

# LEAF CELL AND HIERARCHICAL COMPACTION TECHNIQUES

CYRUS BAMJI  
RAVI VARADARAJAN

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# Leaf Cell And Hierarchical Compaction Techniques

**M. Michael Vai**



## **Leaf Cell And Hierarchical Compaction Techniques:**

Leaf Cell and Hierarchical Compaction Techniques Cyrus Bamji, Ravi Varadarajan, 2012-12-06 Leaf Cell and Hierarchical Compaction Techniques presents novel algorithms developed for the compaction of large layouts. These algorithms have been implemented as part of a system that has been used on many industrial designs. The focus of Leaf Cell and Hierarchical Compaction Techniques is three fold. First, new ideas for compaction of leaf cells are presented. These cells can range from small transistor level layouts to very large layouts generated by automatic Place and Route tools. Second, new approaches for hierarchical pitchmatching compaction are described and the concept of a Minimum Design is introduced. The system for hierarchical compaction is built on top of the leaf cell compaction engine and uses the algorithms implemented for leaf cell compaction in a modular fashion. Third, a new representation for designs called Virtual Interface which allows for efficient topological specification and representation of hierarchical layouts is outlined. The Virtual Interface representation binds all of the algorithms and their implementations for leaf and hierarchical compaction into an intuitive and easy to use system.

From the Foreword: In this book, the authors provide a comprehensive approach to compaction based on carefully conceived abstractions. They describe the design of algorithms that provide true hierarchical compaction based on linear programming but cut down the complexity of the computations through introduction of innovative representations that capture the provably minimum amount of required information needed for correct compaction. In most compaction algorithms, the complexity goes up with the number of design objects, but in this approach, complexity is due to the irregularity of the design and hence is often tractable for most designs which incorporate substantial regularity. Here, the reader will find an elegant treatment of the many challenges of compaction and a clear conceptual focus that provides a unified approach to all aspects of the compaction task.

Jonathan Allen, Massachusetts Institute of Technology      Transistor Level Micro Placement and Routing for Two-dimensional Digital VLSI Cell Synthesis Michael Anthony Riepe, 1999 The automated synthesis of mask geometry for VLSI leaf cells, referred to as the cell synthesis problem, is an important component of any structured custom integrated circuit design environment. Traditional approaches based on the classic functional cell style of Uehara and VanCleave pose this problem as a straightforward one dimensional graph optimization problem for which optimal solution methods are known. However, these approaches are only directly applicable to static CMOS circuits and they break down when faced with more exotic logic styles. Our methodology is centered around techniques for the efficient modeling and optimization of geometry sharing. Chains of diffusion merged transistors are formed explicitly and their ordering optimized for area and global routing. In addition, more arbitrary merged structures are supported by allowing electrically compatible adjacent transistors to overlap during placement. The synthesis flow in TEMPO begins with a static transistor chain formation step. These chains are broken at the diffusion breaks and the resulting sub chains are passed to the placement step. During placement, an ordering is found for each chain and a location and orientation is assigned to each sub chain. Different chain

orderings affect the placement by changing the relative sizes of the sub chains and their routing contribution We conclude with a detailed routing step and an optional compaction step *Techniques for IC Symbolic Layout and Compaction* Jeffrey Lyn Burns,1990 **VLSI CAD Tools and Applications** Wolfgang Fichtner,Martin Morf,2012-12-06 The summer school on VLSI CAD Tools and Applications was held from July 21 through August 1 1986 at Beatenberg in the beautiful Bernese Oberland in Switzerland The meeting was given under the auspices of IFIP WG 10.6 VLSI and it was sponsored by the Swiss Federal Institute of Technology Zurich Switzerland Eighty one professionals were invited to participate in the summer school including 18 lecturers The 81 participants came from the following countries Australia 1 Denmark 1 Federal Republic of Germany 12 France 3 Italy 4 Norway 1 South Korea 1 Sweden 5 United Kingdom 1 United States of America 13 and Switzerland 39 Our goal in the planning for the summer school was to introduce the audience into the realities of CAD tools and their applications to VLSI design This book contains articles by all 18 invited speakers that lectured at the summer school The reader should realize that it was not intended to publish a textbook However the chapters in this book are more or less self contained treatments of the particular subjects Chapters 1 and 2 give a broad introduction to VLSI Design Simulation tools and their algorithmic foundations are treated in Chapters 3 to 5 and 17 Chapters 6 to 9 provide an excellent treatment of modern layout tools The use of CAD tools and trends in the design of 32 bit microprocessors are the topics of Chapters 10 through 16 Important aspects in VLSI testing and testing strategies are given in Chapters 18 and 19

**Multi-Net Optimization of VLSI Interconnect** Konstantin Moiseev,Avinoam Kolodny,Shmuel Wimer,2014-11-07 This book covers layout design and layout migration methodologies for optimizing multi net wire structures in advanced VLSI interconnects Scaling dependent models for interconnect power interconnect delay and crosstalk noise are covered in depth and several design optimization problems are addressed such as minimization of interconnect power under delay constraints or design for minimal delay in wire bundles within a given routing area A handy reference or a guide for design methodologies and layout automation techniques this book provides a foundation for physical design challenges of interconnect in advanced integrated circuits **Algorithms for VLSI Physical Design Automation** Naveed A. Sherwani,2007-05-08 Algorithms for VLSI Physical Design Automation Third Edition covers all aspects of physical design The book is a core reference for graduate students and CAD professionals For students concepts and algorithms are presented in an intuitive manner For CAD professionals the material presents a balance of theory and practice An extensive bibliography is provided which is useful for finding advanced material on a topic At the end of each chapter exercises are provided which range in complexity from simple to research level Algorithms for VLSI Physical Design Automation Third Edition provides a comprehensive background in the principles and algorithms of VLSI physical design The goal of this book is to serve as a basis for the development of introductory level graduate courses in VLSI physical design automation It provides self contained material for teaching and learning algorithms of physical design All algorithms which are considered basic have

been included and are presented in an intuitive manner Yet at the same time enough detail is provided so that readers can actually implement the algorithms given in the text and use them The first three chapters provide the background material while the focus of each chapter of the rest of the book is on each phase of the physical design cycle In addition newer topics such as physical design automation of FPGAs and MCMs have been included The basic purpose of the third edition is to investigate the new challenges presented by interconnect and process innovations In 1995 when the second edition of this book was prepared a six layer process and 15 million transistor microprocessors were in advanced stages of design In 1998 six metal process and 20 million transistor designs are in production Two new chapters have been added and new material has been included in almost all other chapters A new chapter on process innovation and its impact on physical design has been added Another focus of the third edition is to promote use of the Internet as a resource so wherever possible URLs have been provided for further investigation Algorithms for VLSI Physical Design Automation Third Edition is an important core reference work for professionals as well as an advanced level textbook for students

VLSI Design ,1985      **Proceedings** ,1997      **Combinatorial Algorithms for Integrated Circuit Layout** ,2012-12-06 The last decade has brought explosive growth in the technology for manufacturing integrated circuits Integrated circuits with several hundred thousand transistors are now commonplace This manufacturing capability combined with the economic benefits of large electronic systems is forcing a revolution in the design of these systems and providing a challenge to those people interested in integrated system design Modern circuits are too complex for an individual to comprehend completely Managing tremendous complexity and automating the design process have become crucial issues Two groups are interested in dealing with complexity and in developing algorithms to automate the design process One group is composed of practitioners in computer aided design CAD who develop computer programs to aid the circuit design process The second group is made up of computer scientists and mathematicians who are interested in the design and analysis of efficient combinatorial algorithms These two groups have developed separate bodies of literature and until recently have had relatively little interaction An obstacle to bringing these two groups together is the lack of books that discuss issues of importance to both groups in the same context There are many instances when a familiarity with the literature of the other group would be beneficial Some practitioners could use known theoretical results to improve their cut and try heuristics In other cases theoreticians have published impractical or highly abstracted toy formulations thinking that the latter are important for circuit layout

VLSI Algorithms and Architectures Fillia Makedon,Kurt Mehlhorn,T. Papatheodorou,P. Spirakis,1986-06 Introduction to the temporal logic of in particular parallel programs Divided into three main parts Presentation of the pure temporal logic language semantics and proof theory Representation of programs and their properties within the language of temporal logic Application of the logical apparatus to the verification of program properties including a new embedding of Hoare's logic into the temporal framework

**Design systems for VLSI circuits** Giovanni DeMicheli,Giovanni De Micheli,P. Antognetti,Alberto

Sangiovanni-Vincentelli,1987-07-31 Proceedings of the NATO Advanced Study Institute L Aquila Italy July 7 18 1986

*Digest of Technical Papers* ,1988      Proceedings of the First International Conference on Genetic Algorithms and their Applications John J. Grefenstette,2014-01-02 Computer solutions to many difficult problems in science and engineering require the use of automatic search methods that consider a large number of possible solutions to the given problems This book describes recent advances in the theory and practice of one such search method called Genetic Algorithms Genetic algorithms are evolutionary search techniques based on principles derived from natural population genetics and are currently being applied to a variety of difficult problems in science engineering and artificial intelligence      **Physical**

**Design Automation of VLSI Systems** Bryan T. Preas,Michael J. Lorenzetti,Bryan D. Ackland,1988      Annual Symposium on Photomask Technology and Management ,1998      **Advanced Routing of Electronic Modules** Michael Pecht,Yeun Tsun

Wong,2024-11-01 The rapid growth of the electronic products market has created an increasing need for affordable reliable high speed and high density multi layer printed circuit boards PCBs This book presents the technologies algorithms and methodologies for engineers and others developing the next generation of electronic products A vision of the future in advanced electronics Advanced Routing of Electronic Modules provides both fundamental theory and advanced technologies for improving routing Beginning chapters discuss approaches to approximate a minimum rectilinear Steiner tree from a minimum spanning tree and introduce ways to avoid obstacles for routing simple multi terminal nets sequentially in a workspace Timing delay clock skew and noise control requirements in signal integrity are described as well as computer aided approaches to managing these requirements in high speed PCB MCM routing Later chapters present the two layer wiring problem rip up and reroute approaches and parallel routing including global routing boundary crossing placement and detailed maze routing in hardware acceleration Data structures data management and algorithms for parallel routing in a multiple processor hardware systems are also covered      *Lithography-aware Layout Compaction* Curtis A. Andrus,2011

**American Book Publishing Record** ,1997      *Algorithms and Techniques for VLSI Layout Synthesis* Dwight Hill,Don Shugard,John Fishburn,Kurt Keutzer,2012-12-06 This book describes a system of VLSI layout tools called IDA which stands for Integrated Design Aides It is not a main line production CAD environment but neither is it a paper tool Rather IDA is an experimental environment that serves to test out CAD ideas in the crucible of real chip design Many features have been tried in IDA over the years some successfully some not This book will emphasize the former and attempt to describe the features that have been useful and effective in building real chips Before discussing the present state of IDA it may be helpful to understand how the project got started Although Bell Labs has traditionally had a large and effective effort in VLSI and CAD researchers at the Murray Hill facility wanted to study the process of VLSI design independently emphasizing the idea of small team chip building So in 1979 they invited Carver Mead to present his views on MOS chip design complete with the now famous lambda design rules and tall thin designers To support this course Steve Johnson better known for YACC and the

portable C compiler and Sally Browning invented the constraint based i language and wrote a compiler for it A small collection of layout tools developed rapidly around this compiler including design rule checkers editors and simulators

**VLSI Design** M. Michael Vai, 2017-12-19 Very Large Scale Integration VLSI has become a necessity rather than a specialization for electrical and computer engineers This unique text provides Engineering and Computer Science students with a comprehensive study of the subject covering VLSI from basic design techniques to working principles of physical design automation tools to leading edge application specific array processors Beginning with CMOS design the author describes VLSI design from the viewpoint of a digital circuit engineer He develops physical pictures for CMOS circuits and demonstrates the top down design methodology using two design projects a microprocessor and a field programmable gate array The author then discusses VLSI testing and dedicates an entire chapter to the working principles strengths and weaknesses of ubiquitous physical design tools Finally he unveils the frontiers of VLSI He emphasizes its use as a tool to develop innovative algorithms and architecture to solve previously intractable problems VLSI Design answers not only the question of what is VLSI but also shows how to use VLSI It provides graduate and upper level undergraduate students with a complete and congregated view of VLSI engineering

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