

1. Record Nr.	UNINA9910633915603321
Autore	Bairamkulov Rassul
Titolo	Graphs in VLSI // Rassul Bairamkulov, Eby G. Friedman
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , 2023 ©2023
ISBN	9783031110467
Descrizione fisica	1 online resource (356 pages)
Soggetti	Graph theory Integrated circuits - Very large scale integration
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	<p>Intro -- Preface -- Acknowledgments -- Contents -- About the Authors -- 1 Introduction -- 1.1 Precursors of VLSI -- 1.2 The rise of VLSI -- 1.3 Outline of book -- 2 Graph fundamentals -- 2.1 Graph categories -- 2.1.1 Hypergraph -- 2.1.2 Graphs with parallel edges -- 2.1.3 Graphs without parallel edges -- 2.1.4 Weighted graph -- 2.1.5 Directed graph -- 2.2 Inter-graph relationships -- 2.3 Graph exploration -- 2.4 Bipartite graph -- 2.5 Directed acyclic graph -- 2.6 Tree -- 2.7 Common problems in graph theory -- 2.7.1 Pathfinding -- 2.7.1.1 Depth-first search -- 2.7.1.2 Breadth-first search -- 2.7.1.3 Dijkstra's algorithm -- 2.7.1.4 Bellman-Ford -- 2.7.1.5 A* (A-star) algorithm -- 2.7.2 Spanning tree -- 2.7.2.1 Boruvka's algorithm -- 2.7.2.2 Prim's algorithm -- 2.7.2.3 Kruskal's algorithm -- 2.7.2.4 Advanced MST Algorithms -- 2.7.2.5 Steiner tree -- 2.7.3 Graph coloring -- 2.7.4 Topological sorting -- 2.8 Summary -- 3 Graphs in VLSI circuits and systems -- 3.1 Graphs as a VLSI abstraction tool -- 3.2 Register transfer level -- 3.2.1 Register allocation -- 3.2.2 Task scheduling -- 3.2.3 Synchronization -- 3.3 Gate layer -- 3.3.1 Ordered binary decision diagram -- 3.3.2 And-inverter graph -- 3.4 Circuit layer -- 3.4.1 Laplacian matrix of a circuit graph -- 3.5 Physical layer -- 3.5.1 Partitioning -- 3.5.2 Floorplanning -- 3.5.3 Placement -- 3.5.4 Routing -- 3.6 Summary -- 4 Synchronization in VLSI -- 4.1 Graph-based timing analysis -- 4.1.1 Timing constraints in</p>

synchronous systems -- 4.1.1.1 Local timing constraints -- 4.1.1.2 Global timing constraints -- Serial data path. -- Reconvergent (parallel) paths. -- Cyclic data paths. -- 4.1.1.3 Constraint graph -- 4.2 Clock skew scheduling -- 4.2.1 Robustness -- 4.2.2 Performance -- 4.2.2.1 Wave pipelining -- 4.2.3 Power -- 4.3 Clock tree synthesis -- 4.3.1 Clock tree topology.
4.3.2 Clock tree embedding -- 4.3.3 Method of means and medians -- 4.3.4 Deferred merge embedding -- 4.3.5 Elmore delay -- 4.3.6 Bounded skew tree -- 4.3.7 Useful skew tree -- 4.4 Summary -- 5 Circuit analysis -- 5.1 Modified nodal analysis -- 5.2 Iterative numerical methods -- 5.2.1 Domain decomposition -- 5.2.2 ps: [/EMC pdfmark [/Subtype /Span /ActualText (script upper H) /StPNE pdfmark [/StBMC pdfmarkHps: [/EMC pdfmark [/StPop pdfmark [/StBMC pdfmark-matrix -- 5.2.3 Multigrid methods -- 5.3 Non-MNA techniques -- 5.3.1 Scattering parameters -- 5.3.2 Random walks -- 5.3.3 Lattice graph -- 5.4 Summary -- 6 Effective resistance of truncated infinite mesh structures -- 6.1 Historical perspective -- 6.2 Electric potential in an infinite mesh -- 6.3 Electric potential within a truncated infinite mesh -- 6.3.1 Modeling truncation with image -- 6.3.1.1 Half-plane mesh -- 6.3.1.2 Quarter-plane mesh -- 6.3.2 Integral expressions for effective resistance -- 6.4 Closed-form approximation -- 6.5 Model evaluation -- 6.5.1 Accuracy evaluation -- 6.5.2 Computational speed -- 6.6 Conclusions -- 7 Effective resistance of finite grids -- 7.1 Infinity mirror technique -- 7.1.1 Infinite strip -- 7.1.2 Semi-infinite strip -- 7.1.3 Finite mesh -- 7.1.4 Generalization to higher dimensions -- 7.2 Simplification of the effective resistance expressions -- 7.3 Case studies -- 7.3.1 Mesh reduction based on effective resistance -- 7.3.2 Resistive noise in capacitive touch screen -- 7.3.3 Resistive substrate noise -- 7.4 Conclusions -- 8 Placement of on-chip distributed voltage regulators -- 8.1 On-chip voltage regulation -- 8.2 Model of power network -- 8.2.1 Fast grid analysis -- 8.2.2 Limited regulator current -- 8.3 Load clustering -- 8.4 Optimization setup -- 8.5 Case studies -- 8.5.1 Unrestricted placement - case study one -- 8.5.2 Restricted placement - case study two.
8.5.3 Restricted current - case study three -- 8.6 Conclusions -- 9 Exploratory methodology for power delivery -- 9.1 Optimization framework -- 9.1.1 Specification of the electrical design requirements -- 9.1.2 Specification of non-electrical design requirements -- 9.1.3 Combination of electrical and nonelectrical metrics -- 9.1.4 Circuit simulation procedure -- 9.2 Case studies -- 9.2.1 Single rail system -- 9.2.1.1 Optimization setup -- 9.2.1.2 Optimization results -- 9.2.2 Multiple rail system -- 9.3 Conclusions -- 10 SPROUT - Smart Power ROUTing Tool for board-level exploration and prototyping -- 10.1 SPROUT algorithm -- 10.1.1 Available routing space -- 10.1.2 Equivalent graph -- 10.1.3 Seed subgraph -- 10.1.4 Growth stage -- 10.1.5 Refinement stage -- 10.1.6 Subgraph reheating -- 10.1.7 Back conversion -- 10.1.8 Algorithm runtime analysis -- 10.2 Validation of case study -- 10.2.1 Two rail system -- 10.2.2 Six rail system -- 10.2.3 Area/impedance tradeoff -- 10.3 Conclusions -- 11 QuCTS - single flux Quantum Clock Tree Synthesis -- 11.1 Clock skew scheduling -- 11.1.1 Timing graph -- 11.1.2 Minimum clock period -- 11.1.3 Clock skew optimization -- 11.2 Clock tree synthesis -- 11.3 Delay equilibration -- 11.3.1 Coarse routing -- 11.3.2 Analysis of proxy path delay -- 11.3.3 Fine routing -- 11.4 Case study -- 11.5 Conclusions -- 12 Conclusions -- A Green's function for a truncated grid -- B Uniqueness based on boundary conditions -- C Multilayer routing algorithm -- References -- Index.

