

**THURSDAY
DECEMBER 6, 2007**

**Scaife Hall Auditorium
Room 125**

4:30 p.m.
Refreshments—4:00 p.m.



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Sachin Sapatnekar is the Henle Professor of ECE at the University of Minnesota. He received the PhD degree from the University of Illinois at Urbana-Champaign in 1992, and subsequently taught at Iowa State University before moving to Minnesota in 1997. His research interests are in the areas of optimization problems related to physical design, timing and synthesis. He has received several best paper awards, the SRC Technical Excellence award, and is a fellow of the IEEE.

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Solving Linear Equations (efficiently!) Using Random Walks

Systems of linear equations that are characterized by positive definite, diagonally dominant matrices are commonly encountered in science and engineering. In VLSI design applications, large-dimensional matrices with this property arise in simulating the behaviour of on-chip power networks, in circuit placement problems, in the solution of partial differential equations (e.g., for thermal analysis) using finite difference methods, etc.

There is a well-known, decades-old, analogy between the solution of these problems and running random walks on a Markov chain. However, random walk-based solvers have generally been dismissed as esoteric curiosities, and this work attempts to move them to the realm of practicality. The first part of this talk develops the basic approach by adding efficient mechanisms to reuse computations for enhanced efficiency. Next, the method is studied further, and some new links to classical direct methods are uncovered.

Finally, the approach is used to build a preconditioner for an iterative solver. Experimental results on real-life problems show that this method can outperform existing widely-used methods.