Vlsi Physical Design From Graph Partitioning To Timing Closure

VLSI Physical Design: From Graph Partitioning to Timing ClosureGraph PartitioningGraph Partitioning and Graph ClusteringGraph Partitioning: A Heuristic Procedure to Partition Network GraphsMulti-level Spectral K-way Graph PartitioningSpectral K-way Ratio-cut Graph PartitioningAlgorithms for Signal Decoding Using Graph PartitioningApproximation Algorithms for New Graph Partitioning and Facility Location ProblemsGraph Partitioning and Its Applications to Scientific ComputingOn the Partitioning of Graphs and HypergraphsThe Use of Structural Information in Graph Databases to Improve Query Processing PerformanceOn the Complexity of the Graph Partitioning ProblemsProceedings of the First Annual ACM-SIAM Symposium on Discrete AlgorithmsAlgorithms and ComputationAlgorithms and ComputationAnnual International Computer Software and Applications ConferencePhotomask and X-ray Mask TechnologyAsian Test SymposiumMemoirs of the Faculty of Engineering, Kyoto UniversityProceedings Andrew B. Kahng Charles-Edmond Bichot David A. Bader Jason Y. Zien Jason Y. Zien Chuang-Chien Chiu Zoya Svitkina George Karypis Mallek Khelaf Girija Vijayaraghavan Thang Nguyen Bui Dingzhu Du Ky? to Daigaku. K? gakubu

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Complexity of the Graph Partitioning Problems Proceedings of the First Annual ACM-SIAM Symposium on Discrete Algorithms Algorithms and Computation Algorithms and Computation Annual International Computer Software and Applications Conference Photomask and X-ray Mask Technology Asian Test Symposium Memoirs of the Faculty of Engineering, Kyoto University Proceedings *Andrew B. Kahng Charles-Edmond Bichot David A. Bader Jason Y. Zien Jason Y. Zien Chuang-Chien Chiu Zoya Svitkina George Karypis Mallek Khelaf Girija Vijayaraghavan Thang Nguyen Bui Dingzhu Du Ky? to Daigaku. K? gakubu*

the complexity of modern chip design requires extensive use of specialized software throughout the process to achieve the best results a user of this software needs a high level understanding of the underlying mathematical models and algorithms in addition a developer of such software must have a keen understanding of relevant computer science aspects including algorithmic performance bottlenecks and how various algorithms operate and interact this book introduces and compares the fundamental algorithms that are used during the ic physical design phase wherein a geometric chip layout is produced starting from an abstract circuit design this updated second edition includes recent advancements in the state of the art of physical design and builds upon foundational coverage of essential and fundamental techniques numerous examples and tasks with solutions increase the clarity of presentation and facilitate deeper understanding a comprehensive set of slides is available on the internet for each chapter simplifying use of the book in instructional settings this improved second edition of the book will continue to serve the eda and design community well it is a foundational text and reference for the next generation of professionals who will be called on to continue the advancement of our chip design tools and design the most advanced micro electronics dr leon stok vice president electronic design automation ibm systems group this is the book i wish i had when i taught eda in the past and the one i m using from now on dr louis k scheffer howard hughes medical institute i would happily use this book when teaching physical design i know of no other work that s as comprehensive and up to date with algorithmic focus and clear pseudocode for the key algorithms the book is beautifully designed

prof john p hayes university of michigan the entire field of electronic design automation owes the authors a great debt for providing a single coherent source on physical design that is clear and tutorial in nature while providing details on key state of the art topics such as timing closure prof kurt keutzer university of california berkeley an excellent balance of the basics and more advanced concepts presented by top experts in the field prof sachin sapatnekar university of minnesota

graph partitioning is a theoretical subject with applications in many areas principally numerical analysis programs mapping onto parallel architectures image segmentation vlsi design during the last 40 years the literature has strongly increased and big improvements have been made this book brings together the knowledge accumulated during many years to extract both theoretical foundations of graph partitioning and its main applications

graph partitioning and graph clustering are ubiquitous subtasks in many applications where graphs play an important role generally speaking both techniques aim at the identification of vertex subsets with many internal and few external edges to name only a few problems addressed by graph partitioning and graph clustering algorithms are what are the communities within an online social network how do i speed up a numerical simulation by mapping it efficiently onto a parallel computer how must components be organized on a computer chip such that they can communicate efficiently with each other what are the segments of a digital image which functions are certain genes most likely responsible for the 10th dimacs implementation challenge workshop was devoted to determining realistic performance of algorithms where worst case analysis is overly pessimistic and probabilistic models are too unrealistic articles in the volume describe and analyze various experimental data with the goal of getting insight into realistic algorithm performance in situations where analysis fails

graphs are mathematical structures used to model pair wise relationship between objects of a certain collection it consists of

collection of vertices or nodes and a collection of edges that connect these nodes graphs can be directed from one vertex to another or undirected in our context a graph denotes a network with computers distributed as nodes while the communication channel acting as the edges these are directed graphs where each edge has a capacity which cannot be exceeded in real life applications it becomes very essential that graphs are partitioned in some way so as to satisfy certain conditions for example while placing components of electronic circuit on circuit boards or substrates components that are highly dependent on each other exchanging maximum information should be placed on the same board also an important factor is the number of connections between these boards should be minimized similar situation arises in a computer network where computer systems are distributed over a wide geographic location this is the basis of graph partitioning problem the classical graph partitioning problem consists of dividing a graph into pieces such that the pieces are of about same size and there exists very few connections between these pieces the objective is to partition the nodes of a graph with costs on its edges into subsets so as to minimize the sum of the costs on all edges that are cut let g be graph with n nodes of sizes weights wi 0 i 1 2 n let p be a positive number such that 0

in applications as diverse as data placement in peer to peer systems control of epidemic outbreaks and routing in sensor networks the fundamental questions can be abstracted as problems in combinatorial optimization however many of these problems are np hard which makes it unlikely that exact polynomial time algorithms for them exist approximation algorithms are designed to circumvent this difficulty by finding provably near optimal solutions in polynomial time this thesis introduces a number of new combinatorial optimization problems that arise from various applications and proposes approximation algorithms for them these problems fall into two general areas graph partitioning and facility location the first problem that we introduce is the unbalanced graph cut problem here the goal is to find a graph cut minimizing the size of one of the sides while also respecting an upper bound on the number of edges cut we develop two bicriteria approximation algorithms for this problem using the technique of lagrangian relaxation and a

different algorithm for its maximization version the other graph partitioning problem that we introduce and study is the min max multiway cut problem it aims to partition a graph into multiple components minimizing the maximum number of edges coming out of any component we present an approximation algorithm for this problem which uses unbalanced cuts as well as the greedy technique in the second part of the thesis we study two generalizations of the facility location problem which aims to open facilities assigning clients to them in order to minimize the facility opening costs and the connection costs in the facility location with hierarchical facility costs problem the facility costs are more general and depend on the set of assigned clients our algorithm based on the local search technique uses two new local improvement operations achieving a constant factor approximation guarantee the second generalization is the load balanced facility location problem which specifies a lower bound for the number of clients assigned to an open facility we give the first true constant factor approximation algorithm which uses a reduction to the capacitated facility location problem the thesis is concluded with related open problems and directions for future research abstract

abstract in this paper we consider the problems of removing the smallest weight set of edges or vertices to partition a graph into two disjoint subgraphs of bounded size the complexity of these problems on general graphs is well known to be np hard however the complexity of these problems on planar graphs has remained open for some time we show that the vertex partitioning problem on vertex weighted planar graphs and the edge partitioning problem on edge and vertex weighted planar graphs are np complete we also describe a polynomial time approximation algorithm for the edge partitioning problem which has an approximation factor of o n superscript 2 3 for planar graphs and an approximation factor of o n log n superscript 2 3 for general graphs in particular this approximation algorithm can also handle the case when the partitioned subgraphs are required to be of equal size i e the graph bisection problem this case has not been dealt with until recently and our algorithm has better approximation factor than the algorithm given in 16

symposium held jan 22 24 1990 san francisco calif

this volume is the proceedings of the fifth international symposium on algorithms and computation isaac 94 held in beijing china in august 1994 the 79 papers accepted for inclusion in the volume after a careful reviewing process were selected from a total of almost 200 submissions besides many internationally renowned experts a number of excellent chinese researchers present their results to the international scientific community for the first time here the volume covers all relevant theoretical and many applicational aspects of algorithms and computation publisher s website

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