

William H. Robinson, Ph.D.

Curriculum Vitae

Postal Address

Vanderbilt University
VU Station B #351824
2301 Vanderbilt Place
Nashville, TN 37235-1824

Other Contact Information

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Professional Interests

My research explores the hardware implementations of computing systems to improve performance, reliability, and security. As a systems researcher, this requires an understanding of a diverse set of research areas as well as the interrelationship among those areas. Topics of interest include the following:

- Radiation effects in microprocessor design
- Computer architecture design
- Very Large Scale Integrated circuit (VLSI) design
- Field Programmable Gate Arrays (FPGAs)
- Embedded computing
- Secure hardware platforms
- Reconfigurable architectures

Education

Ph.D. Georgia Institute of Technology, Atlanta, GA

Electrical and Computer Engineering, December 2003
Research Areas: VLSI Design, Parallel Computer Architectures
Dissertation Title: *Modeling and Implementation of an Integrated Pixel Processing Tile for Focal Plane Systems*
Advisor: D. Scott Wills, Sc.D.

M.S. Georgia Institute of Technology, Atlanta, GA

Electrical Engineering, June 1998
Concentrations: Computer Engineering, Digital Signal Processing, Telecommunications
Minor: Computer Science
GPA: 3.88

B.S. Florida Agricultural and Mechanical University, Tallahassee, FL

Electrical Engineering, *summa cum laude*, April 1996
Minors: Computer and Information Systems (CIS) and Mathematics
GPA: 3.91

Professional Experience

August 2010 to Present **Vanderbilt University, Nashville, TN**
Associate Professor of Electrical Engineering
Associate Professor of Computer Engineering

- Member of the Radiation Effects and Reliability (RER) research group
 - Member of the Institute for Space and Defense Electronics (ISDE)
 - Member of the Institute for Software Integrated Systems (ISIS)
 - Undergraduate and graduate courses in Computer Architecture Reliability, Computer Organization, Digital Logic, Digital Systems Architecture, and FPGA Design
- August 2003 **Vanderbilt University, Nashville, TN**
to
August 2010 Assistant Professor of Electrical Engineering
Assistant Professor of Computer Engineering
- October 1996 **Georgia Institute of Technology, Atlanta, GA**
to
August 2003 *Graduate Research Assistant*
Portable Image Computational Architecture (PICA) Research Group
- Developed applications for the SIMD Pixel (SIMPil) Processor
 - Developed models to characterize integrated pixel design
- June 2001 **Georgia Institute of Technology, Atlanta, GA**
to
May 2002 *Graduate Teaching Assistant*
Student and Teacher Enhancement Partnership (STEP), an NSF GK-12 Program
- Tutored at-risk students in basic science courses and Algebra
 - Assisted students with science fair projects, including topic selection, notebook keeping, data analysis, and data presentation
 - Introduced new laboratory activity to trigonometry class
- May 2000 **Ford Motor Company, Dearborn, MI**
to
August 2000 *Engineer*
Noise, Vibration, and Harshness (NVH) testing
- Developed user interface for parametric frame modeling tool
 - Developed Frequency Response Function (FRF) based sub-structuring tool using Matlab
 - Assisted with free-body modal testing of vehicle components
- January 1999 **Georgia Institute of Technology, Atlanta, GA**
to
March 1999 *Graduate Teaching Assistant*
Instructor for CmpE 1700 Computer and Digital Fundamentals
- Class size of 36 students
 - Responsible for all lectures and exams
- May 1996 **Andersen Consulting (now Accenture), Tallahassee, FL**
to
October 1996 *Analyst*
Unemployment Compensation (UC) Tax Implementation
- Performed database administrative duties for UC Tax database
 - Generated COBOL subroutines to access ORACLE database

- Wrote training manuals for newly assigned programmers

May 1995 **Michelin Tire Corporation, Greenville, SC**
to *Engineering Intern*

August 1995 Engineering-Major Projects Department

- Developed a functional overview of an automated paging system
- Designed and evaluated hardware configurations of the system
- Wrote a proposal summarizing the study of the paging system

May to August **Honeywell, Inc., Clearwater, FL**

1994, 1993, *Engineering Intern*

and 1992;

June to August

1991

- Developed a functional overview of an automated paging system
- Designed and evaluated hardware configurations of the system
- Wrote a proposal summarizing the study of the paging system

Publications and Scholarly Work

Publications are available online at <http://www.vuse.vanderbilt.edu/~robinswh/publications.html>

Student authors are identified via underline.

Refereed Journal Articles

- [J1] A. P. Lauf, R. A. Peters, and **W. H. Robinson**, “Distributed intrusion detection system for resource-constrained devices in ad hoc networks,” *Elsevier - Ad Hoc Networks*, vol. 8, pp. 253-66, 2010.
- [J2] J. D. Black, D. R. Ball II, **W. H. Robinson**, D. M. Fleetwood, R. D. Schrimpf, R. A. Reed, D. A. Black, K. M. Warren, A. D. Tipton, P. E. Dodd, N. F. Haddad, M. A. Xapsos, H. Kim, and M. Friendlich, “Characterizing SRAM single event upset in terms of single and multiple node charge collection,” *IEEE Transactions on Nuclear Science*, vol. 55, pp. 2943-47, 2008.
- [J3] M. C. Casey, A. R. Duncan, B. L. Bhuva, **W. H. Robinson**, and L. W. Massengill, “Simulation study on the effect of multiple node charge collection on error cross-section in CMOS sequential logic,” *IEEE Transactions on Nuclear Science*, vol. 55, pp. 3136-40, 2008.
- [J4] B. Narasimham, B. L. Bhuva, R. D. Schrimpf, L. W. Massengill, M. J. Gadlage, W. T. Holman, A. F. Witulski, **W. H. Robinson**, J. D. Black, J. M. Benedetto, and P. H. Eaton, “Effect of guard bands in mitigating long SETs in advanced CMOS processes,” *IEEE Transactions on Nuclear Science*, vol. 55, pp. 1708-13, 2008.
- [J5] B. Narasimham, B. L. Bhuva, R. D. Schrimpf, L. W. Massengill, M. J. Gadlage, O. A. Amusan, W. T. Holman, A. F. Witulski, **W. H. Robinson**, J. D. Black, J. M. Benedetto, and P. H. Eaton, “Characterization of digital single event pulse-widths in 130-nm and 90-nm CMOS technologies,” *IEEE Transactions on Nuclear Science*, vol. 54, pp. 2506-11, 2007.

- [J6] B. Narasimham, B. L. Bhuva, W. T. Holman, R. D. Schrimpf, L. W. Massengill, A. F. Witulski, and **W. H. Robinson**, “The effect of negative feedback on single event transient propagation in digital circuits,” *IEEE Transactions on Nuclear Science*, vol. 53, pp. 3285-90, 2006.
- [J7] B. Narasimham, V. Ramachandran, B. L. Bhuva, R. D. Schrimpf, A. F. Witulski, W. T. Holman, L. W. Massengill, J. D. Black, **W. H. Robinson**, and D. McMorrow, “On-chip characterization of single-event transient pulsewidths,” *IEEE Transactions on Device and Materials Reliability*, vol. 6, pp. 542-49, 2006.
- [J8] V. Srinivasan, A. L. Sternberg, A. R. Duncan, **W. H. Robinson**, B. L. Bhuva, and L. W. Massengill, “Single-event mitigation in combinational logic using targeted data path hardening,” *IEEE Transactions on Nuclear Science*, vol. 52, pp. 2516-23, 2005.
- [J9] A. R. Duncan, V. Srinivasan, A. L. Sternberg, **W. H. Robinson**, B. L. Bhuva, and L. W. Massengill, “Comparison of SEUTool results to experimental results in Boeing radiation tolerant DSP (BDSP C30),” *IEEE Transactions on Nuclear Science*, vol. 52, pp. 2224-30, 2005.
- [J10] **W. H. Robinson** and D. S. Wills, “Efficiency analysis for a mixed-signal focal plane processing architecture,” in *Journal of VLSI Signal Processing Systems: Special Issue on System-on-a-Chip for Multimedia Systems*, vol. 41, pages 65-80, 2005.

Refereed Conference Presentations with Proceedings

- [C1] X. Wang and **W. H. Robinson**, “A low-power double edge-triggered flip-flop with transmission gates and clock gating,” to be presented at *IEEE International Midwest Symposium on Circuits and Systems (MWSCAS)*, Seattle, WA, August 2010, 4 pages.
- [C2] A. P. Lauf and **W. H. Robinson**, “Fault tolerance in MANETs using a task-to-resource reallocation framework,” presented at the *2009 International Conference on Computational Science and Engineering (CSE)*, Vancouver, Canada, 2009, pp. 753-58.
- [C3] Q. Ding and **W. H. Robinson**, “An FPGA implementation of an elliptic curve cryptosystem coprocessor over prime fields,” presented at the *International Conference on Engineering of Reconfigurable Systems and Algorithms (ERSA 2009)*, Las Vegas, NV, July 2009, 2 pages.
- [C4] E. J. Ossi, D. B. Limbrick, **W. H. Robinson**, and B. L. Bhuva, “Soft-error mitigation at the architecture-level using Berger codes and instruction repetition,” presented at the *IEEE Workshop on Silicon Errors in Logic – System Effects (SELSE 2009)*, Palo Alto, CA, March 2009, 4 pages.
- [C5] **W. H. Robinson**, M. L. Alles, T. A. Bapty, B. L. Bhuva, J. D. Black, A. B. Bonds, L. W. Massengill, S. K. Neema, R. D. Schrimpf, and J. M. Scott, “Soft error considerations for multicore microprocessor design,” presented at the *International Conference on IC Design and Technology (ICICDT 2007)*, Austin, TX, May 2007, pp. 206-209.
- [C6] A. P. Lauf, R. A. Peters, and **W. H. Robinson**, “Embedded intelligent intrusion detection: A behavior-based approach,” presented at the *4th International Symposium on Embedded Computing*, Niagara Falls, Canada, May 2007, pp. 816-21.

- [C7] D. Lunardini, B. Narasimham, V. Ramachandran, V. Srinivasan, R. D. Schrimpf, and **W. H. Robinson**, “A performance comparison between hardened-by-design and conventional-design standard cells,” presented at the *2004 Workshop on Radiation Effects on Components and Systems (RADECS 2004)*, Madrid, Spain, September 2004, 5 pages.
- [C8] **W. H. Robinson**, A. O. Austin, D. L. Geddis, D. C. Llewellyn, and M. C. Usselman, “Incorporating engineering into high school algebra and trigonometry: An initiative of the Georgia Tech Student and Teacher Enhancement Partnership (STEP) program,” presented at the *2003 ASEE Annual Conference and Exposition*, Session 2665 - Mathematics in the Transition, Nashville, TN, June 2003, 19 pages. **Nominated for Best Paper Award**
- [C9] **W. H. Robinson** and D. S. Wills, “Analysis of area-time efficiency for an integrated focal plane architecture,” presented at the *15th Annual Symposium on Electronic Imaging: Science and Technology*, Image and Video Communications and Processing 2003, Santa Clara, CA, January 2003, 12 pages.
- [C10] **W. H. Robinson**, G. E. Triplett, and D. S. Wills, “Component modeling for an integrated digital pixel,” presented at the *15th Annual Meeting of the IEEE Lasers and Electro-Optics Society (LEOS 2002)*, Glasgow, UK, 2002, pp. 37-38.
- [C11] **W. H. Robinson** and D. S. Wills, “Design of an integrated focal plane architecture for efficient image processing,” presented at the *15th International Conference on Parallel and Distributed Computing Systems (PDCS 2002)*, Louisville, KY, 2002, pp. 128-35.
- [C12] **W. H. Robinson** and D. S. Wills, “Cost modeling for early image processing applications,” presented at the *Second International Workshop on Digital and Computational Video (DCV'01)*, Tampa, FL, 2001, pp. 29-34.
- [C13] **W. H. Robinson**, D. S. Wills, M. Brooke, and N. Jokerst, “IRIS: an integrated, scalable focal plane architecture,” presented at the *11th Annual Meeting IEEE Lasers and Electro-Optics Society (LEOS'98)*, Orlando, FL, 1998, pp. 184-85.

Other Conference Presentations

- [O1] D. B. Limbrick, E. J. Ossi, C. T. Toomey, **W. H. Robinson**, and B. L. Bhuva, “Characterization of control bit errors in the MIPS R2000 microprocessor,” to be presented at *35th Annual Government Microcircuit Applications and Critical Technology Conference (GOMACTech 2010)*, Reno, NV, 2010, 2 pages.
- [O2] T. Reece, **W. H. Robinson**, and B. L. Bhuva, “Signature-based detection of hardware trojans with voltage stepping,” to be presented at *35th Annual Government Microcircuit Applications and Critical Technology Conference (GOMACTech 2010)*, Reno, NV, 2010, 2 pages.
- [O3] J. D. Black, D. R. Ball II, K. M. Warren, R. D. Schrimpf, D. A. Black, R. A. Reed, D. M. Fleetwood, **W. H. Robinson**, P. E. Dodd, N. F. Haddad, and A. D. Tipton, “Characterizing SRAM single event upset in terms of single and double node charge collection,” presented at the *2008 Nuclear and Space Radiation Effects Conference (NSREC 2008)*, Tucson, AZ, 2008.

- [O4] M. C. Casey, A. R. Duncan, B. L. Bhuvu, **W. H. Robinson**, and L. W. Massengill, "Importance of modeling multiple transients in combinational logic using a modified version of SEUTool," presented at the *2008 Nuclear and Space Radiation Effects Conference (NSREC 2008)*, Tucson, AZ, 2008.
- [O5] B. Narasimham, B. L. Bhuvu, R. D. Schrimpf, L. W. Massengill, M. J. Gadlage, W. T. Holman, A. F. Witulski, **W. H. Robinson**, J. D. Black, J. M. Benedetto, and P. H. Eaton, "Effect of guard bands in mitigating long SETs in advanced CMOS processes," presented at the *9th European Conference on Radiation Effects on Components and Systems (RADECS 2007)*, Deauville, France, September 2007. **Best Oral and Outstanding Paper of the Conference.**
- [O6] B. Narasimham, B. L. Bhuvu, R. D. Schrimpf, L. W. Massengill, M. J. Gadlage, O. A. Amusan, W. T. Holman, A. F. Witulski, **W. H. Robinson**, J. D. Black, J. M. Benedetto, and P. H. Eaton, "Characterization of digital single event transient pulse widths in 130 nm CMOS," presented at the *2007 Nuclear and Space Radiation Effects Conference (NSREC 2007)*, Honolulu, HI, July 2007.
- [O7] B. Narasimham, B. L. Bhuvu, W. T. Holman, R. D. Schrimpf, L. W. Massengill, A. F. Witulski, and **W. H. Robinson**, "The effect of negative feedback on single-event transient propagation in digital circuits," presented at the *2006 Nuclear and Space Radiation Effects Conference (NSREC 2006)*, Ponte Vedra Beach, FL, July 2006.
- [O8] K. A. LaBel, M. Berg, D. Black, **W. H. Robinson**, J. Scott, and A. Jordan, "Trade space involved with Single Event Upset (SEU) and Transient (SET) handling of Field Programmable Gate Array (FPGA) based systems," presented at the *2006 Workshop on Hardened Electronics and Radiation Technology (HEART 2006)*, Santa Clara, CA, March 2006.
- [O9] V. Srinivasan, J. W. Farquharson, **W. H. Robinson**, and B. L. Bhuvu, "Evaluation of error detection strategies for an FPGA-based self-checking arithmetic and logic unit," presented at the *2005 Military and Aerospace Programmable Logic Devices Conference (MAPLD 2005)*, Washington, D.C., September 2005.
- [O10] A. R. Duncan, V. Srinivasan, A. L. Sternberg, **W. H. Robinson**, B. L. Bhuvu, and L. W. Massengill, "Comparison of SEUTool results to experimental results in Boeing radiation-tolerant DSP (BDSP C30)," presented at the *2005 Nuclear and Space Radiation Effects Conference (NSREC 2005)*, Seattle, WA, July 2005.
- [O11] B. Narasimham, V. Ramachandran, B. L. Bhuvu, R. D. Schrimpf, A. F. Witulski, W. T. Holman, L. W. Massengill, J. D. Black, and **W. H. Robinson**, "On-chip characterization of single event transient pulse widths," presented at the *2005 Nuclear and Space Radiation Effects Conference (NSREC 2005)*, Seattle, WA, July 2005.
- [O12] V. Srinivasan, A. L. Sternberg, A. R. Duncan, **W. H. Robinson**, B. L. Bhuvu, and L. W. Massengill, "Single event mitigation in combinational logic using targeted data path hardening," presented at the *2005 Nuclear and Space Radiation Effects Conference (NSREC 2005)*, Seattle, WA, July 2005.
- [O13] A. R. Duncan, V. Srinivasan, A. Sternberg, L. W. Massengill, B. Bhuvu, and **W. H. Robinson**, "The effect of frequency and technology scaling on single event vulnerability

- of the combinational logic unit in the LEON2 SPARC V8 processor,” presented at the *2005 Workshop on Hardened Electronics and Radiation Technology (HEART 2005)*, Tampa, FL, March 2005.
- [O14] **W. H. Robinson**, “Integrated mixed-signal embedded systems for video processing,” presented at the *3rd Annual Empowering Minority Engineers to Reach for Graduate Education (EMERGE) Workshop*, Atlanta, Georgia, April 2003.
- [O15] **W. H. Robinson**, “The Georgia Tech Student and Teacher Enhancement Partnership (STEP) program: One-on-one tutoring for the Georgia high school graduation test,” presented at the *27th Annual Conference of the Professional and Organizational Development Network in Higher Education*, Atlanta, Georgia, October 2002.
- [O16] B. E. Brewster and **W. H. Robinson**, “Multiple STEPS to science at DHHS,” presented at *Celebrating Teaching Day 2002*, Atlanta, Georgia, March 2002.
- [O17] **W. H. Robinson**, “The Georgia Tech Student and Teacher Enhancement Partnership (STEP) program: High school graduation test preparation in science,” presented at the *9th Georgia Conference on College and University Teaching*, Kennesaw, Georgia, February 2002.
- [O18] **W. H. Robinson**, D. S. Wills, M. Brooke, and N. Jokerst, “IRIS: An Integrated, Scalable Focal Plane Architecture,” presented at the *20th Anniversary Conference on Advanced Research in VLSI*, Atlanta, Georgia, March 1999.

Dissertation

- [1] W. H. Robinson, “Modeling and Implementation of an Integrated Pixel Processing Tile for Focal Plane Systems,” in *Electrical and Computer Engineering*. Atlanta, GA: Georgia Institute of Technology, 2003.

Seminars, Workshops, and Briefings

- [1] W. H. Robinson, “Applying Time Management and Priorities to Academics,” presented at the *Go To High School, Go To College Program* of the Tau Lambda chapter of Alpha Phi Alpha Fraternity, Inc., Nashville, Tennessee, April 2010.
- [2] W. H. Robinson, “Detection of Malicious Hardware in Integrated Circuits,” presented at the *DARPA Computer Science Study Panel – Session 5*, Institute for Defense Analyses, Alexandria, Virginia, July 2009.
- [3] W. H. Robinson, “Careers and College Majors,” presented at the *Go To High School, Go To College Program* of the Tau Lambda chapter of Alpha Phi Alpha Fraternity, Inc., Nashville, Tennessee, April 2009.
- [4] W. H. Robinson, “An Integrated Approach to Soft Error Mitigation in CMOS Digital Systems,” presented at the *Spring 2008 Industrial Advisory Board (IAB) Meeting*, the Department of Electrical Engineering and Computer Science (EECS), Vanderbilt University, April 2008

- [5] W. H. Robinson, "Surviving (and Thriving) in Engineering," presented at the *Surviving Engineering Seminar*, Vanderbilt University chapter of the National Society of Black Engineers (NSBE), Nashville, Tennessee, November 2007.
- [6] W. H. Robinson, "Got Time?" presented at the *Time Management Seminar*, Vanderbilt University chapter of the National Society of Black Engineers (NSBE), Nashville, Tennessee, September 2006.
- [7] W. H. Robinson, "Seven Keys for Straight A's," presented at the *Straight A's Seminar*, Vanderbilt University chapter of the National Society of Black Engineers (NSBE), Nashville, Tennessee, September 2004.
- [8] W. H. Robinson, "Graduate School Preparation Workshop," presented at the *National Society of Black Engineers (NSBE) Fall Regional Conference 2003*, Nashville, Tennessee, November 2003.
- [9] W. H. Robinson, "Reflections of a GK-12 Fellow," presented at the *Vanderbilt-Meharry-TSU GK-12 Program Meeting*, Nashville, Tennessee, November 2003.
- [10] W. H. Robinson, "Integrated Mixed-Signal Embedded Systems for Video Processing," presented at *Florida Agricultural and Mechanical University*, Tallahassee, Florida, May 2003. **Invited Seminar**
- [11] W. H. Robinson, "Integrated Mixed-Signal Embedded Systems for Video Processing," presented at the *University of Florida*, Gainesville, Florida, April 2003. **Invited Seminar**
- [12] W. H. Robinson, "Integrated Mixed-Signal Embedded Systems for Video Processing," presented at *Vanderbilt University*, Nashville, Tennessee, April 2003. **Invited Seminar**

Keynote Addresses

- [1] "What are you going to do? Finding and fulfilling your purpose," Vanderbilt University National Society of Black Engineers (NSBE) Closing Luncheon, Nashville, Tennessee, April, 2004.

Sponsored Research Activities

While at Vanderbilt University, I have been involved with a total of over \$6.6M in sponsored research. I have received \$1,358,885 of external support as a Principal Investigator. As a Co-Principal Investigator, I have participated in projects which totaled \$5,279,072 of external support.

Funded Proposals as Principal Investigator

1. **Title:** Facilitating Academic Careers in Engineering and Science (FACES) Career Initiation Grant
Sponsoring Agency: Georgia Institute of Technology
Amount Funded: \$20,000
PI: W. H. Robinson
Period of Performance: 9/2003 – 12/2008

2. **Title:** Feasibility Study to Develop Reliability-Aware High-Level Synthesis
Sponsoring Agency: Vanderbilt University
Amount Funded: \$42,703
PI: W. H. Robinson
Period of Performance: 5/2006 – 6/2008

3. **Title:** Study to Identify a Strategy and Approach to Develop an Advanced Radiation-Hardened Microprocessor Technology/Architecture Capable of Meeting Future Satellite and Missile Systems Requirements
Sponsoring Agency: Johns Hopkins University Applied Physics Laboratory
Amount Funded: \$280,000
PI: W. H. Robinson
Co-PIs: T. A. Bapty, B. L. Bhuva, L. W. Massengill, S. K. Neema, R. D. Schrimpf
Period of Performance: 9/2006 – 9/2007

4. **Title:** Reliability-Aware High-Level Synthesis for Integrated Circuits in Multicore Microprocessors
Sponsoring Agency: Southeastern Center for Electrical Engineering Education
Amount Funded: \$18,000
PI: W. H. Robinson
Period of Performance: 9/2007 – 8/2008

5. **Title:** FY08 Computer Science Study Panel – Phase 1
Sponsoring Agency: DARPA
Amount Funded: \$100,000
PI: W. H. Robinson
Period of Performance: 4/2008 – 3/2009

6. **Title:** CAREER: An Integrated Approach to Soft Error Mitigation in CMOS Digital Systems
Sponsoring Agency: NSF
Amount Funded: \$400,000
PI: W. H. Robinson
Period of Performance: 6/2008 – 5/2013

7. **Title:** Computer Science Study Panel – Phase 2
Sponsoring Agency: DARPA
Amount Funded: \$498,182
PI: W. H. Robinson
Period of Performance: 4/2009 – 3/2011

Funded Proposals as Co-Principal Investigator

8. **Title:** RHAP – Institute for Space and Defense Electronics (ISDE) Radiation Effects Modeling and Simulation of Electronics and Technologies
Sponsoring Agency: U.S. Navy/Draper Labs

Amount Funded: \$481,800

PI: R. D. Schrimpf

Co-PIs: L. W. Massengill, D. M. Fleetwood, W. H. Robinson, R. A. Weller, and K. F. Galloway

Period of Performance: 6/2004 – 12/2004

9. **Title:** Team for Research in Ubiquitous Secure Technology (TRUST)

Sponsoring Agency: NSF

Amount Funded: \$3,200,000

PI: J. Sztipanovits

Co-PIs: D. C. Schmidt, G. Karsai, and W. H. Robinson

Period of Performance: 6/2005 – 5/2010

10. **Title:** Research, Development, Test, & Evaluation (R, D, T, & E) of Radiation Effects in Analog and Mixed Signal Technology

Sponsoring Agency: Mission Research Corporation

Amount Funded: \$813,263

PI: L. W. Massengill

Co-PIs: B. L. Bhuva, W. T. Holman, W. H. Robinson, R. A. Reed, R. D. Schrimpf

Period of Performance: 6/2005 – 6/2006

11. **Title:** Technology Readiness for Radiation-Hardened Electronics Design in Support of Minuteman

Sponsoring Agency: Air Force Minuteman Guidance Replacement Program

Amount Funded: \$604,009

PI: B. Templeton

Co-PIs: D. M. Fleetwood, R. D. Schrimpf, L. W. Massengill, W. H. Robinson

Period of Performance: 6/8/2007 – 12/2008

12. **Title:** Beta Version of RTL-Level Single Event Simulator

Sponsoring Agency: Cisco Systems, Inc.

Amount Funded: \$180,000

PI: B. L. Bhuva

Co-PIs: W. T. Holman, W. H. Robinson, L. W. Massengill, R. A. Reed

Period of Performance: 11/14/2008 – 02/28/2010

Honors and Awards

Vanderbilt University

- First African American to earn promotion with tenure in the Vanderbilt University School of Engineering (2010)
- Modern-Day Technology Leader, National Black Engineer of the Year Awards (BEYA) (2009)
- Received a National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award (2008)

- Selected for the Defense Advanced Research Projects Agency (DARPA) Computer Science Study Panel (2008 – 2009)
- Received a Southeastern Center for Electrical Engineering Education (SCEEE) Development Fund Grant for junior faculty (2007)
- Appeared in a feature article of *Black Issues in Higher Education* (November 20, 2003, Vol. 20, No. 20, pp. 40-43) as a 2003 Award Recipient of the Facilitating Academic Careers in Engineering and Science (FACES) Career Initiation Grant

Georgia Institute of Technology

- Appeared in a feature article of *Atlanta Business Journal* (Winter 2006, Vol. 14, No. 1, pp. 64-67) as part of “Georgia Tech’s Star-Studded 16,” a record for engineering doctoral degrees for African Americans in an academic year
- Office of Minority Educational Development (OMED) Tower Award (2004)
- Ford Foundation Dissertation Fellowship for Minorities (2002)
- NSF GK-12 Student and Teacher Enhancement Partnership (STEP) Fellowship (2001)
- Facilitating Academic Careers in Engineering and Science (FACES) Fellowship (2001)
- Eta Kappa Nu Electrical Engineering Honor Society (2000)
- Alfred P. Sloan Scholarship (1996)
- President's Fellowship (1996)

Florida Agricultural and Mechanical University

- National Science Foundation Minority Graduate Fellowship (1996)
- Tau Beta Pi Engineering Honor Society (1993)
- Golden Key National Honor Society (1993)
- Phi Eta Sigma Freshman Honor Society (1992)
- Life-Gets-Better Scholarship (1991)
- National Achievement Scholar (1991)

Miscellaneous

- Marquis Who’s Who in America (2009)
- Outstanding Young Man of America (1998)
- Charles H. Chapman Award for Outstanding Scholarship (1994, 1995, 1996)

Research Training and Supervision

Doctoral Dissertations Supervised

- Jeffrey D. Black, Ph.D. in Electrical Engineering (August 2008)
Dissertation Title: *Pattern Identification of Multiple Cell Upsets in Static Random Access Memories to Relate Experimental Test Results to Single Event Upset Mechanisms*
- Adrian P. Lauf, Ph.D. in Electrical Engineering (May 2010)
Dissertation Title: *Distributed Sensing with Fault-Tolerant Resource Reallocation for Disaster Area Assessment*

Doctoral Dissertation Committees

- Ligu Yu, Ph.D. in Computer Science (August 2004)
- Cordelia Brown, Ph.D. in Electrical Engineering (March 2005)
- Shanshan Jiang, Ph.D. in Computer Science (October 2009)
- Yanchuan Cao, Ph.D. in Computer Science (expected May 2011)

Master's Theses Supervised

- Varadarajan Srinivasan, M.S. in Electrical Engineering (May 2006)
Master's Thesis Title: *Mitigation of Soft Errors in ASIC-Based and FPGA-Based Logic Circuits*
- George E. Sewell, M.S. in Electrical Engineering (August 2007)
Master's Thesis Title: *Security for the Processor-to-Memory Interface using Field Programmable Gate Arrays (FPGAs)*
- Adrian P. Lauf, M.S. in Electrical Engineering (December 2007)
Master's Thesis Title: *HybrIDS: Embeddable Hybrid Intrusion Detection System*
- Olabode Ajiboye, M.S. in Electrical Engineering (August 2009)
Master's Thesis Title: *Sensor Computation and Communication for Remote Structural Monitoring*
- Daniel B. Limbrick, M.S. in Electrical Engineering (December 2009)
Master's Thesis Title: *Mitigation of Radiation-induced Soft Errors Using Temporal Embedded Signature Monitoring*
- Trey Reece, M.S. in Electrical Engineering (December 2009)
Master's Thesis Title: *Detection of Malicious Hardware in ASICs and FPGAs*
- Ryan C. Bickham, M.S. in Electrical Engineering (May 2010)
(co-advised with Prof. Bharat L. Bhuvu)
Master's Thesis Title: *An Analysis of Error Detection Techniques for Arithmetic Logic Units*

Non-Thesis Master's Degrees Supervised

- Julian W. Farquharson, M.S. in Electrical Engineering (August 2007)

Visiting Scholars Supervised

- Suge Yue, Beijing Microelectronic Technology Institute (June 2007 – April 2008)

Current Graduate Students Supervised

- Qian (Daniel) Ding, Ph.D. in Electrical Engineering (expected August 2011)
- Daniel B. Limbrick, Ph.D. in Electrical Engineering (expected May 2012)
- Trey Reece, Ph.D. in Electrical Engineering (expected May 2012)
- Xiaowen Wang, M.S. in Electrical Engineering (expected December 2010; will continue for Ph.D.)
- Zhengyu Yang, Ph.D. in Electrical Engineering (expected May 2012)

Undergraduate Research Supervised

- Charreau S. Bell, "Embedded System Design using the Nios II Processor" (Spring 2009)

- Morakinyo Olugbade, “An Overview of Multi-Core Technology” (Spring 2008)
- Andrew Park, “VLSI Synthesis using Hardware Description Languages” (Spring 2007)
- Andrew Park, “Enhancements to SEUTool” (Summer 2006)
- William Whiteley, “Evaluation of the DST-3100 Platform for Future Use” (Spring 2004)

Teaching Experience

CS 231 Computer Organization

Required for undergraduate computer science and computer engineering majors.

This undergraduate course presents the entire hierarchical structure of computer architecture, beginning at the lowest level with a simple machine model (e.g., a simple von Neumann machine). Topics include: (1) microprocessors, (2) memory hierarchy, (3) process and thread management, (4) I/O handling, and (5) assembler concepts. Students gain an understanding of the interactions of hardware and software in a general-purpose computer system.

- Fall 2003 Enrollment: 18 undergraduate students
- Fall 2004 Enrollment: 18 undergraduate students
- Fall 2005 Enrollment: 15 undergraduate students

EECE 116 Digital Logic

Required for undergraduate computer science, computer engineering, and electrical engineering majors.

This undergraduate course presents the fundamental concepts for constructing digital systems. Topics include: (1) numbering systems, (2) Boolean algebra, (3) combinational logic, (4) graphical simplification, (5) sequential logic, (6) registers, and (7) state machines. Students are also introduced to the basics of hardware description languages.

- Fall 2010 Enrollment: 29 undergraduate students

EECE 277 FPGA Design

This undergraduate course presents both the design and the applications of field-programmable gate arrays (FPGAs). Topics include: (1) Electronic Design Automation (EDA) tools for design, placement, and routing, (2) Hardware Description Languages (HDL) for simulation and synthesis, and (3) state machine specification, design, and simulation. Students work in teams on laboratory assignments and a cumulative design project using FPGA hardware design kits. Skills developed include designing embedded systems, as well as developing test benches for design verification.

- Spring 2005 Enrollment: 23 undergraduate and graduate students
- Spring 2006 Enrollment: 15 undergraduate and graduate students
- Spring 2007 Enrollment: 12 undergraduate and graduate students
- Spring 2008 Enrollment: 7 undergraduate and graduate students
- Spring 2009 Enrollment: 9 undergraduate and graduate students

- Spring 2010 Enrollment: 20 undergraduate and graduate students

EECE 343 Digital Systems Architecture

Designated as a gateway course in the computers domain of the electrical engineering graduate program.

This graduate course presents advanced concepts that improve the performance of computing systems. Topics include: (1) modern microarchitectures, (2) memory systems, (3) storage systems, and (4) parallel computing. Students also examine case studies of microprocessors, and work in teams to evaluate system performance on benchmark suites.

- Spring 2004 Enrollment: 5 graduate students and 5 undergraduate students (co-listed with EECE 292-02)
- Fall 2005 Enrollment: 17 graduate students
- Fall 2006 Enrollment: 12 graduate students
- Fall 2007 Enrollment: 13 graduate students
- Fall 2008 Enrollment: 20 graduate students
- Fall 2009 Enrollment: 11 graduate students

EECE 396 Computer Architecture Reliability

This graduate course presents techniques in computer architecture design that can mitigate the effects of soft errors in microprocessors. Reliability is examined from both a hardware perspective and a software perspective. Topics include: (1) architectural vulnerability factors, (2) fault injection, (3) error detection and correction (EDAC), and (4) redundant multi-threading.

- Spring 2009 Enrollment: 10 graduate students

Professional Service and Activities

Professional Affiliations

- Association for Computing Machinery (ACM)
 - Senior Member (2009 – present)
 - Member (2003 – 2009)
 - Special Interest Group on Computer Architecture (SIGARCH)
- American Society for Engineering Education (ASEE)
 - Member (2003 – present)
 - Electrical and Computer Engineering Division
 - Minorities in Engineering Division
 - New Engineering Educators Division
- Institute of Electrical and Electronic Engineers (IEEE)
 - Senior Member (2009 – present)
 - Member (2003 – 2009)
 - Student Member (1998 – 2003)
 - Computer Society
 - Education Society

- Nuclear and Plasma Sciences Society
- Photonics Society (1998-2009)
- National Society of Black Engineers (NSBE)
 - Member (2003 – present)
- SPIE – The International Society for Optical Engineering
 - Member (2003 – 2009)
 - Electronic Imaging Technical Group

Program Committee Member

- International Symposium on High-Performance Computer Architecture (2011)
- International Conference on Engineering of Reconfigurable Systems and Algorithms (2010)
- International Conference on Complex, Intelligent, and Software Intensive Systems (2010)
- International Conference on Engineering of Reconfigurable Systems and Algorithms (2009)
- International Symposium on High-Performance Computer Architecture (2009)
- International Conference on Engineering of Reconfigurable Systems and Algorithms (2008)
- International Workshop on Embedded Single and Multicore Systems on Chips (2007)
- International Symposium on Embedded Computing (2007)
 - Session Chair
- International Workshop on SoC and MCSoc Design (2006)
- International Workshop on Embedded Computing (2006)

Organizing Committee Member

- Nuclear and Space Radiation Effects Conference (2010)
 - Session Chair
- Parallel Architectures and Compilation Techniques (2009)
 - Registration Chair
- Workshop on Silicon Errors in Logic – System Effects (2007)
 - Poster Session Chair

Peer Reviewer

- ACM Transactions on Embedded Computing Systems (2008-2009)
- IEEE Transactions on CAD of Integrated Circuits and Systems (2008)
- IEEE Transactions on Very Large Scale Integration Systems (2007)
- IEEE Transactions on Nuclear Science (2005-2006, 2008-2009)
- Integration, the VLSI Journal (2007-2008)
- Journal of Supercomputing (2008)
- Microelectronics Reliability Journal (2005, 2008-2010)
- NSF Ad-hoc Reviewer (2008)
- NSF CCF Panel (2006, 2008)
- NSF S-STEM Panel (2006)
- NSF IGERT Panel (2005)

- OSA Applied Optics (2009)
- Solid State Electronics, An International Journal (2008)

University, School, and Departmental Service at Vanderbilt

- Panelist for the Vanderbilt University Grant and Fellowship Workshop (2009)
- Faculty host for the Vanderbilt University Graduate School's Invitation to the Deans of Honors Colleges at Historically Black and Hispanic Serving Universities (2009)
- Ad Hoc Committee on Computer Engineering (2006-2007)
- Chancellor's Scholars Advisory Council (2005-2008)
- Faculty-in-Residence Committee (2005)
- Provost's Graduate Fellowship Committee (2004-2006, 2009)
- Graduate Faculty Delegate Assembly Committee (2004-2005)
- Vision for Engineering at Vanderbilt Committee (2004-2005)
- Academic Adviser for Electrical Engineering, Class of 2004
- Academic Adviser for Electrical Engineering, Class of 2010
- Graduate student recruiting at the National Society of Black Engineers (NSBE) National Convention (2005-2008)

Service and Activities at Georgia Institute of Technology

- Black Graduate Student Association (Treasurer, 1997-1999)
- Georgia Tech Student Foundation Investments Committee (1997)
- Intramural Athletics (1998-2002)

Diversity and Outreach Efforts

- Outreach Director, Team for Research in Ubiquitous Secure Technology (TRUST), an NSF Science and Technology Center (2007 - present)
- Sloan Faculty, Alfred P. Sloan Minority Ph.D. Program in the Department of Electrical Engineering and Computer Science (EECS), Vanderbilt University (2004-2009)
- Judged oral and poster presentations at the Tennessee Louis Stokes Alliance for Minority Participation (T-LSAMP) Research Symposium (2004, 2008)

Miscellaneous

- Alpha Phi Alpha Fraternity, Inc. Life Member