

THE DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE, CS DIVISION

Presents the Spring 2014 EECS Seminar Series

Dr. Paul Rosen

University of Utah



“Gaining Better Understanding of Software through Visualizing the Memory Access Patterns of Executing Software”

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ABSTRACT

The execution of software involves complex interactions within many different hardware systems. Although many tools exist for profiling software execution, a very skilled eye and years of experience are required for investigating and understanding software execution behaviors. Further, these tools often only collect aggregate information from sources such as performance counters, potentially losing details that may be critical.

To address this gap in technology, my team has been working on visualizing software memory behavior using memory reference traces to provide detailed dynamic performance information. In this talk, I will focus on three approaches. The first approach uses abstract visual encodings, animating event streams so that the user can directly observe the motion of memory between levels of cache. Second, I will discuss a topologically-based approach that finds and visualizes cyclical patterns in the normally linear reference trace as spiral structures expanding out into the time dimension. Finally, I will discuss an approach to investigating the memory behavior of a massively parallel kernel executing within the CUDA architecture. Throughout the talk, I will use these approaches to expose a number of pitfalls found in algorithms commonly used in computing.

BIOGRAPHY

Paul Rosen is a Research Assistant Professor at the University of Utah with appointments in the Scientific Computing and Imaging (SCI) Institute and the School of Computing. Dr. Rosen received his PhD from the Computer Science Department of Purdue University where his dissertation was about Camera Model Design, a problem solving paradigm which advocates designing dynamic, application specific camera models for solving problems in computer graphics, visualization, and computer vision. While at Purdue, Dr. Rosen was a key participant of the team which modeled, simulated, and visualized the September 11, 2001 attack on the World Trade Center North Tower. The press release and video produced from the simulation resulted in the most widely covered press release in Purdue University history, appearing on many news and educational television programs, and the YouTube video has been viewed almost 15 million times. Since joining the University of Utah in 2010, Dr. Rosen’s research has focused on developing novel task-oriented visualizations for Scientific Visualization areas, such as vector field and uncertainty visualization, and Information Visualization areas, such as parameter space visualization and software performance visualization.