

# Santosh Nagarakatte

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## Research Interests

Hardware and compiler support to increase performance and reliability of programs.

## Education

- **University of Pennsylvania** Philadelphia, PA  
*Ph.D Student, Computer Science, Advisor: Prof Milo M K Martin* Sep. 2007-present
- **Indian Institute of Science** Bangalore, India  
*M.S, Computer Science, Advisor: Prof R Govindarajan* 2005-2007  
*Thesis: Spill Code Aware Instruction Scheduling Techniques*
- **National Institute of Technology** Surathkal, India  
*B.E Computer Engineering* 2001-2005  
*University Gold Medalist, GPA: 4.0*

## Honors and Awards

- University of Pennsylvania Graduate Fellowship 2007-present
- Philips Research Fellowship 2005-2007
- University Gold Medal for the Best Student of Computer Engineering at NITK Surathkal 2005

## Publications

- Santosh Nagarakatte, Jianzhou Zhao, Milo M K Martin and Steve Zdancewic, *SoftBound: Highly Compatible and Complete Spatial Memory Safety for C*, To appear in the proceedings of Programming Language Design and Implementation (PLDI), 2009
- Andrew Hilton, Santosh Nagarakatte and Amir Roth, *iCFP: Tolerating Cache Misses at All Levels*, To appear in the proceedings of 15<sup>th</sup> International Symposium on High Performance Computer Architecture (HPCA), 2009
- Santosh Nagarakatte and R Govindarajan, *Register Allocation and Optimal Spill Code Scheduling in Software Pipelined Loops using 0-1 Integer Linear Programming Formulation*, In the proceedings of 16th International Conference on Compiler Construction (CC), 2007, LNCS 4420.

## Research Experience

- **SoftBound: Providing Complete Spatial Safety for C**

*Advisor: Prof Milo M K Martin*

- Proposed and evaluated SoftBound, a compiler transformation framework to provide complete spatial safety for the C programming language. SoftBound attains this goal while being highly compatible (requiring no source code modifications), having little performance overhead and maintaining the memory layout of the program intact. The transformation has been implemented in the LLVM compilation infrastructure and catches all buffer overflows and security vulnerabilities in our benchmark suite

- **Inorder Continual-Flow Pipeline**

*Advisor: Prof Amir Roth*

- Proposed and evaluated the mechanism to make inorder processors cache miss tolerant at all levels by adapting the continual flow pipeline concept to the inorder context (*iCFP*). *iCFP* accomplishes the non-blocking property with the help of a novel store buffer design and an enhanced dependence tracking scheme.

- **Static Buffer Overflow Analyzer**

*Advisor: Prof Rajiv Alur*

- Implemented an abstract interpretation framework for buffer overflow analysis using the octagon abstract domain for a subset of the C programming language. The analysis obtained better precision than the traditional interval analysis.

- **Spill Code Scheduling**

*Advisor: Prof R Govindarajan*

- Proposed and evaluated an integrated 0-1 integer linear programming formulation for register allocation and optimal spill code scheduling in software pipelined loops. The evaluation was carried out using the trimaran compilation and simulation environment for VLIW architectures.

## Professional Activities and Service

I have served as an external reviewer for the following conferences:

- International Conference on Supercomputing ICS-2009
- International Conference on Parallel Architectures and Compilation Techniques PACT-2006

## References

### **Prof Milo M K Martin**

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### **Prof Amir Roth**

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CIS, University of Pennsylvania  
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