NSF Workshop
Electronic Design Automation
—Past, Present, and Future

Organizers: Robert Brayton and Jason Cong

July 8 and 9, 2009
The Westin Arlington Gateway, Arlington, VA
Review the Success of EDA in the Past

- Successfully managed the exponential increase of design complexity
  - from 2,000+ transistors (Intel 4004) to the latest multi-core processor with over a billion transistors

- One of the first applied “computational thinking”
  - Building a complete computational prototype via modeling, synthesis, and verification/test

- One of the earliest to engage inter-disciplinary collaboration
  - EE for circuit design
  - Physicists and chemists for manufacturing
  - Math/OR for optimization
  - Theory for formal verification ...
  - Fully integrated in complex, highly automated EDA software tools
Understand the New EDA Challenges

◆ Many challenges
  ▪ Skyrocketing NRE cost ($50M+ for each design)
  ▪ Higher complexity
  ▪ Nanoscale design/manufacturing problems
  ▪ ...

◆ National Design Initiative (NSF/SRC Joint Workshop 2006)
  ▪ System design science
  ▪ Robust optimization
  ▪ Interface to manufacturing
Exploring New Frontiers of EDA

Extending EDA methodology to other fields/application domains

- Synthetic biology,
- In vitro protein diagnostics,
- Nano-systems,
- Future IT infrastructures, e.g. data center design/optimization
- ...

7/16/2009 UCLA VLSICAD LAB
Strengthen the Link with “Theory” Community

- Many papers in FOCS/STOC in 1980s (40+ in total). E.g.
  - Yao, “The entropic limitations on VLSI computations (Extended Abstract),” STOC’81.
  - Hall & Shmoys, “Approximation schemes for constrained scheduling problems,” FOCS’89.

- Mostly absent in FOCS/STOC in 2000s. Current topics are
  - Internet,
  - Game theory,
  - Quantum computing,
  - Probabilistically checkable proof, and Zero-knowledge proof
Participants

◆ Modeling
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◆ Synthesis and optimization
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