

# DANIEL B. LIMBRICK

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## ACADEMIC INTERESTS

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My current research is in the area of mitigating the effects of soft errors on microelectronics through logic synthesis, computer architecture design and VLSI design. Topics of interest include:

- Radiation effects in microprocessor design
- Logic synthesis
- Computer architecture design
- Very Large Scale Integrated circuit (VLSI) design
- Field Programmable Gate Arrays (FPGAs)

## EDUCATION

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**Ph.D., Electrical Engineering**, *Vanderbilt University*, August 2012

Dissertation Title: *Impact of Logic Synthesis on Soft Error Rate of Digital Integrated Circuits*

Minor: Computer Science

**M.S., Electrical Engineering**, *Vanderbilt University*, December 2009

Thesis Title: *Embedding Temporal Signatures to Monitor Microarchitectural Control Flow*

Minor: Computer Science

**B.S., Electrical Engineering**, *Texas A&M University-College Station*, May 2007

## RESEARCH EXPERIENCE

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Vanderbilt Radiation Effects and Reliability Group Member - Fall 2007 - Present

- Mission: study the underlying phenomena behind the effects of radiation on electronic devices and integrated circuits and to propose new solutions to increase the reliability of systems in space and other systems exposed to ionizing radiation.
- One of the very few programs involved in microelectronics research for space applications

Vanderbilt University Summer Research Program in Hybrid and Embedded Systems - Summer 2006

- Adapted Lego Mindstorms robot kit to use Bluetooth communication
- Programmed (Java) robot to explore maze and send information to PC (Bluetooth) during runtime
- Created a Dynamic Link Library in C and imported it into Java for serial port communication
- Created a controller that allows the robot to be controlled from the computer screen

Texas A&M University Undergraduate Research Program - Spring 2003; Summer 2004

- Spring 2003, Summer 2003: Department of Electrical Engineering - Power Systems
- Designed software in Visual Basic that interfaces with MicroStation and C++

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**PROFESSIONAL EXPERIENCE**

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Hewlett Packard @ Research Park - Fall 2006 - Summer 2007, Summer 2008

- Test Engineering Intern
- Conducted HP Integrity Superdome firmware development testing

Motorola/Freescale Semiconductors - Summer 2004; Summer 2005

- Summer 2005: Networking and Computing Systems Group; Computer Platform Division
  - Demonstrate Error Correcting Code of the L2 Cache of PowerPC processor via Assembly
- Summer 2004: Networking and Computing Systems Group; Computer Platform Division
  - Created web interface that manages wafer tests and stores information in an Oracle database

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**PUBLICATIONS**

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**Refereed Journal Articles**

- [J2] **Daniel B. Limbrick**, Suge Yue, William H. Robinson, and Bharat L. Bhuvu, "Impact of Area and Delay Optimization on Combinational Logic Masking," *Journal of Electronic Testing: Theory and Applications*, In Review.
- [J1] Dolores A. Black, Robert A. Reed, William H. Robinson, **Daniel B. Limbrick**, and Kevin D. Dick, "Impact of Ion-Induced Transients on High-Speed Dual-Complementary Flip-Flop Designs," *IEEE Transactions on Device and Materials Reliability*, In Review.

**Refereed Conference Presentations with Proceedings**

- [C9] **Daniel B. Limbrick** and William H. Robinson, "Characterizing Single Event Transient Pulse Widths in an Open-Source Cell Library Using SPICE," *IEEE Workshop on Silicon Errors in Logic - System Effects*, March 2012.
- [C8] Trey Reece, **Daniel B. Limbrick**, William H. Robinson, "Design Comparison to Identify Malicious Hardware in External Intellectual Property," *IEEE International Conference on Trust, Security and Privacy in Computing and Communications*, November 2011.
- [C7] **Daniel B. Limbrick**, Suge Yue, William H. Robinson, and Bharat L. Bhuvu, "Impact of Synthesis Constraints on Error Propagation Probability of Digital Circuits," *Proceedings of the IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems*, October 2011.
- [C6] **Daniel B. Limbrick**, William H. Robinson, Bharat L. Bhuvu, "Synthesis optimization trends on error propagation probability of combinational circuits," *IEEE Workshop on Silicon Errors in Logic - System Effects*, March 2011.
- [C5] Dolores A. Black, Robert A. Reed, William H. Robinson, Jeffrey D. Black, **Daniel B. Limbrick**, and Kevin D. Dick, "Impact of Ion-Induced Transients on High-Speed Dual-Complementary Flip-Flop Designs", *Proceedings of the IEEE International Reliability Symposium*, April 2011.
- [C4] **Daniel B. Limbrick**, Dolores A. Black, Kevin Dick, Nicholas M. Atkinson, Nelson J. Gaspard, Jeffrey D. Black, William H. Robinson, Arthur F. Witulski, "Impact of Logic Synthesis on Soft Error Vulnerability Using a 90-nm Bulk CMOS Digital Cell Library," *Proceedings of the IEEE SoutheastCon*, March 2011.
- [C3] Nihaar N. Mahatme, Indranil Chatterjee, Akash Patki, **Daniel B. Limbrick**, Ronald D. Schrimpf, Bharat L. Bhuvu, and William H. Robinson, "An Efficient Technique to Select Logic Nodes for Single

Event Transient Reduction”, *11th European Conference on Radiation and Its Effects on Components and Systems*, September 20-24, 2010.

- [C2] **Daniel B. Limbrick**, William H. Robinson, Bharat L. Bhuvu, “Reliability-Aware Synthesis: XOR logic function case study,” *IEEE Workshop on Silicon Errors in Logic - System Effects*, March 2010.
- [C1] Edward J. Ossi, **Daniel B. Limbrick**, William H. Robinson, Bharat L. Bhuvu, “Soft-error Mitigation at the Architecture-Level Using Berger Codes and Instruction Repetition,” *IEEE Workshop on Silicon Errors in Logic - System Effects*, March 2009.

### Other Conference Presentations

- [O4] Ryan C. Bickham, **Daniel B. Limbrick**, William H. Robinson, Bharat L. Bhuvu, “An Analysis of Error Detection Techniques for Arithmetic Logic Units (ALUs),” *Government Microcircuit Applications and Critical Technology Conference (GOMACTech)*, March 2011.
- [O3] Corey T. Toomey, Brian D. Sierawski, Andrew Sternberg, **Daniel B. Limbrick**, Bharat L. Bhuvu, Lloyd W. Massengill, William H. Robinson, S.-J. Wen, R. Wong, S. Martin, “Statistical Fault Injection and Analysis at the Register Transfer Level Using the Verilog Procedural Interface,” *Government Microcircuit Applications and Critical Technology Conference (GOMACTech)*, March 2011.
- [O2] Dolores A. Black, Robert A. Reed, William H. Robinson, Jeffrey D. Black, **Daniel B. Limbrick**, and Kevin D. Dick, “Impact of Ion-Induced Meta-Stable Conditions on Clocked Operations Of DICE Flip-Flops for Reconfigurable Devices,” *Military and Aerospace Programmable Logic Devices Conference (MAPLD)*, November 2010.
- [O1] **Daniel B. Limbrick**, Edward Ossi, Corey Toomey, Bharat Bhuvu, William Robinson, “Characterization of Control Bit Errors in the MIPS R2000 Microprocessor,” *Government Microcircuit Applications and Critical Technology Conference (GOMACTech)*, March 2010.

### HONORS AND AWARDS RECEIVED

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#### Vanderbilt University

- Vanderbilt University Provost Graduate Fellowship (2007 - Current)
- Alfred P. Sloan Foundation Minority PhD Program Sloan Fellow (2007 - Current)
- National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM) Fellowship (2007 - 2008)

#### Texas A&M University

- National Society of Black Engineers (NSBE) Academic Technical Bowl (ATB) Regional 1st place winner (2003)
- NSBE Undergraduates Students in Technical Research (USTR) Regional 1st place winner (2003)
- Texas A&M University Department of Physics Mechanics Scholar (2002)
- National Achievement Scholar (2002)
- National Merit Commended Scholar (2002)

### TEACHING EXPERIENCE

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GRE Math Workshop Lecturer (Fall 2010, Fall 2011)  
Guest Lecturer (Fall 2010 - Spring 2012)

- Vanderbilt University - EECE 116 Digital Logic Design - 5 Lectures
- Vanderbilt University - EECE 277 FPGA Design - 1 Lecture
- Vanderbilt University - EECE 343 - Digital Systems Architecture - 2 Lectures

Tennessee Louis Stokes Alliance for Minority Participation (TLSAMP) Tutor (Fall 2010)  
Teachers Assistant

- Vanderbilt University - EECE 112 - Engineering Circuit Analysis (Fall 2007, Spring 2008)

## SERVICE

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### Professional Affiliations

- Institute of Electrical and Electronics Engineers (IEEE)
  - Student Member (2007 - Present)
  - Computer Society (2011 - Present)
- Association for Computing Machinery (ACM)
  - Student Member (2010 - Present)
- National Society of Black Engineers
  - Collegiate Member (2002 - Present)
  - Pre-College Initiative (PCI) Member (1998-2002)

### Conference Organizing Committee

- Parallel Architectures and Compilation Techniques (2009)
  - Registration Committee Volunteer

### Peer Reviewer

- IEEE Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS) (2011)
- Wiley's Security and Communication Networks Journal (2010)

### University Service at Vanderbilt University

- Vice President for Diversity Affairs Selection Committee (2009)
- National Society of Black Engineers
  - Graduate Student Representative (2008-2009)

### University Service at Texas A&M University

- National Society of Black Engineers
  - Regional Academic Excellence Chair (2004-2005)
  - Chapter Telecommunications Chair (2004-2005)
  - Chapter Academic Excellence Chair (2003-2004)