

Murali R. Varanasi
Department of Electrical Engineering
University of North Texas
Denton TX 76203

EDUCATION

B.S.	Andhra University, Waltair, India, 1957	Physics
D.M.I.T.	Madras Inst. of Technology, Chromepet, India 962	Electronics Engineering
M.S.	University of Maryland, College Park, MDI 972	Electrical Engineering
Ph.D.	University of Maryland, College Park, MDI 973	Electrical Engineering

EXPERIENCE

2/13-	Professor, Electrical Engineering
11/04 - 2/13	Professor and Founding Chair, Electrical Engineering University of North Texas
01/04 - 11/04	Professor and Coordinator of Electrical Engineering University of North Texas
08/91 - 12/03	Professor, University of South Florida
08/93 - 1/95	Program Director, Systems Prototyping and Fabrication National Science Foundation, Arlington VA
08/87 - 08/91	Professor & Chair, Computer Science and Engineering
08/86 - 08/87	Professor, Computer Science and Engineering
12/80 - 07/86	Associate Professor, Computer Science and Engineering University of South Florida, Tampa, FL.
08/79 - 12/80	Associate Professor, Electrical Engineering
08/73 - 07/79	Assistant Professor, Electrical Engineering Old Dominion University, Norfolk, VA.
06/72 - 08/73	Senior Member Technical Staff Computer Sciences Corp., Silver Springs, MD.
02/69 - 06/72	Graduate Teaching and Research Assistant, University of Maryland, College Park, MD
03/63 - 01/69	Senior Scientific Assistant, Junior Scientific Officer, Senior Scientific Officer II, Senior Scientific Officer I Defense R & D Laboratory, Hyderabad, India
07/62 - 02/63	Engineer-in-Training Chief Inspectorate of Electronics, Bangalore, India

PROFESSIONAL AND HONOR SOCIETIES

Institute of Electrical and Electronic Engineers (IEEE)
Association for Computing Machinery (ACM)
Computer Society of India
Eta Kappa Nu and Sigma Xi

HONORS AND AWARDS

Andhra Pradesh State Government Scholarship, 1955 - 57.
National Merit Scholarship, 1959 - 62.
Ranked 10th in the National Electronic Engineering Examination, 1962.
Old Dominion University Summer Faculty Fellowship, 1976.
IEEE Computer Society Outstanding Contribution Award for Leadership and Contributions to the Model Program in Computer Science and Engineering, 1985.
IEEE Computer Society Meritorious Service Award for contributions to chapters and student activities, 1988.
Outstanding Service to the Profession Award, Florida Engineering Society, Aug. 1991.
Meritorious Service Award for Service as Editor of Computer Society Press, 1994
Fellow of IEEE, for contributions to Coding for Fault Tolerance and Leadership in Computer Science and Engineering Education, 1995
Certificate of Appreciation for Service on Fellow Evaluation Committee, IEEE Computer Society, 1996, 1997
Certificate of Appreciation for service as Chair of Distinguished Visitors Program, IEEE Computer Society, 1997
Certificate of Appreciation for dedicated and sustained contributions to Computer Science Accreditation, Educational Activities Board, IEEE Computer Society, 1998
Professorial Excellence Award, University of South Florida, 1998
IEEE Third Millennium Medal, 2000
Distinguished Service Award, University of South Florida, 2004
Richard E Merwin Distinguished Service Award, IEEE Computer Society, 2004
Elected as CSAB Fellow, October 2009

RESEARCH INTERESTS

Digital Communications and Coding Theory
Fault Tolerant Computing

Digital Systems Design and Computer Architecture
VLSI Design

PROFESSIONAL ACTIVITIES

Secretary, IEEE Hampton Roads Computer Chapter; June, 1976-December, 1977.

Vice-Chairman, IEEE Hampton Roads Computer Chapter; January, 1978-80.

Member, IEEE Computer Society Education Committee; 1975-77.

Session Chairman, Microprocessor Applications, IEEE SOUTHEASTCON Conference, Williamsburg; April, 1977.

Session Chairman, Session 11 : Microprocessors in Computer Science and Engineering Education, IEEE Computer Society Model Curricula Workshop/Conference, June 1977.

Moderator, Wang User's Group; January, 1976.

Editor, Chapter Activities Newsletter, IEEE Computer Society; 1979- 81. Program

Chairman, IEEE Computer Society Tutorial Week East; 1982.

General Chairman, IEEE Computer Society Tutorial Week East; 1982-86.

Chapter Chairman, IEEE Computer Society Florida West Coast Section; 1981-82.

Chairman, Model Program Committee, IEEE Computer Society Educational Activities Board; 1981 Secretary, IEEE Computer Society Publications Board; 1984-86.

Chairman, Model Program and Accreditation Workshops, ACM-IEEE Computer Society Joint Committee; 1984-86.

Associate Editor, IEEE Transactions on Education; 1983-86.

Chairman, Chapter Tutorials Committee, IEEE Computer Society; 1985-86.

Co-Chairman, IEEE Computer Society Design in Computer Science and Engineering Task Force; 1984

Team Chair, Computing Sciences Accreditation Commission for Evaluation of Computing Sciences Programs In U.s.; 1986, 1988, 1990.

Consultant, Electronics Research Laboratory, Government of INDIA; 1986-88. Member, Florida High Technology and Industry Council; 1987-93.

Chairman, Student Activities Committee IEEE Computer Society; 1987-92.

Vice Chairman, Area Activities Board, IEEE Computer Society; 1987.

PROFESSIONAL ACTIVITIES (cont.)

Member, Educational Activities Board, IEEE Computer Society; 1981-93.

Editor, CS Press, IEEE Computer Society; 1990-94.

Distinguished Visitor, IEEE Computer Society; 1991-93.
Chair, Distinguished Visitor Program, IEEE Computer Society, 1994-
Chair, ABET Accreditation Activities, IEEE Computer Society, 1991- 1996.
Alternate Director, Computing Sciences Accreditation Board, 1994-1998.
Member, Computer Sciences Accreditation Commission, 1986-98
Member, CSAC Executive Committee, 1996-2000
Consultant, Board of Regents, State of Louisiana, Baton Rouge, LA, 1987
Consultant, Old Dominion University, Norfolk, VA, 1990 - 1995
Consultant, University Of Cincinnati, Cincinnati, OH, 1994
Member, Advisory Board, Electrical Engineering Department, Old Dominion University, Norfolk, VA, 1996 - 1999
Vice-Chair, Computing Accreditation Commission of ABET, 2000-2001
Member, Accreditation Policy Council, IEEE Educational Activities Board, 2001-2002
IEEECS Representative Director, CSAB Inc. 1998-2007
Treasurer, CSAB Inc, 2002,2003
Vice-President, Chapter Activities, IEEE Computer Society, 2003
Vice-President, Educational Activities, IEEE Computer Society, 2004-2006
Member, IEEE Sensors council, 2006-2008
President, CSAB Inc, 2006 - 2007 Member, Board
of Directors, ABET Inc. 2006-2012
Past-President, CSAB Inc, 2008-2009
Member, IEEE Committee on Engineering Accreditation Activities, 2008 - 2010
Member, IEEE Accreditation Policy Council, 2008-2010

PUBLICATIONS

1. Synthesis of Gaussian Noise from Physical Fluctuation Phenomenon. M.S. Thesis, University of Maryland, College Park, Maryland; January, 1972.
2. Systematic Non-Separate Codes (with T.R.N. Rao). 10th Allerton Conference on Circuits and Systems, Allefton Park, IL; October, 1972.
3. Systematic Codes and Application to Computer Systems. Ph.D. Dissertation, University of Maryland, College Park, Maryland; August, 1973.
4. User Program Evaluator. NASA Technical Report; June, 1973.

5. Microprogram Control for Digital Systems. ODURF Final Report GRIX; December, 1975.
6. Data processing and Transfer. Vol. 1, contributor and editor. NASA-OAST Workshop Report; December, 1974.
7. Life Support Systems, editor. Vol. XI, NASA-OAST Workshop Report; December, 1974.
8. Synthesis of an improved Error Detector/Corrector for Hamming Distance-4 Code. Presented at the Virginia Academy of Science Annual Meeting; May, 1976.
9. Investigation of Microelectronic Methods for Data Compression. NASA Inventions Report; February, 1977.
10. Functional Evaluation of Oculometer System. NASA Technical Report; March, 1977.
11. Design of Self-Checking Microprogram Control, Symposium of Virginia Academy of Sciences, May, 1977.
12. Microprocessor implementation of Data Compression Algorithms, (with D.L. Livingston), Symposium of Virginia Academy of Sciences ; May, 1977.
13. Hardware Implementation of Transcendental Functions. Old Dominion University Technical Report, February 1978, NASA Invention Report; February, 1979.
14. Computer Design Language Simulator, (with Leonard W. Johnston). Old Dominion University Technical Report; May, 1978.
15. Efficient Methods for Oculometer System Digital Signal Processing. Technical Report, ODU Research Foundation Report; December, 1978.
16. Modeling and Design of a Video Data Compressor, (with S.T. Charalambous). IEEE Workshop on Time Varying Imagery, Philadelphia, PA; April, 1979.
17. Performance Evaluation of Digital Systems Using Computer Hardware Descriptive Languages, (with F.W. Harison). Pittsburgh Conference on Modeling and Simulation, Pittsburgh, PA.; April, 1979.
18. Codes for Package Errors with Large Byte Lengths, (with L.A. Dunning). ACM Conference; February, 1980.
19. Residue Generation for High Speed Applications, (with D.L. Livingston). April, 1980.
20. Dimensionality Reduction Algorithm for Karhunen-Loeve Transform. NASA Invention Report; May, 1981.
21. Design of a Microprocessor-based Oculometer for Real-Time Applications. NASA Final Report; March 1981.
22. Implementation of a High Speed Algorithmic Processor for Real-Time Vision Monitoring Application, Tenth Workshop on Applied Imagery Pattern Recognition, IEEE Computer Society; October, 1981.

23. Residue Generator for Use in Encoding/Decoding Arithmetic Codes. Invited Paper, Proceedings of the International Conference on Circuits and Systems, Jadavpur University, India; December, 1981.
24. Code Constructions for Byte Organized Memory Systems, (with L.A. Dunning). IEEE Transactions on Computers; June, 1983.
25. Memory Package Error Detection/Correction,(with S. Pham and T.R.N. Rao). IEEE Transactions on Computers; September, 1983.
26. Division by Base Conversion, (with T.R.N. Rao and S. Pham). Proceedings of the IEEE SouthEastCon, April 1983
27. SEC-BED codes for Short Byte Lengths, (with L.A. Dunning). BGSU Technical Report; January, 1983.
28. Goals for Models in Computer Science and Engineering Programs, (with J. T. Cain and G.G. Langdon). Frontiers in Engineering Education Conference. Worcester, MA.; October, 1983.
29. IEEE Computer Society Model Program in Computer Science and Engineering, (with J.T. Cain and G.G. Langdon). Frontiers in Engineering Education Conference, Worcester MA.; October, 1983.
30. A New Computer Science and Engineering Model Program, (with J.T. Cain and G.G. Langdon). IEEE EduCompCon, October, 1983.
31. IEEE Computer Society Model Program in Computer Science and Engineering, a committee report (with J.T. Cain and G.G. Langdon), IEEE Computer Society Press, Cat. No. 932, December 1983.
32. SEC-BED and SEC-BED-DED Codes for Short Byte Lengths (with L.A. Dunning), IEEE Computer Society Fault Tolerant Computing Conference; 1984.
33. IEEE Computer Society Model Program in Computer Science and Engineering (with J. T. Cain and G.G. Langdon). Computer, April; 1984.
34. A (14.4, 49) SEC-DED-BED Rotational Code. IEEE Computer Society Fault Tolerant Computing Conference, Orlando, Florida; June, 1984.
35. Laboratory Environment for Robotics and Vision Research, (with R.A. Perez). Proceedings of the International Conference on Robotics and Factory of the Future, Charlotte, North Carolina; December, 1984.
36. Discrete Mathematics for Computer Science. IEEE Potentials; February, 1985.
37. Obstacle Avoidance Algorithms for Robotic Workshop, (with D. Krause). Proceedings of the IEEE Southeastcon 87, NASA report; April, 1987.
38. Multiple Arm Coordination Method, (with R. Basta). Proceedings of IEEE Southeastcon 87, NASA report; April, 1987.
39. Functional Decomposition Techniques using Lattice Theoretic Techniques, (with D. Livingston). Proceedings of the IEEE SoutheastCon 87.

40. Properties of Codes Generated from Transforms over Finite Fields, (with D. Livingston). Proceedings of IEEE Southeastcon; April, 1987.
41. Design Education in Computer Science and Engineering. IEEE Press; March, 1987
42. Detecting and Avoiding Collisions Between Two Robot Arms in a Common Workspace, (R.A. Basta, R. Mehrotra, M.R. Varanasi). IEEE International Workshop on Robot Control: Theory and Application (IEEE), Oxford, U.K.; April, 1988.
43. Collision Detection for Planning Collision-Free Motion of Two Robot Arms, (R.A. Basta, R. Mehrotra, MR. Varanasi). IEEE International Conference on Robotics and Automation, Philadelphia, PA.; April, 1988.
44. Codes for Detection of Unidirectional Byte Errors in Computer Memory Systems, (with L. Dunning and Gur Dial). 19th International Symposium on Fault Tolerant Computing, Chicago, IL; June, 1989.
45. Multi-Robot Systems, (with R. Mehrotra). Monographs in Technology Series, IEEE Computer Society; December, 1989.
46. Collision Detection Between the Wrists of Two Robot Arms in a Common Workspace, (with R. Mehrotra and R. Basta). Journal of Intelligent and Robotic Systems, 1989.
47. Unidirectional Byte Error Detecting codes for Computer Memory Systems, (with L. Dunning and G. Dial). IEEE Transactions on Computers; April, 1990.
48. Architecture and Algorithms for Galois Field based Multiplication Division Algorithms, (with M. Kovac and N. Ranganathan). IEEE International Parallel Processing Symposium; Mar 1992.
49. SIGMA: A VLSI Chip for Galois Field $GF(2^m)$ based Multiplication/Division (with M. Kovac and N. Ranganathan) VLSI Design 93, Sixth International Conference on VLSI Design, Bombay, India, January 1993.
50. SIGMA: A VLSI Systolic Array Implementation of a Galois Field Based Multiplication/Division, (with M. Kovac and N. Ranganathan), IEEE Transactions on VLSI Systems, March 1993.
51. A Systematic (16,8) Code for Correcting Double Errors and Detecting Random Triple Errors, (with R. Klein and L.A. Dunning) IEEE SoutheastCon 1996. This paper was only an initial investigation. Continuation of this work has resulted in excellent results that are submitted for FTC and Computer Transactions. 52.
52. A Modular Design for Large Multicast ATM Switches (with R. King), IEEE SoutheastCon 96 April 1996.
53. A Model for a Computer Engineering Program (with P. Maurer and N. Ranganathan), Frontiers in Education Conference, November 1998.
54. Component-Level Programming: A Revolution in Software Technology(with P. Maurer), 29th ASEE/IEEE Frontiers in Education Conference, San Juan, Puerto Rico, November 1999.

55. Interactive Logic Design on the World Wide Web, (with P.Maurer), 3rd European workshop in Micro-Electronics Education, Aix En Provence, to be presented in May 2000.
56. Multiple Error Detecting/Correcting properties of Nordstrom-Robinson Code (with R.Klein and L.A. Dunning), 43rd MWCSA Symposium 2000, Lansing, MI, August 2000.
57. Detection of Buildings in Lidar Imagery, (with A. Nayegandhi and J. Brock), Fifth International Airborne Remote Sensing Conference and Exhibition, San Francisco, CA, September 2001.
58. Knowledge and Data Engineering: Accomplishments and Research Needs, Society for Design and Process Science, Vallejo, CA May 2002.
59. Computing Curricula: Computer Engineering, 2003 Microelectronics Education Conference (MSE03), Los Angeles, CA, June 2003.
60. Z4 Linearity of Nordstrom-Robinson codes (with R.Klein and Sarma Vangala), 2003 Int'l Conference on Parallel and Distributed Processing Techniques and Applications(PDPTA03) Las Vegas, Nevada, June 2003.
61. Implementation of International Data Encryption Algorithm (with Vipul Mistry), IEEE SoutheastCON, 2004.
62. A VLSI Architecture for Advanced Encryption Standard (AES) Algorithm (with Naga Kosaraju, and S. Mohanty), VLSI Design 06, January 2006, Hyderabad, India.
63. Murali R. Varanasi, Oscar N. Garcia, and Parthasarathy Guturu, "Innovative Approaches to Electrical Engineering Education," presented at the ASEE South Gulf West Conference, Baton Rouge, Louisiana, USA, March 15-17, 2006.
64. A. Koneru, X. Li, and M. Varanasi, "Comparative study of RSS-based collaborative Localization methods in sensor networks", IEEE Region 5 Technical and Science conference, April 2006.
65. Pafthasarathy Guturu, Murali R. Varanasi, and Oscar N. Garcia, "Course Remodeling by Integration of Project-based Education with L2L Principles for Enhanced Student Learning Proceedings of the International Conference on Engineering Education (ICEE) 2006, San Juan, Puerto Rico, USA, July 23-28, 2006.
66. Murali R. Varanasi, Oscar N. Garcia, Parthasarathy Gutunu, Hai Deng, Xinrong Li, and Shengli Fu, "Work In Progress: An Innovative Electrical Engineering Program Integrating Projectoriented and Lifelong Learning Pedagogies," 2006 IEEE Frontiers in Education Conference, San Diego, California, USA, Oct. 28-31, 2006.
67. O. B. Adamo, S. P. Mohanty, E. Kougiianos, W. Cai, and M. Varanasi, "VLSI Architecture and FPGA Prototyping of a Digital Camera for Image Security and Authentication", in Proceedings of the IEEE Region 5 Technology and Science Conference, pp. 154-158, 2006.

68. O. B. Adamo, S. P. Mohanty, E. Kougianos, and M. Varanasi, "VLSI Architecture for Encryption and Watermarking Units Towards the Making of a Secure Digital Camera", in Proceedings of the IEEE International SOC Conference (SOCC), pp. 141-144, 2006.
69. Cooperative Network Coding for wireless Ad-Hoc Networks, Shengli Fu, Kejie Lu, Murali Varanasi and Yi Qian , IEEE Globecom 2007, November 2007.
70. RFID Student Educational Experiences at the UNT College of Engineering: A Sequential approach to creating a Project-based RFD Course, Vijay Vaidyanathan, Murali Varanasi, Elias Kougianos, Shuping Wang, and Hari Raman, IEEE Transactions on Education, (to appear in 2008).
71. H. Deng, M. Varanasi, K. Swigger, O. Garcia, R. Ogan and E. Kougianos, "Design of SensorEmbedded Radio Frequency Identification (SE-RFID) Systems," Proceedings ofIEEE International Conf on Mechatronics and Automation, Henan, China, June 2006.
72. OB. Adamo, S. Fu, and M. Varanasi, "Hardware-Efficient Encryption Encoder and Decoder Unit," IEEE Military Communication (MILCOM 2008), San Diego, November 2008.
73. J. N. Resendiz, R. Nelson, O. B. Adamo, P. Guturu and M. R. Varanasi, "Smart Sprinkler System Controller based on Field Programmable Gate Array," IEEE Green Technology Conference 2009.
74. Oluwayo Adamo, Parthasarathy Guturu, and Murali. Varanasi, "An Innovative Method of Teaching Digital System Design in an Electrical and Computer Engineering Curriculum", IEEE Microelectronic System Education (MSE), 2009.
75. Oluwayomi Adamo, Shengli Fu, and Murali Varanasi, "Physical Layer Error Correction Based Cipher" IEEE Global Communications Conference (GLOBECOM 2010), 2010
76. Oluwayomi Adamo and Murali Varanasi, "Hardware based Encryption for Wireless Networks, ,,in Proceedings of IEEE Military Communication Conference (MILCOM), pp. 1800-1805, 2010.
77. Oluwayomi Adamo and Murali Varanasi, "Joint Scheme for Physical Layer Error Correction and Security," ISRN Journal of Communications and Networking, vol. 2011, Article ID 502987, 2011
78. Oluwayomi Adamo, Eric Ayeh and Murali Varanasi, "Joint Encryption Error Correction and Modulation (JEEM) Scheme," in Proceedings of 2012 IEEE International Communications Quality and Reliability (CQR) workshop, 2012. - WON BEST PAPER AWARD
79. Y. Wan, K. Namuduri, S. Akula, and MR. Varanasi, "The impact of Multi-group network structure on the performance of distributed consensus building strategies," International Journal of Robust and Nonlinear Control, February 2012.

80. N. Maze* Y. Wan, K. Namuduri, and M. Varanasi, "A Lego Mindstorms NXT-Based Test Bench for Cohesive Distributed Multi-agent Exploratory Systems: Mobility and Coordination" in Proceedings of AIAA Infotech@aerospace Conference, June 2012.
81. Application of Error Correcting Codes in Computer Memory Systems, Invited paper, 4th International Conference on Computing, Communication, and Networking Technologies, Elayampalayam, Tamilnadu, India, July 2013.
82. K. Namuduri, M. Varanasi, and B. Buckles, "A Link between Consensus Building and Low Density Parity Check Coding, Information Sciences and Systems (CISS) 2015 49th Annual Conference on, 1-5.

RESEARCH GRANTS

1. Design of Self-Checking Microprogram Control, Old Dominion University Research Foundation summer grant; June-August, 1975: \$2,640.
2. Investigation of Microelectronic Methods for Data Reduction, NASA Langley Research Center; October, 1975 - September, 1976: \$12,500.
3. Evaluation of Oculometer System, NASA Langley Research Center, June — December
4. Evaluation of Oculometer System, NASA Langley Research Center, June - December, 1976, (supplement): \$5,000.
5. Investigation of Efficient Methods for Oculometer Signal Processing, NASA Langley Research Center-, January - December, 1977: \$54,772.
6. Investigation of Efficient Methods for Oculometer Signal Processing, NASA Langley Research Center; January - December, 1977: \$54,772.
7. Feasibility Study of a Microprocessor-based Oculometer System, NASA Langley Research Center; January, 1978 - December, 1979: \$114,000.

8. Design Study of a Microprocessor-based Oculometer System, NASA Langley Research Center; January - August, 1980: \$65,000.

9. Investigation of High Speed Signal Processing Architectures, NASA Langley Research Center; May 15-August 15, 1980: \$10,000.

10. Investigation of High Rate Codes for Use in Arithmetic and Memory Systems,

National Science Foundation; September, 1980-August, 1982: \$88,000.

11. Investigation of Analytical Methods for Efficient Functional Partitioning of On-Board processing Functions, NASA Langley Research Center; August, 1980 - July, 1981 : \$14,836.
12. Investigation error detecting and collecting codes, AT&T Foundation, September 1986 — August, 1988: \$12,500.
13. Intelligent Software methods for Multiple Robotic Arm Coordination, NASA Langley Research Center; May, 1987 - April, 1988: \$30,745.
14. Towards Building an Intelligent Team of Robots (with R. Methrota), NASA Langley Research Center; May, 1987 — September, 1987: \$29,650.
15. Advanced Concepts in Communications- Trellis Coding, E - Systems; January, 1986 December, 1986: \$20,000.
16. Advanced Concepts in Communications- Trellis Coding, E - Systems; January, 1987 - August, 1987: \$15,000.
17. Software Methods in Robotics Applications, AT&T Foundation; September, 1987 - August, 1988: \$30,000.
18. Investigation of High Rate Codes for Use in Arithmetic and Memory Systems, National Science Foundation; April, 1981 -September, 1983: \$86,133.
19. Intelligent Software Research for Robotic Applications, NASA Langley Research Center; May, 1986 -April 30, 1987: \$27,500.
20. Intelligent Software Research for Robotic Applications, NASA Langley Research Center; May 1987 - April, 1988: \$31,046.
21. Intelligent Software Research for Robotic Applications, NASA Langley Research Center; May 1988 - April 1989: \$32,000.
22. Intelligent Software Research for Robotic Applications, NASA Langley Research Center, May, 1989 - April, 1990: \$37,606.
23. Florida space Grant Consortium, FSGC/UF; August, 1990-July, 1991 : \$12,000.
24. Florida Space Grant Consortium, FSGC/UF; August 1991 -July 1992: \$12,000.
25. Intergovernmental Personnel Act Assignment, National Science Foundation, 8/93 — 8/94, \$138,536

26. Intergovernmental Personnel Act Assignment, National Science Foundation, 8/94 — 8/95, \$25,008
27. Honeywell Inc, Hardware-Software Codesign, Aug 98 — Aug 99, \$50,000
28. High Bandwidth Connection to vBNS, National Science Foundation, Oct 1998 — Oct 2000, USF match \$350,000, V.K. Jain is a CO-PI)
29. Research Experiences for Undergraduates (REU), NSF grant supplement \$ 10,000, October 1999-October 2000.
30. Efficient Information Storage and Processing Algorithms,USF-USGS Cooperative agreement, \$174,341, 2001-2003
31. Integrated Sensors Laboratory Infrastructure for CART, DEFG02-04CHI 1217, Department of Energy, \$483,000, 2004 - 2006 (co-PI).
32. A Design- and Project- Oriented Innovative Electrical Engineering Program, National Science Foundation, \$998,688, 2004-2007 (co-PI 2004, 2005, PI 2006, 2007).
33. Planning for an Innovative Interdisciplinary Mechanical and Energy Engineering Curriculum, National Science Foundation, \$99,954, 2005-06 (co-PI).
34. RET Center for wireless sensor networks , National Science Foundation, \$499,932, June 2011 -May 2014. (PI 2011-12, coP1 2012-13).