed multiple heterogeneous robot algorithms that support human supervisors' decision making tasks, particularly in cognitively demanding and high workload situations. This work has centered on the development and deployment of coalition formation algorithms for real robot applications, such as mass casualty event response. I am also developing capabilities that allow robots to gain situation awareness and use that awareness to determine future actions and behaviors in dynamic, uncertain mission environments.

EDUCATION

University of Pennsylvania, Philadelphia, PA

- PH.D. IN COMPUTER AND INFORMATION SCIENCES

Graduation date: December 1995

Dissertation title: Human management of a hierarchical system for the control of multiple mobile robots

Dissertation supervisor: Dr. Richard P. Paul

- MASTER OF SCIENCE IN ENGINEERING IN COMPUTER AND INFORMATION SCIENCES

Graduation date: May 1993

Dissertation title: Robust hypothesis testing and statistical color classification

Dissertation supervisor: Dr. Max Mintz

Siena College, Loudonville, NY

- BACHELORS OF BUSINESS ADMINISTRATION IN ACCOUNTING, MAGNA CUM LAUDE, 1990
- BACHELORS OF SCIENCE IN COMPUTER SCIENCE, BUSINESS MINOR, 1989

PROFESSIONAL EXPERIENCE

Vanderbilt University, Department of Electrical Engineering and Computer Science, Nashville, TN

Assistant Professor, August 2003 - present

Research Assistant Professor, August 2002 - August 2003

Kansas State University, Department of Computing and Information Science, Manhattan, KS

Adjunct Professor, June 2007 - present

Rochester Institute of Technology, Department of Computer Science, Rochester, NY

Assistant Professor, September 2000 - May 2003

Cornell University, Sibley School of Mechanical and Aerospace Engineering, Ithaca, NY

Visiting Assistant Professor, June 2002 - August 2002

Eastman Kodak Company, Rochester, NY

Senior Applications Engineer, Engineering Systems Division, November 1999 - August 2000

Senior Human Factors Engineer, Center for Design and Usability, October 1996 - November 1999

University of Rochester, Department of Computer Science, Rochester, NY

Adjunct Professor, January 1999 - May 2000

Honeywell, Inc., User Centered Design Group, Minneapolis, MN

Research Associate, September 1995 - October 1996

University of Pennsylvania, Philadelphia, PA

Research Assistant, Department of Computer Science, General Robotics, Automation, Sensing and Perception Laboratory, May 1992 - August 1995

Research Scientist/Programmer, Center for Bioinformatics, September 1991 - May 1993

Unisys, Human Genome Project, Paoli, PA

Research Scientist/Programmer, June 1991 - August 1991

Allied-Signal Bendix, FMD, Corporate Accounting Department, Albany, NY

Fixed-Asset and Capital Projects Accountant, April 1988 - June 1990

HONORS AND AWARDS

- National Science Foundation (NSF) Faculty Early Career Development Award (CAREER), 2007-2011.
- Outstanding Service Award (Vice President of Long Range Planning and Finance), IEEE Systems, Man and Cybernetics Society, 2007.
- Distinguished Service Award, 2004 IEEE Conference on Information Reuse and Integration, 2004.
- Outstanding Service Award (Treasurer), IEEE Systems, Man and Cybernetics Society, 2002.
- ASEE/NASA Summer Faculty Fellowship, NASA Johnson Space Center, 2001.
- Senior Member, Institute of Electrical and Electronics Engineers (IEEE), September 2001.
- International Who's Who of Information Technology, 1999.
- GOLD Representative, Rochester IEEE Section, IEEE-USA PACE Conference, 1998.
- National Science Foundation (NSF) Summer Institute in Japan, 1994.

PROFESSIONAL AFFILIATIONS

- Institute of Electrical and Electronics Engineers (IEEE).
- Association of Computing Machinery (ACM).
- Association for the Advancement of Artificial Intelligence (AAAI).
- Human Factors and Ergonomics Society (HFES).

PUBLICATIONS¹ (Student co-authors are underlined)

Refereed Journal Publications

- J1. T. C. Service and **J. A. Adams**, (Accepted) "Coalition formation for Task Allocation: Theory and Algorithms", *Autonomous Agents and Multi-Agent Systems*.

This paper presents new theoretical and algorithmic results related to the computational complexity of using heuristic techniques to form multiple agent/robot coalitions. This paper is an extension of one result from T. Service's Distributed Artificial Intelligence course project, taught by myself. This paper will constitute a portion of T. Service's Ph.D. dissertation that will be conducted under my supervision. This is a premier journal in autonomous agents. Approximate contribution: 40%.

¹Publications are available at <http://www.vuse.vanderbilt.edu/adamsja/>

- J2. C. M. Humphrey and **J. A. Adams**, (Accepted) “Cognitive Information Flow Analysis,” *Cognition, Technology and Work*.

This paper presents a new method for combining results from multiple cognitive task analysis techniques in order to facilitate understanding how information flows through a system. Such an understanding is required for developing a system of interfaces to support a hierarchy of system users. This result represents one component of C. Humphrey’s Ph.D. dissertation conducted under my supervision. This is a top international journal focused on human interaction with technology. Approximate contribution: 50%.

- J3. M. A. Goodrich, B. S. Morse, C. Engh, J. L. Cooper, and **J. A. Adams** (In Press) “Towards Using UAVs in Wilderness Search and Rescue: Lessons from Field Trials,” *Interaction Studies, Special Issue on Robots in the Wild: Exploring Human-Robot Interaction in Naturalistic Environments*, 10(3).

This paper presents lessons learned from Brigham Young University’s (BYU) mini-UAV field trials and a cognitive task analysis. This paper also presents some of the technologies that resulted from the field trials and task analysis. My student, C. Humphrey and I led the cognitive task analysis with assistance from J. Cooper (BYU). This work contributed to C. Humphrey’s Ph.D. dissertation conducted under my supervision. I wrote the sections of the paper directly related to the cognitive task analysis. Interaction Studies is an international journal. Approximate contribution: 25%.

- J4. C. M. Humphrey and **J. A. Adams** (2009) “Robotic Tasks for CBRNE Incident Response,” *Journal of Advanced Robotics, Special Issue on Disaster Response Robotics*, 23: 1217-1232. DOI:10.1163/156855309X452502

This paper presents eight robotic specific tasks for Chemical, Biological, Nuclear, Radiological, and Explosive (CBRNE) incident response. These tasks are defined based upon a cognitive task analysis of the CBRNE incident response domain that C. Humphrey and I jointly conducted. This paper represents a portion of C. Humphrey’s Ph.D. dissertation conducted under my supervision. A special issue in an international journal dealing with disaster response robotics. Approximate contribution: 50%.

- J5. **J. A. Adams**, C. M. Humphrey, M. A. Goodrich, J. L. Cooper, B. S. Morse, C. Engh, and N. Rasmussen (2009) “Cognitive Task Analysis for Developing UAV Wilderness Search Support,” *Journal of Cognitive Engineering and Decision Making*, 3(1): 1-26. DOI 10.1518/155534309X431926

This paper focuses on the cognitive task analysis that my student, C. Humphrey and I conducted, with assistance from J. Cooper (Brigham Young University - BYU). This paper provides a review of the analysis and important lessons learned. This work contributed to C. Humphrey’s Ph.D. dissertation conducted under my supervision. I wrote a majority of the paper with assistance from the other authors. This is a newer journal focused on cognitive engineering and human decision making that is becoming prominent in the field. Approximate contribution: 75%.

- J6. **J. A. Adams** (2009) "Multiple Robot-Single Human Interaction: Affects on Perceived Workload and Performance," *Behaviour & Information Technology*, 28(2): 183-198. DOI: 10.1080/01449290701288791

This paper presents results from one of the first quantitative user evaluations of single human-multiple robot interaction that was conducted for my dissertation. The evaluation found workload increased and productivity decreased as the number of robots being controlled increased. A new statistical analysis was conducted for this paper using the original data. Contribution: 100%.

- J7. M. A. Goodrich, B. S. Morse, D. Gerhardt, J. L. Cooper, M. Quigley, C. Humphrey, and **J. A. Adams** (2008) "Augmenting Wilderness Search and Rescue using a Camera Equipped Mini UAV," *Journal of Field Robotics, Special Issue on Safety, Security, and Rescue Robotics*, 25(1-2): 89-110. DOI: 10.1002/rob.20226.

This paper focuses on the work conducted by the Brigham Young University (BYU) team, lead by Dr. Goodrich. My student, C. Humphrey and I led the goal-direct task analysis that is reported in the paper and was employed by BYU for designing the system aspects reported in this paper. This work contributed to C. Humphrey's Ph.D. dissertation conducted under my supervision. I wrote the portions of the paper directly related to the task analysis. This is a new journal focused on field robotics work that is becoming prominent in the field. Approximate contribution: 25%.

- J8. P. Rani, N. Sarkar, and **J. A. Adams** (2007) "Anxiety-based affective communication for implicit human-machine interaction," *Advanced Engineering Informatics*, 21(3):323-334. DOI: 10.1016/j.aei.2006.11.009

This paper reports results from evaluations that P. Rani conducted as part of her Master's and Ph.D. research, in particular it presents different methods of classifying the collected information for predicting user's affective behaviors. I assisted P. Rani with the classification techniques and contributed to the paper writing. Approximate contribution: 25%.

- J9. L. Vig and **J. A. Adams** (2007) "Coalition Formation: From Software Agents to Robots," *Journal of Intelligent Robotic Systems*, 50(1): 85-118. DOI: 10.1007/s10846-007-9150-0

This paper was written as an overview of robotic coalition formation based upon L. Vig's doctoral dissertation conducted under my supervision. Portions of this paper appeared in conference and workshop papers (B1, C4, and C6). This is a top international journal in the field of robotics. Approximate contribution: 50%.

- J10. L. Vig and **J. A. Adams** (2006) "Multi-Robot Coalition Formation," *IEEE Transactions on Robotics*, 22(4): 637-649. DOI: 10.1109/TRO.2006.878948

This paper presents issues of applying software agent coalition formation algorithms to robotics, a heuristic-based multi-robot coalition formation algorithm, and results from an algorithm evaluation with both simulated and real robots. This paper represents part of L. Vig's dissertation research conducted under my supervision. Together we identified the issues associated with software agent coalition algorithms, developed the heuristic-based algorithm, and designed the experiments. L. Vig implemented and evaluated the algorithm. This is a premier journal in robotics. Approximate contribution: 50%.

- J11. **J. A. Adams** (2006) "Supporting Supervision of Multiple Robots," *The Journal of the Robotics Society of Japan*. 24(5): 17-19.

This paper provides a general overview of the multi-robot coalition formation and human-robotic interaction research projects conducted in my laboratory. The article was part of a special issue on women in robotics. This journal is considered a top robotics journal and is the premier robotics journal in Japan. Contribution: 100%.

- J12. **J. A. Adams** and M. Skubic (2005) "Introduction to the Special Issue on Human-Robotic Interaction," *IEEE Transactions on Systems, Man and Cybernetics - Part A, Special Issue on Human-Robotic Interaction*, 35(4): 433-437. DOI: 10.1109/TSMCA.2005.850577

This paper is the introduction to a special issue on Human-Robotic Interaction that Dr. Skubic and I co-edited. The paper provides an overview of the field and the articles published in the issue. Approximate contribution: 50%.

- J13. M. Skubic, S. Blisard, C. Bailey, **J. A. Adams**, and P. Matsakis (2004) "Qualitative Analysis of Sketched Route Maps: Translating a Sketch into Linguistic Descriptions," *IEEE Transactions on Systems, Man and Cybernetics - Part B*, 34(2): 1275-1282. DOI: 10.1109/TSMCB.2003.817099

This paper reports on work done by S. Blisard and C. Bailey at the University of Missouri - Columbia while completing their Master's degrees. This paper focuses on the analysis of sketched route maps and the automatic conversion of those maps into linguistic descriptions. I directed the design and analysis of the user evaluation. I also contributed to the paper writing. Approximate contribution: 30%.

- J14. **J. A. Adams**, R. Bajcsy, J. Kosecka, V. Kumar, R. Mandelbaum, M. Mintz, R. Paul, C.-C. Wang, Y. Yamamoto, and X. Yun (1996) "Cooperative Material Handling by Human and Robotic Agents: Module Development and System Synthesis," *Expert Systems with Applications*, Pergamon, 11(2): 89-97. DOI: 10.1016/0957-4174(96)00036-X

This paper describes the multiagents system integration, capabilities, and technology demonstration that resulted from the DARPA funded Multiagents project. The Ph.D. dissertations of Adams, Kosecka, Mandelbaum, Wang, and Yamamoto contributed to the resulting system. I was responsible for developing the human-robot interaction capabilities, conducting the system integration and testing, and writing the majority of the paper with contributions from the other student authors. Approximate contribution: 65%.

- J15. G. C. Overton, J. S. Aaronson, J. Hass, and **J. Adams** (1994) "QGB: A System for Querying Sequence Database Fields and Features," *Computational Biology*, 1(1): 3-13. PMID: 8790449

This paper presents the Querying Sequence System that extracted information from several human genome sequence databases. I wrote software that comprised a portion of the system as a research scientist in the University of Pennsylvania's Center for Bioinformatics. Approximate contribution: 15%.

Journal Publications Under Review

- S1. C. M. Humphrey and **J. A. Adams**, "Applying Cognitive Task Analysis to Broad Domains: Modifications to and Synergy of Goal-Directed Tasks Analysis and Cognitive Work Analysis," *Theoretical Issues in Ergonomics*. Review: Favorable, subject to minor revisions (October, 2009). Previously submitted September, 2008; April 27, 2009; and August 31, 2009.

This paper presents a number of modifications to Goal-Directed Task Analysis and Cognitive Work Analysis to extend them to permit an analysis of broad domains, such as the Chemical, Biological, Radiological, Nuclear, and Explosive incident response domain. The extensions permit an analysis incorporating humans as system components and considers a larger set of system components, decision-makers, and environmental issues than is common for these analysis techniques. This paper represents a portion of C. Humphrey's Ph.D. dissertation conducted under my supervision. Approximate contribution: 50%.

- S2. L. Vig and **J. A. Adams**, "Balancing in Multi-Robot Teams". *Behaviour & Information Technology*. Submitted January 31, 2009.

This paper presents results from L. Vig's dissertation conducted under my supervision. In particular, this paper introduces the idea of coalition imbalance within the context of multi-robot coalitions and identifies a relationship between the imbalance level of a multi-robot team and team performance. This paper also investigates the impact of coalition imbalance on coalition fault tolerance. Approximate contribution: 50%.

- S3. C. M. Humphrey, and **J. A. Adams**, "A Hierarchy of Human-Robot Interaction Levels for Emergency Response," *IEEE Transactions on Systems, Man and Cybernetics - Part A*. Submitted May 21, 2009.

This paper presents a new set of human-robotic interaction roles/levels specific to emergency response. The interaction levels are based on the cognitive task analysis of the CBRNE domain conducted by C. Humphrey and myself. The interaction level definitions incorporate existing human-robotic interaction role definitions and a new role is defined. This paper represents a portion of C. Humphrey's Ph.D. dissertation conducted under my supervision. This is a prestigious journal focused on humans and systems. Approximate contribution: 50%.

- S4. C. M. Humphrey, and **J. A. Adams**, "General Visualization Abstraction Algorithm for Directable Map-based Human-Robot Interaction," *Human Factors*. Submitted June 17, 2009, in revision.

This paper presents an overview of the General Visualization Abstraction (GVA) algorithm for performing information abstraction in order to determine how information items should be presented in directable visualizations. The presented between subjects user evaluation found that the GVA algorithm improved user performance and workload. This paper represents a portion of C. Humphrey's Ph.D dissertation conducted under my supervision. A very limited general presentation of the algorithm was published in C2 and CE2. This is a premier journal in human factors. Approximate contribution: 50%.

- S5. T. C. Service and **J. A. Adams**, “Constant Factor Approximation Algorithms for Coalition Structure Generation”, *Autonomous Agents and Multi-Agent Systems*. Submitted: June 30, 2009, in revision.

This paper presents a design-to-time constant factor approximation algorithm for coalition structure generation. This paper also shows how to randomize the algorithm and achieve asymptotically faster run times in an approach that can also be used as an anytime algorithm. This paper will constitute a portion of T. Service’s Ph.D. dissertation that will be conducted under my supervision. This is a premier journal in autonomous agents. Approximate contribution: 40%.

- S6. C. M. Humphrey, and **J. A. Adams**, “General Visualization Abstraction Algorithm for Directable Interfaces: Component Performance and Learning Effects,” *IEEE Transactions on Systems, Man and Cybernetics - Part A*. Submitted July 1, 2009.

This paper presents a detailed description of the new General Visualization Abstraction algorithm for information abstraction and presentation in directable interfaces. The presented within subjects user evaluation determined that the full and two partial GVA conditions resulted in better performance, workload and situation awareness than the condition not using the algorithm. This paper represents a portion of C. Humphrey’s Ph.D. dissertation conducted under my supervision. This is a prestigious journal focused on humans and systems. Approximate contribution: 50%.

- S7. C. M. Humphrey, and **J. A. Adams**, “Information Sharing via the Decision Information Abstracted to a Relevant Encapsulation Concept,” *International Journal of Human-Computer Studies*. Submitted July 2, 2009.

This paper presents a new information sharing concept, the Decision Information Abstracted to a Relevant Encapsulation (DIARE) that is designed to facilitate sharing decision-relevant information for particular moments in time across system users. This paper presents user evaluation results that demonstrate that the DIARE permits effective information sharing across time. This paper represents a portion of C. Humphrey’s Ph.D. dissertation conducted under my supervision. This is a top journal in human-computer interaction. Approximate contribution: 50%.

Selective Conference Publications

(Acceptance Based on Peer Review of Full Paper/Acceptance Rate \leq 40%)

- CS1. C. Humphrey and **J. A. Adams** (2008) “Compass Visualization for Human-Robotic Interaction,” *Proceedings of the 3rd ACM/IEEE International Conference on Human-Robot Interaction*, pp. 49-56. (Acceptance rate: 36%)

This paper provides user evaluation results demonstrating when ego-centric vs. exo-centric compass visualizations should be used for human-robot interaction tasks. My student, C. Humphrey and I developed the idea and designed the evaluation. C. Humphrey then implemented the visualizations and conducted the user evaluation. It appears as a full paper in the proceedings, but was presented as a poster. This is a premier conference on human-robotic interaction. Approximate contribution: 50%.

- CS2. C. M. Humphrey, C. Henk, G. Sewell, B. Williams, and **J. A. Adams** (2007) “Evaluating a Scalable Multiple Robot Interface,” *Proceedings of the 2nd ACM/IEEE International Conference on Human-Robot Interaction*, pp. 239-246. (Acceptance rate: 40%)
- This paper presents a user interface concept for single human-multiple robot interaction. The students conducted the project as a requirement for a course I taught. The paper appears as a full paper in the proceedings, but was presented as a poster. This is a premier conference on human-robotic interaction. Approximate contribution: 50%.*
- CS3. S. Singh and **J. A. Adams** (2006) “Transfer of learning for Complex Task Domains: A Demonstration using Multiple Robots,” *Proceedings of the 2006 IEEE International Conference on Robotics and Automation*, pp. 3332-3337. (Acceptance Rate: 39%)
- This paper demonstrates a learning mechanism for complex multiple robotic tasks based upon S. Singh’s semester course project for a course taught by myself. This is a premier robotics conference. Approximate contribution: 40%.*
- CS4. L. Vig and **J. A. Adams** (2005) “A Framework for Multi-Robot Coalition Formation,” *Proceedings of the 2nd Indian International Conference on Artificial Intelligence*, pp. 347-363. (Acceptance Rate: 40%)
- This paper presents a novel architecture for distributed multiple robot coalition formation for L. Vig’s Ph.D. dissertation conducted under my supervision. Approximate contribution: 50%.*
- CS5. R. Olivares, C. Zhou, R. Bodenheimer, and **J. A. Adams** (2003) “Interface Evaluation for Mobile Robot Teleoperation,” *Proceedings of the 41st Annual ACM Southeast Conference*, pp. 112-118. (Acceptance Rate: 33%)
- I developed project concepts and assisted with directing the team, and designing and overseeing the user evaluation and associated analysis. Approximate contribution: 40%.*

Refereed Conference Publications (Acceptance Based on Peer Review of Full Paper) ²

- C1. S. T. Freedman and **J. A. Adams** (Nov. 2009) “Human-Inspired Robotic Forgetting: Filtering to Improve Estimation Accuracy,” *Proceedings of the 14th IASTED International Conference on Robotics and Applications*, pp. 434-441.
- This paper presents the novel ActSimple algorithm that is designed based upon models of human forgetting and is intended to improve robotic performance by filtering data available to existing algorithms. The paper presents experimental analysis comparing ActSimple with four forgetting algorithms. This paper represents a portion of S. Freedman’s Ph.D. dissertation conducted under my supervision. Approximate contribution: 50%.*
- C2. C. M. Humphrey and **J. A. Adams** (2009) “General Visualization Abstraction Algorithm for Geographic Map-based Human-Robot Interfaces,” *Proceedings of the 2009 Human Factors and Ergonomics Society 53rd Annual Meeting*, pp. 970-974.
- This paper presents a high-level description of the General Visualization Abstraction algorithm and preliminary user evaluation results of the partially implemented algorithm demonstrating that the algorithm makes important information more salient. This paper represents a portion of C. Humphrey’s Ph.D. dissertation conducted under my supervision. Approximate contribution: 50%.*

²Acceptance rates are included for the conferences that provide this information.

- C3. C. M. Humphrey, S. R. Motter, **J. A. Adams** and M. Gonyea (2009) “A Human Eye Like Perspective for Remote Vision,” *Proceedings of the IEEE International Conference on Systems, Man and Cybernetics*, pp. 1712-1717.

This paper presents a method for combining two images taken from different focal lengths that allows the image detail from the image with higher focal length to be more visible in the combined image. High school teacher M. Gonyea began the work during his summer research project and my undergraduate research student, S. Motter, modified the implementation and ran the experiments. My student, C. Humphrey and I conceived of and directed the project and wrote the paper. Approximate contribution: 40%.

- C4. T. P. English, D. J. Shampine, C. G. Muniak, **J. A. Adams**, and E. W. Kratoovil (2008) “The Safety of Unmanned Systems: The Development of Safety Precepts for Unmanned Systems (UMS),” *Proceedings of the 26th International System Safety Conference*. Paper length: 13 pages.

This paper discusses the process followed in developing the unmanned systems (UMS) safety precepts and the associated DoD UMS safety guidelines document, the environment in which UMS are currently employed, the safety concerns with those operational environments and designs, UMS guide objectives, and concludes with an example of a Command and Control/Situational Awareness precept. I participated in the safety precept development and wrote the Command and Control/Situational Awareness example. Approximate contribution: 15%.

- C5. T. P. English, D. J. Shampine, **J. A. Adams**, C. G. Muniak, and E. W. Kratoovil (2008) “The Safety of Unmanned Systems: The Development of Safety Precepts for Unmanned Systems (UMS),” *Proceedings of the 13th International Command and Control Research and Technology Symposium*. Paper length: 29 pages.

This paper is a slightly different version of paper C4.

- C6. **J. A. Adams** and S. T. Freedman (2007) “Unmanned System Autonomy, Situation Awareness, and System Safety,” *Proceedings of the 25th International System Safety Conference*, pp. 800-810.

This paper discusses how existing autonomous system capabilities are insufficient to guarantee system safety and how incorporating the concept of situation awareness into the unmanned system can improve safety. This paper represents a portion of S. Freedman’s Ph.D. research. Approximate contribution: 50%.

- C7. M. A. Goodrich, J. L. Cooper, **J. A. Adams**, C. Humphrey, R. Zeeman, and B. G. Buss (2007) “Using a Mini-UAV to Support Wilderness Search and Rescue: Practices for Human-Robot Teaming,” *Proceedings of the IEEE International Workshop on Safety, Security and Rescue Robotics*, pp. 1-6.

This paper focuses on the work conducted by the Brigham Young University (BYU) team, led by Dr. Goodrich. My student, C. Humphrey and I led the goal-directed task analysis that was employed by the BYU team for designing the human-robot teaming reported in this paper. I also contributed to the paper writing. Approximate contribution: 20%.

- C8. S. T. Freedman and **J. A. Adams** (2007) "The Inherent Components of Unmanned Vehicle Situation Awareness," *Proceedings of the 2007 IEEE International Conference on Systems, Man and Cybernetics*, pp. 973-977.
- This paper presents an initial delineation of the inherent components required for unmanned vehicles to possess situation awareness. The presented work is foundational for developing holistic unmanned vehicle situation awareness architecture. This paper represents a portion of S. Freedman's Ph.D. research that is being conducted under my supervision. Approximate contribution: 50%.*
- C9. **J. A. Adams** (2007) "Unmanned Vehicle Situation Awareness: A Path Forward," *Proceedings of the 2007 Human Systems Integration Symposium*. Paper length: 11 pages.
- This paper presents the concept of unmanned vehicle situation awareness and provides a discussion of how an unmanned vehicle situation awareness architecture can be developed based upon human situation awareness. Contribution: 100%.*
- C10. L. Vig and **J. A. Adams** (2006) "Market-based Multi-Robot Coalition Formation," *Proceedings of the 8th International Symposium on Distributed Autonomous Robotic Systems*, M. Gini & R. Voyles (Eds.), Springer, pp. 227-236.
- This paper presents RACHNA, a new architecture for multi-robot task allocation based on the winner determination problem in multi-unit combinatorial auctions that was developed as part of L. Vig's Ph.D. dissertation conducted under my supervision. Approximate contribution: 50%.*
- C11. I. C. Envarli and **J. A. Adams** (2005) "Task Lists for Human-Multiple Robot Interaction," *Proceedings of the 14th IEEE International Symposium on Robot and Human Interactive Communication*, pp. 119-124.
- This paper is a result of I. C. Envarli's summer undergraduate research project and his fall 2004 independent study. The paper presents a new single human-multiple robot user interface and results from an associated user evaluation. This paper was nominated for the best student paper. Approximate contribution: 50%.*
- C12. H. Kaymaz-Keskinpala, and **J. A. Adams** (2004) "Analysis of Perceived Workload when using a PDA for Mobile Robot Teleoperation," *Proceedings of the 2004 IEEE International Conference on Robotics and Automation*, pp. 4128-4133.
- This paper presents results showing that PDA-based human-robot interaction using a display combining image and ultrasonic or a display providing only ultrasonic information both result in higher perceived workload than a display providing images only. This paper is a subset of H. Kaymaz-Keskinpala's Master's Thesis conducted under my supervision. This is a premier robotics conference. Approximate contribution: 50%.*
- C13. L. Chamberlain, J. Tang, M. Watugala, **J. A. Adams** and M. Babish (2003) "A Behavioral Architecture for Strategy Execution in the RoboFlag Game," *Proceedings of the American Controls Conference*, pp. 672-677.
- This paper describes the development of a hybrid multi-agent behavioral control architecture used to implement the strategies for RoboFlag and the associated user interface. The students were supported by the California Institute of Technology and Cornell University. I was responsible for supervising these students throughout the program. Approximate contribution: 50%.*

- C14. **J. A. Adams** and A. T. Hayes (2003) “The RoboFlag SURF Competition: Results, Analysis, and Future Work,” *Proceedings of the American Controls Conference*, pp. 678-682.
This paper provides the detailed results of the RoboFlag Summer Undergraduate Research Fellowship program, an analysis of the competition, and reviews the future work. The program was sponsored by the California Institute of Technology and Cornell University. I supervised the California Institute of Technology team. Approximate contribution: 50%.
- C15. R. P. Paul, C. P. Sayers, and **J. A. Adams** (1995) “Operabotics,” *Proceedings of the International Symposium on Microsystems, Intelligent Materials and Robotics*.
- C16. **J. A. Adams**, R. Bajcsy, J. Kosecka, V. Kumar, R. Mandelbaum, M. Mintz, R. Paul, C.-C. Wang, Y. Yamamoto, and X. Yun (1995) “Cooperative Material Handling by Human and Robotic Agents: Module Development and System Synthesis,” *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 200-205.
- C17. **J. A. Adams** and R. P. Paul (1994) “Human-Managed, Hierarchical Control of Multiple Mobile Agents,” *Proceedings of the 33rd IEEE Conference on Decision and Control*, pp. 3524-3529.

Conference Publications (Acceptance Based on Review of Extended Abstract)

- CE1. D. T. Levin, M. Saylor and **J. A. Adams** (2009) “The role of concepts about agency in perceiving and conceptualizing actions,” Abstract only, *Proceedings of the 50th Annual Meeting of the Psychonomic Society*.
This abstract outlines the team’s collaborative results related to human perception and conceptualization of artificial agents. Approximate contribution: 10%
- CE2. C. M. Humphrey and **J. A. Adams** (2009) “General Visualization Abstraction Algorithm for Geographic Map-based Human-Robot Interaction,” Late Breaking, short papers, *Proceedings of the 4th ACM/IEEE International Conference on Human-Robot Interaction*, pp. 289-290.
This paper is a short paper representing late breaking results and provides an introduction to the General Visualization Abstraction algorithm. This paper represents a portion of C. Humphrey’s Ph.D. dissertation conducted under my supervision. This paper was presented as a poster and is a subset of the information presented in papers C2 and S3. Approximate contribution: 50%.
- CE3. C. M. Humphrey, S. M. Gordon, and **J. A. Adams** (2006) “Robotic Team Visualization,” *Proceedings of the 2006 Human Factors and Ergonomics Society 50th Annual Meeting*, pp. 651-655.
I developed concepts and led the team. Approximate contribution: 50%.
- CE4. **J. A. Adams** (2005) “Human-Robot Interaction Design: Understanding User Needs and Requirements,” *Proceedings of the 2005 Human Factors and Ergonomics Society 49th Annual Meeting*, pp. 447-451.
This paper presents preliminary results for the goal-directed task analysis of the Chemical, Biological, Radiological, Nuclear, and Explosive incident response. Contribution: 100%.

- CE5. H. Kaymaz-Keskinpala and **J. A. Adams** (2004) “Objective Data Analysis for PDA-Based Human-Robot Interaction,” *Proceedings of the 2004 IEEE International Conference on Systems, Man and Cybernetics*, pp. 2809-2814.
- This paper describes a touch-based PDA interface for mobile robot teleoperation and the objective user evaluation results that are part of H. Kayamaz-Keskinpala’s M.S. Thesis conducted under my supervision. Approximate contribution: 50%.*
- CE6. S. Shankar, L. Su, Y. Jin, **J. A. Adams**, and B. Bodenheimer (2004) “Comparing the Usability of Enhanced RoboFlag Interfaces,” *Proceedings of the 2004 IEEE International Conference on Systems, Man and Cybernetics*, pp. 2815-2820.
- I developed the project concepts, directed the team, and designed and oversaw the user evaluation and associated analysis. Approximate contribution: 50%.*
- CE7. J. Phillips, S. Kogekar, and **J. A. Adams** (2004) “Emergency Automated Response System (EARS),” *Proceedings of the 2004 Human Factors and Ergonomics Society 48th Annual Meeting*, pp. 851-856.
- I developed concepts and led the team. Approximate contribution: 50%.*
- CE8. S. Shankar, Y. Jin, **J. A. Adams**, and B. Bodenheimer (2004) “Enhancing RoboFlag Users’ Situational Awareness,” *Proceedings of the 2004 Human Factors and Ergonomics Society 48th Annual Meeting*, pp. 356-360.
- I developed the project concepts, directed the team, and designed and oversaw the user evaluation and associated analysis. Approximate contribution: 50%.*
- CE9. P. Rani, N. Sarkar, C. A. Smith, and **J. A. Adams** (2003) “Affective Communication for Implicit Human-Machine Interaction,” *Proceedings of the 2003 IEEE International Conference on Systems, Man and Cybernetics*, pp. 4896-4903.
- This paper reports results from evaluations that P. Rani conducted as part of her Master’s and Ph.D. research. The paper reports on different methods of classifying the collected information for predicting user’s affective behaviors. I assisted P. Rani with the classification techniques and contributed to the paper writing. Approximate contribution: 30%.*
- CE10. C. A. Johnson, **J. A. Adams**, and K. Kawamura (2003) “Evaluation of an Enhanced Human-Robot Interface,” *Proceedings of the 2003 IEEE International Conference on Systems, Man and Cybernetics*, pp. 900-905.
- This paper reported results of evaluating a human-robot interface that integrates the Sensory EgoSphere as part of my co-advised student, C. Johnson’s Ph.D. dissertation. I assisted her with the statistical analysis and contributed to the paper writing. Approximate contribution: 50%.*
- CE11. H. Kaymaz-Keskinpala, **J. A. Adams**, and K. Kawamura (2003) “PDA-Based Human-Robotic Interface,” *Proceedings of the 2003 IEEE International Conference on Systems, Man and Cybernetics*, pp. 3931-3936.
- This paper presents the PDA-based human-robot interface design for H. Keskinpala’s Master’s Thesis conducted under my supervision. Approximate contribution: 50%.*

- CE12. K. Kawamura, P. Nilas, K. Muguruma, **J. A. Adams**, and C. Zhou (2003) “An Agent-Based Architecture for an Adaptive Human-Robot Interface,” *Proceedings of the 36th Hawaii International Conference on System Science*, pp. 126-133.
This paper describes an innovative agent-based architecture for mixed-initiative interaction between a human and a robot that interacts via a graphical user interface. Approximate contribution: 25%.
- CE13. **J. A. Adams** (2001) “The feasibility of distributed web based expert systems,” panel session position paper, *Proceedings of the 2001 IEEE International Conference on Systems, Man and Cybernetics*.
- CE14. **J. A. Adams** and C. Reynolds (2000) “Complex Systems for Abnormal Situation Management of Complex Chemical Processes,” *Proceedings of the 2000 IEEE International Conference on Systems, Man, and Cybernetics*, pp. 1959 - 1964.
- CE15. **J. A. Adams**, A. Bopp, D. Kinney, J. Larmann, and C. Reynolds (2000) “Combining Engineering Knowledge Across Continents,” Eastman Kodak Engineering Conference, Rochester, N.Y.
- CE16. **J. A. Adams** (1999) “Employing User Feedback during the Product Design,” *Proceedings of the 43rd Human Factors and Ergonomics Society Annual Meeting*, pp. 1080-1084.
- CE17. **J. A. Adams** (1997) “Employing MASC to Control Multiple Mobile Robots,” *Proceedings of the American Nuclear Society Seventh Topical Meeting on Robotics and Remote Systems*, pp. 990-997.
- CE18. **J. A. Adams** and R. P. Paul (1996) “Experimental Analysis of the Mediation Hierarchy Theory,” *Proceedings of the 1996 IEEE International Conference on Systems, Man and Cybernetics*, pp. 544-549.
- CE19. R. P. Paul, C. P. Sayers, and **J. A. Adams** (1995) “Operator Control of Robotic Systems,” *Proceedings of the International Symposium on Robotics Research*.
- CE20. **J. A. Adams** and R. P. Paul (1995) “Human Supervisory Control of Multiple Mobile Robots,” *Proceedings of the 1995 IEEE International Conference on Systems, Man and Cybernetics*, pp. 3298-3303.
- CE21. **J. A. Adams** and R. P. Paul (1994) “Human Management of a Hierarchical Control System for Multiple Mobile Agents,” *Proceedings of the 1994 IEEE International Conference on Systems, Man and Cybernetics*, pp. 2780-2785.

Book Chapters

- B1. L. Vig and **J. A. Adams** (2005) “Issues in Multi-Robot Coalition Formation,” *Multi-Robot Systems: From Swarms to Intelligent Automata Vol. III*, L. E. Parker, F. E. Schneider & A. C. Schultz (Eds.), Springer: Germany, pp. 15-26.
This paper investigates allocating tasks to disjoint robot teams, or coalitions and presents simulation-based results for a new heuristic coalition formation algorithm. This paper represents a subset of the Vig and Adams 2006 journal paper and a portion of L. Vig’s Ph.D. dissertation conducted under my supervision. Approximate contribution: 50%.

Workshop Publications (Acceptance Based on Review of Extended Abstract)

- WE1. S. T. Freedman and **J. A. Adams** (2008) "Synthetic Cognitive Agent Situational Awareness Components," *AAAI Fall Symposium on Biologically Inspired Cognitive Architectures*, AAAI Technical Report FS-08-04, p. 62.
- WE2. **J. A. Adams** (2006) "Unmanned Vehicle Situation Awareness," 2006 Robotics: Science and Systems Conference, Intuitive Human-Robot Interaction for Getting the Job Done Workshop. *This paper reports on preliminary ideas developed for the unmanned vehicle situation awareness concept as a result of the DoD white paper written by J. A. Adams. Contribution: 100%.*
- WE3. **J. A. Adams**, P. Rani, and N. Sarkar (2004) "Mixed Initiative Interaction and Robotic Systems," *AAAI-04 Workshop on Supervisory Control of Learning and Adaptive Systems*, AAAI Technical Report, WS-04-10, pp. 6-14. *This paper presents a mixed-initiative interface interaction architecture for robotic systems and the affect-based interaction constraints. This was an invited paper that I wrote based upon P. Rani's independent study final report. Approximate contribution: 75%.*
- WE4. **J. A. Adams** (2002) "Critical Considerations for Human-Robot Interface Development," *Proceedings of the 2002 AAAI Fall Symposium on Human-Robot Interaction*, AAAI Technical Report, FS-02-03, pp. 1-8. *This paper draws attention to the vast bank of Human Factors Research and indicates how these existing results may be applied to the field of human-robot interaction. Contribution: 100%*
- WE5. **J. A. Adams**, R. Bajcsy, J. Kosecka, V. Kumar, R. Mandelbaum, M. Mintz, R. Paul, C.-C. Wang, Y. Yamamoto, and X. Yun (1995) "Cooperative Material Handling by Human and Robotic Agents: Task Description and Experiments (revised version)," *Proceedings of the ARO International Workshop on Critical Issues in Robotics*.
- WE6. **J. A. Adams**, R. Bajcsy, J. Kosecka, V. Kumar, R. Mandelbaum, M. Mintz, R. Paul, C.-C. Wang, Y. Yamamoto, and X. Yun (1995) "Cooperative Material Handling by Human and Robotic Agents: Task Description and Experiments," *Proceedings of IROS Workshop on Computer Vision*.

Videos

- V1. Jesse Gray, Matt Berlin, Cynthia Breazeal, Paula Aguilera, Kenton Williams, **Julie A. Adams**, Philipp Robbel, Sanford T. Freedman, Jonathan P. How, Aditya Undurti, Stefanie Tellex, Nicholas Roy, Thomas Kollar, Sigurdur Orn Adalgeirsson, Jason B. Alonso, Fardad Faridi, Jun Ki Lee, Mikey Siegel, Sophie Wang, Jonathan Williams (2009) "Robots to the Rescue: Mixed-initiative human-robot teaming for disaster response," The 2009 International Joint Conference on Artificial Intelligence, AI Video Competition. Nominated for Best Video and Best Sound Track.

Book Reviews

- BR1. **J. A. Adams** (2001) "Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence, A Review," *AI Magazine*, Vol. 22, No. 2.

Technical Reports

- TR1. S. T. Freedman and **J. A. Adams** (2009) “Improving robot situational awareness through commonsense: Side-stepping incompleteness and unsoundness,” Human-Machine Teaming Laboratory Technical Report HMT-09-03, Vanderbilt University.
- TR2. S. T. Freedman and **J. A. Adams** (2008) “Synthetic Cognitive Agent Situational Awareness Components”, Human-Machine Teaming Laboratory Technical Report HMT-08-04, Vanderbilt University.
- TR3. B. Okorn and **J. A. Adams** (2008) “KSU Urban Operation Lab and Vanderbilt Human Machine Teaming Lab: Single Human - Multiple Robot Interface,” Human-Machine Teaming Laboratory Technical Report HMT-08-01, Vanderbilt University.
- TR4. **J. A. Adams**, J. L. Cooper, M. A. Goodrich, C. Humphrey, M. Quigley, B. G. Buss, and B. S. Morse (2007) “Camera-Equipped Mini-UAVs for Wilderness Search Support: Task Analysis and Lessons from Field Trials,” BYU-HCMI Technical Report 2007-1, Brigham Young University.
- TR5. A. Pitman, C. M. Humphrey and **J. A. Adams** (2007) “A picture-in-picture interface for a multiple robot system,” Human-Machine Teaming Laboratory Technical Report HMT-07-02, Vanderbilt University.
- TR6. R. Wu, C. M. Humphrey, S. T. Freedman and **J. A. Adams** (2007) “Multi-Robot Disaster Recon: Building Software Foundations with Real and Simulated Robots to Work with a Common Interface,” Human-Machine Teaming Laboratory Technical Report HMT-07-01, Vanderbilt University.
- TR7. C. M. Humphrey, C. Henk, G. Sewell, B. Williams, and **J. A. Adams** (2006) “Evaluating a Scaleable Multiple Robot Interface based on the UTFARSim Platform,” Human-Machine Teaming Laboratory Technical Report HMT-06-01, Vanderbilt University.
- TR8. **J. A. Adams** and D. Lawler (2001) “Remote Intelligent Robonaut Health Monitoring Demonstration,” Final report NASA/ASEE Summer Faculty Fellowship Program, NASA Johnson Space Center.
- TR9. **J. A. Adams** and J. C. Watts-Perotti (1997) “Human-Centric Model of Consumer Digital Imaging: Digital User Experience Strategy (DUES),” Technical Report, Eastman Kodak Company.
- TR10. **J. A. Adams** (1996) “Human Factors Experimental Analysis of the MASC System,” Technical Report MS-CIS-96-11, University of Pennsylvania.
- TR11. **J. A. Adams** (1995) “Human Management of a Hierarchical System for the Control of Multiple Mobile Robots,” Ph.D. Dissertation, University of Pennsylvania.
- TR12. **J. A. Adams** (1995) “Human Management of a Hierarchical Control System for Multiple Mobile Robots,” Ph.D. Dissertation Proposal, Technical Report MS-CIS-95-17, University of Pennsylvania.

- TR13. **J. A. Adams**, R. Bajcsy, J. Kosecka, V. Kumar, R. Mandelbaum, M. Mintz, R. Paul, C.-C. Wang, Y. Yamamoto, and X. Yun (1995) “Cooperative Material Handling by Human and Robotic Agents: Module Development and System Synthesis” (Long Version), Technical Report MS-CIS-95-01, GRASP LAB 385, University of Pennsylvania.
- TR14. **J. A. Adams** (1993) “Robust Hypothesis Testing and Statistical Color Classification,” Masters Thesis, Technical Report MS-CIS-93-90/GRASP LAB 365, University of Pennsylvania.

Posters

- P1. **J. A. Adams** (2006) “Unmanned Vehicle System Situation Awareness,” BOT Language Workshop, West Point, N.Y.

Tutorials

- TT1. G. Trafton and **J. A. Adams** (2008) “Human-Robot Interaction: Conducting User Evaluations,” The 2008 IEEE International Conference on Robotics and Automation.

Invited Talks

- T1. *Human-Robotic Teaming*, Keynote address, Regional Celebration of Women in Computing Conference, February 26, 2010.
- T2. *Human Robotic Teaming/Interaction and Experimentation*, ONR Science of Autonomy Program Meeting, July 2009.
- T3. *Conducting Cognitive Task Analysis for Real-World Systems*, Keynote Address, AAAI Spring Symposium on Experimental Design for Real-World Systems, March 2009.
- T4. *Cognitive Limitations when Humans Interact with Large Teams of Robots*, The 34th Annual Interdisciplinary Conference, February 2009.
- T5. *A System of Human-Robot Interfaces for Large Robot Teams*, Georgia Institute of Technology, Robotics and Intelligent Machines Seminar Series, January 2009.
- T6. *A System of Human-Robot Interfaces for Large Robot Teams*, Carnegie Mellon University, The Robotics Institute, Robotics/Human-Computer Interaction Institute Seminar Series, December 2008.
- T7. *A System of Human-Robot Interfaces for Large Robot Teams*, University of Minnesota, CSE Distinguished Lecture Series, May 2008.
- T8. *A System of Human-Robot Interfaces for Large Robot Teams*, University of Pennsylvania, The General Robotics, Automation, Sensing, and Perception Laboratory, March 2008.
- T9. *Statistical Validity Pitfalls*, Keynote Address: Metrics for Human-Robot Interaction Workshop, The 3rd ACM/IEEE International Conference on Human-Robot Interaction, March 2008.
- T10. *Applying Cognitive Engineering to Human-Robotic Interaction*, Brigham Young University, Computer Science Department, December 2007.

- T11. *Human Supervision of Unmanned Vehicles*, Georgia Institute of Technology, Daniel Guggenheim School of Aerospace Engineering, September 2007.
- T12. *Multi-Robot Coalition Formation*, Unmanned Systems Capabilities Conference III, Academic panel, Department of Defense, Joint Ground Robotics Enterprise, January 2007.
- T13. *Unmanned Vehicle Situation Awareness Briefing - Update*, Unmanned Systems Safety Workshop, Department of Defense, Office of the Under Secretary of Defense, June 2006.
- T14. *Unmanned Vehicle Situation Awareness Briefing*, Unmanned Systems Safety Workshop, Department of Defense, Office of the Under Secretary of Defense, May 2006.
- T15. *The Human Response to Chemical, Biological, Radiological, Nuclear, and Explosive Device Events*, North Carolina State University Edward P. Fitts Department of Industrial and Systems Engineering, April 2006.
- T16. *Task Analysis for System Design*, Vanderbilt Informatics Seminar Series, March 2006.
- T17. *The Human Response to Chemical, Biological, Radiological, Nuclear, and Explosive Device Events*, Patient Safety Seminar Series, Vanderbilt University Center for Improving Patient Safety, November 2005.
- T18. *The Human Response to Chemical, Biological, Radiological, Nuclear, and Explosive Device Events*. The Western NY Human Factors and Ergonomics Chapter, Rochester, NY. May 2005.
- T19. *The Human Response to Chemical, Biological, Radiological, Nuclear, and Explosive Device Events*. The Mechanical Engineering Department, State University of New York at Buffalo. May 2005.
- T20. *Vanderbilt University Robotics Research*. AUVSI, Pathfinder Chapter - Unmanned Systems Symposium, TEAMS week 2005, Huntsville, AL. March 2005.
- T21. *Human-Robotic Teaming*. Department of Computer Science, Rochester Institute of Technology. September 2003.
- T22. *Human-Machine Teaming*. ACM Student Chapter, Middle Tennessee State University. March 2004.
- T23. *Critical Considerations for Human-Robotic Interface Development*. Department of Computer Science; University of South Florida. February 2003.

Other Talks (Talks given prior to 2003 are not listed.)

- O1. *General Visualization Abstraction Algorithm for Geographic Map-based Human-Robot Interaction*, The 53rd Human Factors and Ergonomics Society Annual Meeting, October 2009.
- O2. *A Human Eye Like Perspective for Remote Vision*, The 2009 IEEE International Conference on Systems, Man and Cybernetics, October 2009.
- O3. *Adapting Robotic and Human Teams in Real-Time Based Upon Human Performance Metrics: An Update*, with S. A. DeLoach (Kansas State Univ.), AFOSR Workshop on Cognitive Modeling and Software Engineering. May 2009.

- O4. *Robotics*, Vanderbilt University School of Engineering Boy Scouts of America Explorers Program, April 2009.
- O5. *How to Enhance Situational Awareness, Agility and Mobility for Your Warfighter in Urban Operations*, with B. Levin (Kansas State Univ.), 2009 Soldier Technology US, Situation Awareness focus day, February 2009.
- O6. *Adapting Robotic and Human Teams in Real-Time Based upon Human Performance Metrics*, with S. A. DeLoach (Kansas State Univ.), AFOSR Workshop on Cognitive Modeling and Software Engineering. July 2008.
- O7. *Robotics*, Vanderbilt University School of Engineering Boy Scouts of America Explorers Program, January 2008.
- O8. *Unmanned System Autonomy, Situation Awareness, and System Safety*, The 25th International System Safety Conference, August 2007.
- O9. *Cognitively Compatible and Collaboratively Balanced Human-Robot Teaming in Urban Military Domains: Thrusts II-C and III*, ONR MURI Topic 8 Program Kick Off Meeting, November 2007.
- O10. *The Inherent Components of Unmanned Vehicle Situation Awareness*, The 2007 IEEE International Conference on Systems, Man and Cybernetics, October 2007.
- O11. *Unmanned Vehicle Situation Awareness: A Path Forward*, The 2007 Human Systems Integration Symposium, March 2007.
- O12. *Unmanned Vehicle Situation Awareness*, 2006 Robotics: Science and Systems Conference, Intuitive Human-Robot Interaction for Getting the Job Done Workshop, August 2006.
- O13. *Human-Robot Interaction Design: Understanding User Needs and Requirements*, The 2005 Human Factors and Ergonomics Society 49th Annual Meeting, September 2005.
- O14. *Objective Data Analysis for PDA-Based Human-Robot Interaction*, The 2004 IEEE International Conference on Systems, Man and Cybernetics, October 2004.
- O15. *Comparing the Usability of Enhanced RoboFlag Interfaces*, The 2004 IEEE International Conference on Systems, Man and Cybernetics, October 2004.
- O16. *Enhancing RoboFlag Users' Situational Awareness*, The 2004 Human Factors and Ergonomics Society 48th Annual Meeting, September 2004.
- O17. *Mixed Initiative Interaction and Robotic Systems*, AAI-04 Workshop on Supervisory Control of Learning and Adaptive Systems, July 2004.
- O18. *Analysis of Perceived Workload when using a PDA for Mobile Robot Teleoperation*, The 2004 IEEE International Conference on Robotics and Automation, April 2004.
- O19. *Evaluation of an Enhanced Human-Robot Interface*, 2003 IEEE International Conference on Systems, Man, and Cybernetics, October 2003.

Invited Panels

- IP1. *Comparing, Merging, and Adapting Methods of Cognitive Task Analysis*, Discussant, The 53rd Human Factors and Ergonomics Society Annual Meeting, October 2009.
- IP2. *Simplifying Systems Interfaces to Ease Decision Making in Operations*, Soldier Technology US 2009, Situation Awareness Focus Session, Arlington, VA, February 2009.
- IP3. *From Sorceress to Scientist: Women in Computing*, Object Oriented Programming, Systems, Languages and Applications Conference, Nashville, TN, October 2008.
- IP4. *Academic Panel*, The Third Annual Unmanned Systems Capabilities Conference, Nashville, TN, January 2007.
- IP5. *The Future of Human-Robotic Interaction*, 2003 IEEE International Conference on Systems, Man and Cybernetics, Arlington, VA, October 2003.

SPONSORED RESEARCH ACTIVITIES

The total research funding that I have been involved with since August 2003 is **\$7,827,967**. This amount can be broken into two categories: Principal Investigator (PI) **\$1,828,341**; Co-PI **\$5,999,626**.

Contracts and Grants

1. Complex mission coalition formation for human-UxV deployments

Sponsoring Agency: DEPSCoR - ONR

Amount: \$376,855

Starting - Ending Date: August 4, 2009 - August 2, 2012

PI and Co-PIs: **Julie A. Adams**

Role: This proposal focuses on developing a robust system of coalition formation algorithms for allocating tasks to robotic and human teams. This program requires a 30% cost share, which totals \$189,622.

Support: 0.25 summer months, 2 graduate research assistants, and 1 undergraduate student.

2. Human-robot teams informed by human performance moderator functions

Sponsoring Agency: Air Force Office of Scientific Research

Amount: \$609,602

Starting - Ending Date: March 1, 2009 - May 30, 2012

PI and Co-PIs: **Julie A. Adams** (PI) and Scott DeLoach (Kansas State University) (Co-PI)

Role: This grant will develop a theory of human-robot team organization that integrates humans and robots into a single team based on member capabilities and human performance factors. I will be responsible for analyzing existing and developing new human performance moderator functions that will be integrated with Dr. DeLoach's team organization capabilities. I am also responsible for all system evaluations.

Support: 12.5% academic year off-set 2011/2012, 1.5 summer months 2009/2010 and 1 summer month 2011, and 1 graduate research assistant.

3. REU Supplement to CAREER: Human interaction with large numbers of unmanned vehicles
Sponsoring Agency: National Science Foundation
Amount: \$8,000
Starting - Ending Date: 6/1/2009 - 5/30/2010
PI and Co-PIs: **Julie A. Adams** (PI)
Role: This grant supplements the NSF CAREER award to permit funding an undergraduate student to participate in the research.
Support: 1 undergraduate research assistant.
4. HSD: Thinking about, and interacting with living and mechanical agents
Sponsoring Agency: National Science Foundation
Amount: \$749,991
Starting - Ending Date: 9/2008 - 8/2011
PI and Co-PIs: Daniel Levin (PI), **Julie A. Adams**, Gautam Biswas, and Megan Saylor (Co-PIs)
Role: This grant focuses on conducting a number of user evaluations regarding how people interact with mechanical and living agents. My role is to provide video, actual robots, and the human-robot interface for the user evaluations of human interaction with robots.
Support: 5% academic year off-set, 0.25 summer months, and 1 graduate research assistant co-supervised with Gautam Biswas.
5. MRI: Acquisition of instrumentation for learning and interacting in virtual environments
Sponsoring Agency: National Science Foundation
Amount: \$260,479
Starting - Ending Date: 7/2008 - 6/2011
PI and Co-PIs: Robert E. Bodenheimer (PI), **Julie A. Adams**, Timothy P. McNamara, John J. Riser, and Nilanjan Sarkar (Co-PIs)
Role: This grant does not support faculty or students. Dr. Adams will assist with the equipment set-up and will write new proposals incorporating the new equipment.
Support: NA
6. Urban Operations Laboratory
Sponsoring Agency: Marine Corps Systems Command (MCSC), Marine Expeditionary Rifle Squad Program Office
Amount: \$3,075,000, Vanderbilt portion \$101,089
Starting - Ending Date: 12/1/2007 - 5/2010
PI and Co-PIs: Larry Erickson (Kansas State Univ.) (PI)
Role: Dr. Adams' is a sub-contract on the grant and works on the robotics sub-project with Drs. Scott DeLoach and David Gustafson (Kansas State Univ.). Dr. Adams' group is responsible for developing the remote human operator multimodal interaction capabilities.
Support: 0.25 summer months, 1 graduate research assistant.

7. CAREER: Human interaction with large numbers of unmanned vehicles
Sponsoring Agency: National Science Foundation
Amount: \$499,634
Starting - Ending Date: 2/15/2007 - 2/14/2012
PI and Co-PIs: **Julie A. Adams** (PI)
Role: I am responsible for designing, developing, and evaluating interaction and visualization techniques to support a single human interacting with a large number of multiple robots.
Support: 1 summer month, and 1 graduate research assistant.
8. REU Supplement to CAREER: Human interaction with large numbers of unmanned vehicles
Sponsoring Agency: National Science Foundation
Amount: \$6,000
Starting - Ending Date: 6/1/2007 - 1/31/2009
PI and Co-PIs: **Julie A. Adams** (PI)
Role: This grant supplemented the NSF CAREER award and permitted funding undergraduate students to participate in the research.
Support: 1 undergraduate research assistant.
9. MURI: Cognitively compatible and collaboratively balanced human-robot teaming in urban military domains
Sponsoring Agency: Office of Naval Research
Amount: \$3M - 3 years with possible total of \$5M - 5 years; Vanderbilt Budget: \$529K - 5 years
Starting - Ending Date: 5/2007 - 4/2010 with possible extension to 4/2012
PI and Co-PIs: Cynthia Breazeal (MIT) (PI), Deb Roy (MIT), Nick Roy (MIT), John How (MIT), Rod Grupen (UMASS - Amherst), Pamela Hinds (Stanford), Deiter Fox (U Washington), and **Julie A. Adams** (Co-PIs)
Role: I am responsible for developing the remote operator human-robotic team interaction that integrates information and components provided via the other contributors. I am also responsible for developing and conducting user evaluations related to the resulting system. I am the team lead for the Visualization and Interface for Situation Awareness and Simulation-based Evaluation research thrusts.
Support: 12.5% academic year off-set, 0.5 summer months, and 1 graduate research assistant.
10. SGER: Requirements assessment for a multiple robot-multiple human interface
Sponsoring Agency: National Science Foundation
Amount: \$99,950
Starting - Ending Date: 3/1/2005-2/28/2007
PI and Co-PIs: **Julie A. Adams** (PI)
Role: I led the goal-directed task analysis of the Chemical, Biological, Radiological, Nuclear, and Explosive device response that assessed the needs and requirements and developed preliminary interface designs for novel interaction techniques that permit a small number of humans to supervise large robotic teams. The results of this grant were one half of the foundation for my NSF CAREER proposal, awarded in 2007.
Support: 2 summer months, and 1 graduate research assistant.

11. Computer Science Study Panel (CS2P)
Sponsoring Agency: DARPA
Amount: \$75,700
Starting - Ending Date: 3/15/2006-2/28/2007
PI and Co-PIs: **Julie A. Adams** (PI)
Role: My role was to attend four required week long meetings, and prepare a Phase II research proposal.
Support: 12.5% academic year off-set, 2 summer months, and 1 graduate research assistant for six months.
12. Vanderbilt-Northwestern-Texas-Harvard/MIT Engineering Research Center for Bioengineering Educational Technologies
Sponsoring Agency: National Science Foundation
Amount: \$1,400,000. Adams' portion: \approx \$30,000
Starting - Ending Date: 9/1/1999-8/31/2008
PI and Co-PIs: Thomas Harris (PI)
Role: My role was as a subcontractor responsible for conducting The Courseware Authoring and Packaging Environment (CAPE) user evaluation from September 2006 - August 2007.
Support: 0.5 summer months, and 1 hourly research assistant at 10 hours per week.
13. Research and interactive human robot interaction
Sponsoring Agency: DARPA-SMDC
Amount: \$331,979
Starting - Ending Date: 6/1/2002-12/31/2003
PI and Co-PIs: Kazuhiko Kawamura (PI), Richard A. Peters, and Mitch Wilkes (Co-PIs)
Role: I was an investigator on this grant between September 2002 and May 2003. I supervised a student developing a PDA based Human-Robot Interface. I also facilitated an interview with Military personnel at the Redstone Arsenal in Huntsville, AL.
Support: 50% of my time Fall 2002, 25% of my time Spring 2003.
14. Acquisition of autonomous behaviors by robotic assistants
Sponsoring Agency: DARPA-NASA-JSC MARS2020 (DARPA-sponsored grant; VU Subcontract)
Amount: \$1,029,000
Starting - Ending Date: 9/1/2002-12/31/2004
PI and Co-PIs: Kazuhiko Kawamura (PI), Richard A. Peters, Mitch Wilkes, and Nilanjan Sarkar (Co-PIs)
Role: I was an investigator on this grant between January 2003 and July 2003. I supervised a student developing a display of the Sensory EgoSphere. I also worked with NASA Johnson Space Center to look at human factors issues associated with using eyeglass displays.
Support: 25% of my time Spring 2003, 6 summer weeks 2003.

15. Travel grant for student paper competition at the 1999 IEEE International Conference on Systems, Man, and Cybernetics

Sponsoring Agency: National Science Foundation

Amount: \$5,000

Starting - Ending Date: 9/1/1999-8/31/2000

PI and Co-PIs: **Julie A. Adams** (PI)

Role: Society's Student Activities Chair. Managed student travel support and student paper awards.

Support: NA.

Internal Funding Support

1. Visualization of laser mapping information for human-robotic interaction.

Sponsoring Agency: Vanderbilt University Summer Research Program

Amount: \$4,000

Starting Date: 6/2009 - 8/2009

PI: **Julie A. Adams**

Role: This proposal funded an undergraduate, Raffi Bedikian, for the summer to on work a problem related to my NSF CAREER award and ONR MURI grant.

2. Single human - multiple robot interface

Sponsoring Agency: Vanderbilt University VUSE Summer Undergraduate Research Program

Amount: \$2,000

Starting Date: 6/2008 - 8/2008

PI: **Julie A. Adams**

Role: This proposal funded an undergraduate, Brian Okorn, to work on the Kansas State Urban Operations Laboratory grant to develop a potential human-robotic interaction visualization technique.

3. Cognitive work analysis for human-robotic chemical, biological, radiological, nuclear, and explosive search and rescue teams

Sponsoring Agency: Vanderbilt Discovery Grant

Amount: \$50,000

Starting Date: 7/1/2005 - 6/30/2007

PI: **Julie A. Adams**

Role: This work conducted a modified cognitive work analysis of the Nashville Metro Police department's Weapons of Mass Destruction team to develop potential human-robotic interaction techniques. The results of this grant represented one half of the foundation for my NSF CAREER proposal, awarded in 2007.

Support: 1 graduate research assistant.

4. A picture-in-picture human interface for a multiple robot system
Sponsoring Agency: Vanderbilt University VUSE Summer Undergraduate Research Program
Amount: \$2,000
Starting Date: 6/2007 - 8/2007
PI: Julie A. Adams
Role: This proposal funded an undergraduate, Andrew Pitman, to work on the NSF CAREER grant to develop a potential image visualization technique.
5. Building software foundations with real and simulated robots to work with a common interface
Sponsoring Agency: Vanderbilt University Summer Undergraduate Research Program
Amount: \$4,000
Starting Date: 6/2007 - 8/2007
PI: Julie A. Adams
Role: This proposal funded an undergraduate, Roger Wu, to work on developing a software interface between the user interface and real robots that also supported our robotic simulators.
6. Understanding user needs and requirements for human-robotic interaction development
Sponsoring Agency: Vanderbilt University VUSE Summer Undergraduate Research Program
Amount: \$1,800
Starting Date: 6/2005 - 8/2005
PI: Julie A. Adams
Role: This proposal funded an undergraduate, Ari M. Wilson, to work on the NSF SGER grant by helping to conduct the cognitive task analysis.
7. Human-robotic interaction development for multiple robots
Sponsoring Agency: Vanderbilt University Summer Undergraduate Research Program
Amount: \$3,800
Starting Date: 5/2004 - 7/2004
PI: Julie A. Adams
Role: This proposal funded an undergraduate, Izzet (John) Can Envarli, for a summer to develop a preliminary human-robot interface for a multiple robot system. This work was related to my CAREER and SGER proposals.
8. College of Applied Science and Technology FEAD Grant
Sponsoring Agency: Rochester Institute of Technology
Amount: \$6,400
Starting Date: 9/2001 - 8/2002
PI: Julie A. Adams
Role: Review of the current state of multiple mobile robotic systems.

Pending Proposals

1. IGERT: Multidisciplinary Program in Systems Science and Engineering with an Emphasis on Cyber Physical Systems

Sponsoring Agency: National Science Foundation

Date Submitted: September 14, 2009

Amount Requested: \$3,250,000

Starting - Ending Date: September, 2010 - August, 2015

PI and Co-PIs: Gautam Biswas(PI), Janos Sztipanovits, Sankaran Mahadevan, Michael Goldfarb, and Peter Miller (Co-PIs)

Role: This proposal seeks to provide an interdisciplinary education to U.S. Ph.D. students in the area of Cyber Physical Systems. My role will be as a contributing faculty participant in the program.

Support: NA

Summary of Support for Dr. Adams and Students

	2005	2006		2007		2008		2009	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Offset	0%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	25%
Post Doctoral Assistants	0	0	0	0	0	0	0	0	1
Graduate Students	2	2	1	1	2	2	3	4	5
Undergraduate Students	1	0	0	0	0	0	1	3	3

Proposals Submitted but not Funded

1. CPS Small: Cyber physical systems for emergency management incorporating humans into the decision making/control loop

Sponsoring Agency: National Science Foundation

Date Submitted: February 27, 2009

Amount Requested: \$596,858

Starting - Ending Date: October 1, 2009 - Sept 30, 2012

PI and Co-PIs: Gautam Biswas (PI), **Julie A. Adams** and Xenofon Koutsoukos (Co-PIs)

Role: This collaborative work would have developed methodologies and tools for the design and evaluation of complex, distributed cyber-physical systems. Dr. Adams would have been responsible for the design and development of the human-system interaction for the decision support system. and for designing and conducting system user evaluations.

Outcome: Not funded.

2. CMMI: Visual steering of multiscale computational analysis and design

Sponsoring Agency: National Science Foundation

Date Submitted: 10/1/2008

Amount Requested: \$365,518

PI and Co-PIs: Caglar Oskay (PI), **Julie A. Adams**, and Sankaran Mahadevan (Co-PIs)

Role: This collaborative effort would have studied the impact of real-time user interaction in the analysis and design of structural systems composed of microstructured materials. Dr. Adams would have been responsible for developing the manipulation capabilities for the multiscale visualization and providing user capabilities to track the analysis events.

Outcome: Not funded.

3. MURI: Coordinated multi-disciplinary design of complex human-machine systems

Sponsoring Agency: Air Force Research Laboratory

Date Submitted: 10/23/2007

Amount Requested: \$3,000,000

PI and Co-PIs: Jeff Shamma (Georgia Tech) (PI), Amy Pritchett (Georgia Tech), Terry L. von Thaden (UIUC), Kathleen Carley (CMU), Eric Johnson (Georgia Tech), Eric Feron (Georgia Tech), and **Julie A. Adams** (Co-PIs)

Role: This collaborative MURI project would have developed and integrated methods across various disciplines to mathematically model and design large-scale complex military systems.

Outcome: Not funded.

4. HRI: Collaborative research: Mixed teams - humans and robots as peers

Sponsoring Agency: National Science Foundation

Date Submitted: 11/02/2006

Amount Requested: \$785,157

PI and Co-PIs: **Julie A. Adams** (PI) and Scott DeLoach (Kansas State Univ) (Co-PI)

Role: This collaborative proposal sought to develop peer based interaction capabilities that would adapt to changes in human user capabilities, such as increased fatigue. Dr. Adams would have been responsible for developing the human performance metrics and peer-based interaction capabilities in addition to designing and conducting the system evaluations.

Outcome: Not funded. This proposal was revised and was funded by the AFOSR.

5. A worksite supervision system

Sponsoring Agency: John Deere & Company

Date Submitted: 06/01/2007

Amount Requested: \$50,000

PI and Co-PIs: **Julie A. Adams**

Role: This proposal would have developed a user interface system to permit a single human, the head foreman of a construction site, to monitor and supervise the activities of the various vehicles; autonomous, semi-autonomous and manned distributed across a worksite.

Outcome: Not funded.

6. Unmanned system situation awareness architecture

Sponsoring Agency: DARPA

Date Submitted: 11/17/2006

Amount Requested: \$446,000

PI and Co-PIs: **Julie A. Adams**

Role: This proposal would have developed an unmanned system situation awareness architecture.

Outcome: Not funded.

7. Condition based maintenance for unmanned vehicles

Sponsoring Agency: Vanderbilt Discovery Grant

Date Submitted: 11/2005

Amount Requested: \$100,000

PI and Co-PIs: **Julie A. Adams** (PI) and Nilanjan Sarkar (Co-PI)

Role: This proposal was a revised version of the 2004 Vanderbilt Discovery Grant proposal submission.

Outcome: Not funded.

8. Adaptable multiple robot team organization

Sponsoring Agency: Draper Laboratory

Date Submitted: 1/6/2005

Amount Requested: \$127,335

PI and Co-PIs: **Julie A. Adams**

Role: This proposal would have developed techniques to permit a heterogeneous multiple robot team to reorganize itself based upon provided system health information or the introduction of new robots, tasks, and environmental constraints.

Outcome: Not funded.

9. Real time adaptive health monitoring and control for robotic teams

Sponsoring Agency: Vanderbilt University Discovery Grant Program

Date Submitted: 11/1/2004

Amount Requested: \$100,000

PI and Co-PIs: **Julie A. Adams** (PI), and Nilanjan Sarkar (Co-PI)

Role: This proposal would have developed a distributed, decentralized condition based maintenance monitoring framework to automatically detect and isolate system faults; a control methodology that utilized system health information to modify an existing controller or choose a new controller in order to avoid performance degradation; and decision support to facilitate human monitoring and interaction with a multiple unmanned vehicle system.

Outcome: Not funded. This proposal was revised and resubmitted to the 2005 Discovery Grant Program.

10. Improving robotic cognition and teaming capabilities through the addition of dexterous manipulation

Sponsoring Agency: Vanderbilt University Discovery Grant Program

Date Submitted: 11/1/2004

Amount Requested: \$123,394

PI and Co-PIs: Robert Bodenheimer (PI), **Julie A. Adams**, Dan Leven, David Noelle, Alan Peters, Nilanjan Sarkar, M. Saylor, and Mitch Wilkes (Co-PIs)

Role: This was an infrastructure request. Dr. Adams' role would have been to use the infrastructure for future work.

Outcome: Not funded.

11. CAREER: Human-robotic interaction development for large multiple robot teams

Sponsoring Agency: National Science Foundation

Date Submitted: 7/20/2004

Amount Requested: \$500,317

PI and Co-PIs: **Julie A. Adams** (PI)

Role: This project would have worked with the Nashville Metro Police to develop Human-Robotic Interaction for the Weapons of Mass Destruction team.

Outcome: Not funded. The first year of this proposal was funded as a NSF SGER grant, which led to the subsequent NSF CAREER submission and award.

12. BAA 04-02: Mixed-initiative implicit human-robotic interaction for multi-agent teams

Sponsoring Agency: NASA

Date Submitted: 9/30/2004

Amount Requested: \$10,475,806

PI and Co-PIs: **Julie A. Adams** (PI), Dave Kortenkamp (Metrica/TRACLabs), Alan Schultz (Naval Research Laboratory), Reid Simmons (Carnegie Mellon University), Nilanjan Sarkar, Kimberly Tyree (NASA Johnson Space Center), and Terrence Fong (NASA Ames Research Center) (Co-PIs)

Role: Dr. Adams would have been the PI, directing the system development. Dr. Adams would have had responsibility for developing the mixed-initiative interaction architecture. This proposal intended to develop a mixed-initiative interface based primarily on implicit communication techniques for teams of astronauts and robots. The application was construction and maintenance on the Moon.

Outcome: Not funded.

13. BAA 04-02 Notice of intent: Enabling efficient teamwork between humans and robots

Sponsoring Agency: NASA

Date Submitted: 8/15/2004

Amount Requested: \$2,000,000

PI and Co-PIs: Dave Kortenkamp (Metrica/TRACLabs) (PI), **Julie A. Adams**, Nilanjan Sarkar, and Kimberly Tyree (NASA Johnson Space Center) (Co-PIs)

Role: This work would have studied how astronauts need to interact with robots to fulfill missions to the Moon. Dr. Adams would have been responsible for developing and assisting with the astronaut-robot interaction evaluations, analyzing results, and providing input into the definition of future research problems.

Outcome: Not funded.

14. Real time adaptive health monitoring and control reconfiguration of UGVs
Sponsoring Agency: ARMDEC E-Teams
Date Submitted: 3/9/2004
Amount Requested: \$199,893
PI and Co-PIs: Nilanjan Sarkar (PI) and **Julie A. Adams** (Co-PI)
Role: This proposal would have developed an adaptive system that allowed a robotic team to recover from fault situations in real-time. Dr. Adams would have been responsible for developing the unmanned ground vehicle station.
Outcome: Not funded. This proposal was narrowed and submitted as a Discovery Grant proposal in 2004.
15. Improving human-robot teams through ethnographic analysis
Sponsoring Agency: NASA
Date Submitted: 9/29/2003
Amount Requested: \$760,404
PI and Co-PIs: Robert Bodenheimer (PI), **Julie A. Adams**, David Noelle, and Rogers Hall (Co-PIs)
Role: This project aimed to improve NASA's Extravehicular activity by analyzing ethnographically how astronauts train for such missions. We intended to identify actions and methods with the goal of enabling robots to better interact with astronauts during such activities.
Outcome: Not funded.
16. IIS: Improving human-robot teams through ethnographic analysis
Sponsoring Agency: National Science Foundation
Date Submitted: 4/1/2003
Amount Requested: \$507,427
PI and Co-PIs: Robert Bodenheimer (PI), **Julie A. Adams**, David Noelle, and Rogers Hall (Co-PIs)
Role: This collaborative project would have examined several activities in which robots and humans interact with the goal of identifying key cognitive mechanisms that could be leveraged in improved interaction between humans and robots.
Outcome: Not funded. This proposal was narrowed and submitted to NASA.
17. IIS: Combining modular microrobotic swarms and humans for dangerous environments
Sponsoring Agency: National Science Foundation
Date Submitted: 11/15/2002
Amount Requested: \$394,920
PI and Co-PIs: Ferat Sahin (RIT) (PI) and **Julie A. Adams** (Co-PI)
Role: This project would have developed a swarm of micro robots that could be reconfigured to meet the demands of various tasks. My responsibility would have been to develop the human supervisory station.
Outcome: Not funded.

18. College of Applied Science and Technology FEAD Grant

Sponsoring Agency: Rochester Institute of Technology

Amount Requested: \$5,600

PI: **Julie A. Adams**

Role: I would have developed theories and architectures for the coordination and cooperation of large multiple mobile robot teams with limited human supervisory control.

Outcome: This proposal was awarded, but the award was declined because I took a leave of absence from the institute.

19. College of Applied Science and Technology Provost Grant

Sponsoring Agency: Rochester Institute of Technology

Amount: \$3,500

PI: **Julie A. Adams**

Role: Incorporation of human-computer interaction into the introductory computer science curriculum.

Outcome: This proposal was awarded, but it had to be declined since I accepted the awarded FEAD Grant.

PROFESSIONAL ACTIVITIES AND SERVICE

Editorial Boards

- Associate Editor, IEEE Transactions on Systems, Man and Cybernetics - Part A, November 2004 - present.
- Editorial Board, Human Factors and Ergonomics in Manufacturing, October 2008 - present.
- Guest co-editor (with Richard Voyles), special issue of the *Journal of Intelligent and Robotic Systems* on Safety, Security, and Rescue Robotics, to appear early 2010.
- Guest co-editor (with Carline Cao and Guadalupe Muoz), special issue *Advances in Human-Computer Interaction* on Human-Computer Interaction in Critical Systems, 2008, canceled due to low submission rate, handled paper reviewing for regular review process.
- Guest co-editor (with Marjorie Skubic), special issue of the *IEEE Transactions on Systems, Man and Cybernetics - Part A* on Human-Robotic Interaction, July 2005.

Committees

- Human-Robot Interaction Steering Committee, 2005-present
- IEEE Systems, Man and Cybernetics Society, Board of Governors, 2006-2009
- IEEE Systems, Man and Cybernetics Society, Executive Committee, 2000-2005, 2010-2011
- IEEE Systems, Man and Cybernetics Society, Administrative Committee (AdCom), 1998-2000
- IEEE Systems, Man and Cybernetics Society, Conference and Meetings Committee, 2006-2010
- IEEE Technical Activities Board, Society Review Committee, 2002-2004

- IEEE Technical Activities Board, Finance Committee, 2001-2002
- IEEE Graduates of the Last Decade (GOLD) Committee, 2000-2001
- IEEE Systems, Man and Cybernetics Society, Student Activities Committee, 1996-2005

Steering Committee Co-Chair

- Human-Robot Interaction Steering Committee, 9/2009-present

Vice President

- IEEE Systems, Man and Cybernetics Society, Human-Machine Systems, 2010-2011
- IEEE Systems, Man and Cybernetics Society, Long Range Planning and Finance, 2004-2005
- IEEE Systems, Man and Cybernetics Society, Conferences and Meetings, 2002-2003

Treasurer

- IEEE Systems, Man and Cybernetics Society, 2000-2003

Program Co-Chair (with J. Gregory Trafton)

- The 6th ACM/IEEE International Conference on Human-Robot Interaction, Switzerland, March 2011

Program Chair

- Regional chair for the Americas, 2010 IEEE International Workshop on Safety, Security, and Rescue Robotics, Germany
- Computer Systems Technical Group (CSTG), Human Factors and Ergonomics Society 43rd Annual Meeting, Houston, TX, September 1999
- Computer Systems Technical Group (CSTG), Human Factors and Ergonomics Society 42nd Annual Meeting, Chicago, IL, October 1998

Assistant Program Chair (to Stephanie Guerlain)

- Computer Systems Technical Group (CSTG), Human Factors and Ergonomics Society 41st Annual Meeting, 1997
- Computer Systems Technical Group (CSTG), Human Factors and Ergonomics Society 40th Annual Meeting, 1996

Local Arrangements Chair

- 2005 IEEE International Symposium on Robot and Human Interactive Communication, Nashville, TN, August 2005

Publicity Chair

- 2004 IEEE International Conference on Information Reuse and Integration, Las Vegas, NV, November 2004

Finance Chair

- The 2nd ACM/IEEE International Conference on Human-Robot Interaction, Arlington, VA, March 2007
- The 1st ACM/IEEE International Conference on Human-Robot Interaction, Salt Lake City, UT, March 2006

Finance Co-Chair (with Curtis Neilsen)

- The 3rd ACM/IEEE International Conference on Human-Robot Interaction, Amsterdam, March 2008

Demo Chair

- 2009 IEEE International Workshop on Safety, Security, and Rescue Robotics, Denver CO, November 2009

Invited Session Track Organizer (with Jean Scholtz)

- Human-Robotic Interaction Track, 2003 IEEE International Conference on Systems, Man and Cybernetics, Washington, DC, October 2003

Program Committee Member

1. IEEE International Workshop on Safety, Security, and Rescue Robotics, 2008, 2009
2. 3rd International Conference on Applied Human Factors and Ergonomics, 2010
3. ACM/IEEE International Conference on Human-Robot Interaction, 2008-2010
4. New Frontiers in Human-Robot Interaction Symposium, 2009, 2010
5. Grace Hopper Conference, 2008
6. ACM International Conference on Human-Robot Interaction, 2006
7. IEEE International Symposium on Robot and Human Interactive Communication, 2005
8. American Association for Artificial Intelligence National Conference (AAAI), 2004-2005
9. IEEE International Conference on Systems, Man and Cybernetics, 1998-2005
10. Human Factors and Ergonomics Society Annual Meeting, 1996-2003

Student Activities Committee

- Co-Chair (with Abdel El Kamel), IEEE Systems, Man and Cybernetics Society, 1999
- Chair, IEEE Systems, Man and Cybernetics Society, 1997-1998

Peer-Reviewing (since August 2003)

1. Autonomous Robots
2. Human Factors
3. IEEE Intelligent Systems
4. IEEE Transactions on Knowledge and Data Engineering
5. IEEE Transactions on Robotics
6. IEEE Transactions on Systems, Man, and Cybernetics, Part A
7. IEEE Transactions on Systems, Man, and Cybernetics, Part B
8. IEEE Transactions on Systems, Man, and Cybernetics, Part C
9. International Journal of Robotics and Automation
10. Journal of Cognitive Engineering and Decision Making
11. Journal of Intelligent and Robotic Systems

Review Panels

1. National Science Foundation, 2004, 2005, 2007, 2008, 2009

Other Professional Service

1. National Academy of Science, Soldier Systems Panel, 2007-2010
2. Joint Government/Industry Unmanned Systems Safety Initiatives - Situation Awareness Working Group, Office of the Under Secretary of Defense, 2006
3. IEEE Young Members Focus Group, 1999

University Service

- **Vanderbilt**
 - Provost's Graduate Fellowship Committee, 2007, 2008, 2009
 - Graduate Faculty Delegate Assembly, 2004-2005

School Service

- **Vanderbilt - School of Engineering**
 - Library Committee, 2009
 - Website Committee, 2008-2009
- **Rochester Institute of Technology - College of Computing and Information Sciences**
 - Student Scholars Committee, 2001-2002

Departmental Service

- **Vanderbilt**
 - Academic Adviser, Computer Science, Class of 2009
 - Computer Science Faculty Search Committee, 2008-2009
 - Coordinator, Artificial Intelligence Research Group, 2006-2007
 - Computer Engineering Ad-Hoc Committee, 2005-2006
 - Systems Engineering Concentration Committee, 2003-2004
- **Rochester Institute of Technology**
 - Chair, Department of Computer Science Web Committee, 2001-2002
 - First Year Java Committee, 2000-2001
 - Introductory Computer Science Committee, 2001-2002
 - ABET Committee, 2000

RESEARCH TRAINING AND SUPERVISION

Publications with students, if any, are shown in parenthesis

Post-doctoral Research Associate

1. Tao Zhang, September 2009 - present.

Doctoral Students Graduated

1. Carlotta Johnson, Ph.D. in Electrical Engineering, Co-Advised with Kazuhiko Kawamura, *Enhancing a Human-Robot Interface using a Sensory Egosphere*, May 2003. (CE10)
Current employment: Assistant Professor, Department of Electrical and Computer Engineering, Rose-Hulman Institute of Technology.
2. Lovekesh Vig, Ph.D. in Computer Science, *Multi-Robot Coalition Formation*, December 2006. (J9, J10, S2, CS4, C10, B1)
Current Employment: Assistant Professor of Information Technology, Jawaharlal Nehru University. As of November 2009, Assistant Professor, Indraprastha Institute of Information Technology Delhi (IIIT-Delhi).

3. Curtis Humphrey, Ph.D. in Computer Science, *Information Abstraction Visualization for Human-Robot Interaction*, August 2009. (J4, J5, J7, J2, S3, S4, S6, S7, CS1, CS2, C2, C3, C7, CE2, CE3, TR4, TR5, TR6, TR7)
Current Employment: Computer Analyst I, Dynetics, Inc.

Doctoral Students

1. Sanford Freedman, Ph.D. student in Computer Science. Area of research: Forgetting for robots. Expected completion date: May 2010. (C6, C8, C1, WE1, TR1, TR2, V1)
2. Travis Service, Ph.D. student in Computer Science. Area of research: Multiple Robot Coalition Formation. Expected completion date: May 2012. (J1, S5)
3. Sean Hayes, Ph.D. student in Computer Science. Area of research: Multimodal Human-Robotic Interaction.
4. Jonathan Barrett, Ph.D. student in Computer Science. Co-advised with Gautam Biswas.
5. Eli Hooten, Ph.D. student in Electrical Engineering, National Defense Science and Engineering Fellowship Recipient.
6. Caroline Harriott, Ph.D. student in Computer Science.

M.S. Students Graduated

1. Andrew Bouchard, M.S. in Mechanical Engineering, *Design and Control of a Manipulator for Autonomous Joining of Featureless Panels*, May 2009.
Current employment: Civilian Engineer, Naval Surface Warfare Center.
2. Peter Grant, M.S. in Computer Science, *Grid Results Checking*, May 2006.
3. Christopher Henk, M.S. in Computer Science, December 2006. (CS2, TR7)
Current employment: Engineer, Allison Transmission.
4. Hande Kaymaz-Keskinpala, M.S. in Electrical Engineering, *PDA-Based Teleoperation Interface for a Mobile Robot*, December 2004. (C12, CE5, CE11)
Current employment: Vanderbilt University, Ph.D. program in Electrical Engineering.
5. Souyma Sengupta, M.S. in Computer Science, Rochester Institute of Technology, Co-advised with James E. Heliotis, *Utilizing Mobile Agents for Accessing Remote Services*, 2003.
6. John Mikucki, M.S. in Computer Science, Rochester Institute of Technology, *Net.Sense*, 2002.
7. Tung-Cheih Lee, M.S. in Computer Science, Rochester Institute of Technology, *Network Studio*, 2001.
8. Christopher Hahn, M.S. in Printing Management and Sciences, Rochester Institute of Technology/Eastman Kodak Company, *An Investigation of Non-Verbal Auditory Cues within Graphical User Interfaces*, 1999.

M.S. Students

1. William Holcomb, M.S. in Computer Science, On leave March-December, 2009.

M.S. Academic Advisor

1. Sayan Dev Sen, M.S. in Computer Science. Academic Advisor.
2. Andrew Pitman, M.S. in Computer Science. Academic Advisor. Expected completion date: May 2009.
3. Ari M. Wilson, M.S. in Computer Science, May 2008.
4. Arun Ghosh, M.S. in Computer Science, May 2007.
5. Sameer Singh, M.S. in Computer Science, May 2007. (CS3)
6. Ryan Castle, M.S. in Computer Science, May 2005.
7. Thanjavur Prabhu, M.S. in Computer Science, May 2004.
8. Sangeeta Shankar, M.S. in Computer Science, May 2003. (CE6, CE8)

Thesis Committee Member

1. Isaac Amundson, Ph.D. in Computer Science, May 2010 (expected).
2. Scott Harman, Ph.D. in Computer and Information Science, Kansas State University, May 2010 (expected).
3. John Kinnebrew, Ph.D. in Computer Science, *Global SensorWeb Coordination and Control Using Multi-Agent Systems*, May 2009 (expected).
4. Mark Somanader, Ph.D. in Psychology, May 2010 (expected).
5. Christina Campbell, Ph.D. in Electrical Engineering, *Robotic Grasp Learning*, December 2009 (expected).
6. Candice Griffith, Ph.D. in Civil Engineering (Interdisciplinary Studies), *Human Reliability in Engineering Systems*, December 2009 (expected).
7. Juan Rojas, Ph.D. in Electrical Engineering, *Autonomous Cooperative Assembly by Force Feedback using a Control Basis Approach*, May 2009.
8. Larry Thomas, Ph.D. in Computer Science, *Quality Issues in Open Source Software Engineering*, August 2008.
9. Liguu Yu, Ph.D. in Computer Science, *Categorization of Common Coupling and its Application to Open-Source Operating Systems*, August 2004.
10. Roxanne Canosa, Ph.D. in Imaging Science, Rochester Institute of Technology, *Seeing, Sensing, and Selection: Modeling Visual Perception in Complex Environments*, 2003.
11. Elizabeth Seward, M.S. in Computer Science, *Time-to-Contact Estimation for Street Crossing*, 2006.
12. Craig Bailey, M.S. in Computer Science, University of Missouri-Columbia, *A Sketch Interface for Understanding Hand-Drawn Route Maps*, 2004. (J13)

13. Daniel Kunkle, M.S. in Computer Science, Rochester Institute of Technology, *Automatic Classification of One-Dimensional Cellular Automata*, 2003.
14. Keith Jones, M.S. in Computer Science, Rochester Institute of Technology, *Obsage - An Agent Based Model of Observational Learning*, 2003.
15. Unmesh Churi, M.S. in Computer Science, Rochester Institute of Technology, *XML Database Data Manipulation Systems (XDBDMS)*, 2001.
16. Richard Buck, M.S. in Computer Science, Rochester Institute of Technology, *Intelligent Home Automation Control System*, 2001.

Other Graduate Student Supervision

1. Travis Service, Independent Study (CS 390), Introduction to Robotics, Fall 2008.
2. William Holcomb, Independent Study (CS 390), Development of an Introduction to Robotics Course, Spring 2008.
3. Robin Rostorfer, Independent Study (CS 390), RACHNA Implementation Architecture, Fall 2007.
4. Karla Conn, Independent Study (EECE 398), Robotics Reading Group, Fall 2005.
5. Matthew Daigle, Independent Study (CS 390), Robotics Reading Group, Fall 2005.
6. Stephen Gordon, Independent Study (EECE 398), Robotics Reading Group, Fall 2005.
7. Ridelto Gutierrez, Independent Study (EECE 398), Robotics Reading Group, Fall 2005.
8. Derek Riley, Independent Study (CS 390), Robotics Reading Group, Fall 2005.
9. Di Wu, Independent Study (CS 390), Robotics Reading Group, Fall 2005.
10. Pramila Rani, Independent Study (EECE 398), Mixed-Initiative Interaction for Affect-Based Human-Robot Interaction, Summer 2003. (J8, CE9, WE3)
11. Sangeeta Shankar, Independent Study (CS 390)/Research, Situation Awareness for Human-Robotic Interaction, 2003. (CE6, CE8)
12. Chen Zhou, Research, Co-Advised with Bobby Bodenheimer, 2003. (CS5, CE12)
13. Chip Clifton, Research, Sensory Egosphere Display, Summer 2003.

Undergraduate Student Research Supervision

1. Raffi Bedikian
 - Vanderbilt University Undergraduate Summer Research Program, Human-Robotic Interaction Environmental Mapping Visualization, Summer 2009.
 - Undergraduate Research Assistant, Human-Robotic Interaction System Development, Spring, Fall 2009.
2. Ken Hartsook, Independent Study (CS 240), Multiagent Planning in Real-Time, Spring 2009.

3. Stephen Motter (C3)
 - Undergraduate Research Assistant, Human-Robotic Interaction User Evaluations, Spring, Fall 2009.
 - Undergraduate Research Assistant, Interactive, Web-based Cognitive Task Analysis Results, Fall 2009.
4. Brian Okorn
 - Undergraduate Research Assistant, Robotic Architecture Integration and Controller Development, Fall 2008 - Spring 2009, Fall 2009.
 - Summer Research Program for Engineering Undergraduate Students, Single Human - Multiple Robot Interface for Military Applications, Summer 2008. (TR3)
5. Andrew Pitman, Summer Research Program for Engineering Undergraduate Students, A picture-in-picture interface for a multiple robot system, Summer 2007. (TR5)
6. Roger Wu, Vanderbilt University Undergraduate Summer Research Program, Building software foundations for Human-Robotic Interaction, Summer 2007. (TR6)
7. Trieu Dang, Independent Study (CS 240), Introduction to Artificial Intelligence Robotics, Fall 2006.
8. Ari Wilson
 - Undergraduate Research Assistant, Robotic Cognitive Task Analysis, Fall 2005.
 - Summer Research Program for Engineering Undergraduate Students, Robotic Cognitive Task Analysis, Summer 2005.
9. Izzet (John) Can Envarli (C11)
 - Independent Study (CS 240), Human-Multiple Robot Interface User Evaluation, Fall 2004.
 - Vanderbilt University Undergraduate Summer Research Program, Human-Multiple Robot Interface Development, Summer 2004.
10. Dalton Franklin, Independent Study (CS 240), Human-Computer Interaction Development based upon Database Design, Spring 2004.
11. Timothy Rapp, Independent Study (CS 240), Comparison of A* and IDA* algorithms, Spring 2004.
12. Lyle Chamberlain, California Institute of Technology/Cornell University Summer Undergraduate Research Fellowship, RoboFlag Competition. (C13)
13. Japeck Tang, California Institute of Technology/Cornell University Summer Undergraduate Research Fellowship, RoboFlag Competition. (C13)
14. Megha Watugala, California Institute of Technology/Cornell University Summer Undergraduate Research Fellowship, RoboFlag Competition. (C13)

Other Research Supervision

1. Mark Gonyea, Vanderbilt University Bioengineering Research Experiences for Teachers Program
 - Effectively Co-located GIS Map Items, Summer 2009.
 - Virtual Camera, Summer 2008. (C3)
2. Kimberly Gold, Vanderbilt University Bioengineering Research Experiences for Teachers, Image Mosaicking, Summer 2007.

TEACHING ACTIVITIES

Courses Taught

Vanderbilt University Course numbering reflects curricular changes approved by the School of Engineering Faculty. Courses may have appeared as, for example CS 396 instead of CS 366. Enrollment is shown in parenthesis beside the year the course was taught.

Course	Title	Fall	Spring
CS252	Theory of Automata, Formal Languages, and Computation		2008 (7)
CS260	Introduction to Artificial Intelligence	2003 (26) 2004 (22) 2005 (22) 2006 (14) 2008 (16)	
CS269	Projects in Artificial Intelligence Co-taught with CS366		2004 (11) 2005 (7) 2007 (3) 2009 (1)
CS352	Human-Computer Interaction	2005 (17) 2007 (14) 2009 (12)	
CS366 (396)	Distributed Artificial Intelligence		2004 (15) 2005 (7) 2007 (5) 2009 (11)
EECE/CS396	Complex Man-Machine Systems		2003 (10) 2006 (5)
EECE/CS395	Behavior-Based Robotics	2002 (5)	

Curriculum Development

CS260 *Introduction to Artificial Intelligence*. This course is an advanced undergraduate elective course. Gautam Biswas and I revised the course pre-requisites in Spring 2004. Also during that time, I worked with David Noelle (CS 360 Advanced Artificial Intelligence) to develop syllabi for CS 260 and CS 360 that covers the required introductory material in CS 260 and reduced the material to be covered in CS 360. I also developed a three-phase project based upon the board game Othello. This project allowed students to work in groups and each phase added additional capabilities. The teams were to employ software engineering skills typically found in industry. At the completion of each phase, the teams' software played opposing teams. During the Fall 2006, I again revised the project assignment to include two three-phase projects. The students very much like the project assignments in this class.

CS252 *Theory of Automata, Formal Languages, and Computation* This is an existing advanced undergraduate elective course that I took over from Xenofon Koutsoukos. I had previously taught a version of this course at Rochester Institute of Technology (RIT). I adopted the existing text, but updated the syllabus to include additional topics related to complexity. My RIT course materials were modified for the Vanderbilt text book, a semester schedule, and new assignments and exams were developed.

CS352 *Human-Computer Interaction* This course is a graduate level course. Bobby Bodenheimer previously taught the course as a seminar-based course. I teach the course as a lecture based course that requires students to complete a semester long project. The 2005 course required a completely new syllabus that was developed based upon HCI courses throughout the country. One conference paper resulted from the 2005 course. The 2007 course was revised based upon a new textbook. Additionally, out-of-class lecture notes were provided so that some in-class time could be dedicated to project-based in-class activities.

CS269 *Projects in Artificial Intelligence* and **CS366/CS396** *Distributed Artificial Intelligence* This was a new course to Vanderbilt in Spring 2004 that I developed. This course introduces students to the fundamentals of developing distributed artificially intelligent algorithms (agents). It is a project-based course in which students develop, test, and evaluate a multiple agent system. Students choose a course topic they wish to study further via the project. The previous course (RIT 4003-590/4005-709) was modified in Spring 2004 to adapt it to a semester system and a different textbook. In addition, I incorporated a series of research papers that undergraduate and graduate students read, but graduate students present. During Spring 2005, I returned to the original textbook and updated the research papers. I changed to a new textbook for the Spring 2007 semester. The textbook changes required significant revision of the lecture materials. L. Vig's Ph.D. dissertation topic resulted from his course project, and two other projects have led to conference papers.

EECE/CS396 *Complex Human-Machine Systems* This was a new advanced seminar/project course that I developed. The course introduces students to the systems engineering and human factors considerations for the development of large complex systems (i.e., air traffic control stations, and monitoring of chemical, nuclear, or power plants). The course materials are seminal papers in the field, portions of a textbook, and current journal publications. The students are required to present a number of papers. The primary deliverable is a project. Students choose a topic in which they are interested and develop a system. The students then conduct user evaluations that employ standard measurement tools; evaluate the results and provide final reports. Two conference papers have resulted from course projects.

EECE/CS395 *Behavior-Based Robotics* This course had been taught a number of times at Vanderbilt. It was an advanced seminar course. I revised the syllabus by incorporating material from an additional textbook and related journal papers. The students were required to complete a project and present a number of research papers.

Rochester Institute of Technology Graduate level course numbers 4005-70X. Enrollment shown in parenthesis beside the year the course was taught. Enrollments shown as (x, y) indicate individual enrollment for two sections of a course.

Course	Title	Fall	Winter	Spring
4003-231	Computer Science I	2000 (43)		
4003-232	Computer Science II		2000-2001 (38)	
4003-233	Computer Science III			2002 (28)
4003-234	Computer Science IV	2001 (45)		2001 (42, 37)
4003-263	Computer Science for Transfers	2000 (31)		
4003-380	Introduction to Computer Science Theory	2001 (37)		
4003-456	Expert Systems		2000-2001 (9)	
4003-590	Distributed Artificial Intelligence		2001-2002 (15)	
4005-705	Foundations of Computing Theory			2001 (20)
				2002 (22)
4005-709	Distributed Artificial Intelligence		2001-2002 (7)	
4005-751	Knowledge Based Systems		2000-2001 (1)	
NA	Computer Science Honors Seminar		2001-2002 (~20)	

Curriculum Development

4003-234 *Computer Science IV*. I was the course coordinator for this course during the Fall 2001 term. This course is the first introduction to C++ and software engineering principles. In total, there were three sections of the course being taught by three faculty members. The course coordinator position requires one to develop the programming assignments, refine the weekly laboratory assignments, establish the semester schedule, conduct a weekly coordination meeting, run the “cheater-checker” software on all submitted programming assignments, supervise the undergraduate lab assistants, and supervise the development of a common final exam.

4003-590/4005-709 *Distributed Artificial Intelligence* Both of these courses were new courses that I developed. 4005-709 is the graduate version. As is typical at RIT, both courses were taught in the same lecture. Graduate students had additional deliverables.

University of Rochester I have not retained enrollment numbers for these courses.

Course	Title	Fall	Spring	Summer
CS 108	Introduction to Computers		1999	
CS 170	Introductory Computer Programming (Engineering Majors, Non-Computer Science)		2000	
CS 171	Computer Programming	2000 (≈ 100)		1999

Curriculum Development

CS 170 *Introductory Computer Programming*. I designed this course to service the School of Engineering students. The school placed all engineering students into the CS 171 course in Fall 2000. The CS 171 course proved to be too advanced for most general engineering students. Therefore, CS 170 was developed to provide introductory scientific programming principles. I developed the course from scratch, with input from the engineering departments whose students would be serviced by this course.

Volunteer Service

Volunteer/Running Buddy, Girls on the Run Nashville, 2008-present

Volunteer, Boy Scouts of America, Career Awareness Exploring Program, 2001-2002

Post co-advisor, Boy Scouts of America, Computer Science Explorers Post, 1997

Team member, For Inspiration and Recognition of Science and Technology (FIRST) Robotics Competition, 1996-1998, 2000-2001

Judge, Western New York middle school science fair, 1998-2000

Volunteer, The Jason Project, middle and elementary school program, 1997

Student Mentor, University of Minnesota, Institute of Technology, 1996

Volunteer, Industry Volunteers Encouraging Science and Technology, 1996