Deza, Antoine; Dickson, Chris; Terlaky, Tamás; Vannelli, Anthony; Zhang, Hu
Global routing in VLSI design: algorithms, theory, and computational practice. (English)

Summary: Global routing in VLSI (very large scale integration) design is one of the most challenging discrete optimization problems in computational theory and practice. In this paper, we present a polynomial time algorithm for the global routing problem based on integer programming formulation with theoretical approximation bound. The algorithm ensures that all routing demands are satisfied concurrently, and the overall cost is approximately minimized. We provide both serial and parallel implementation and develop several heuristics used to improve the quality of the solution and reduce running time. We provide computational results on two sets of well-known benchmarks and show that, with a certain set of heuristics, our new algorithms perform extremely well compared with other integer-programming models.

MSC:
68U07 Computer science aspects of computer-aided design
68W35 Hardware implementations of nonnumerical algorithms (VLSI algorithms, etc.)
90C10 Integer programming
94C05 Analytic circuit theory
68T20 Problem solving in the context of artificial intelligence (heuristics, search strategies, etc.)

Keywords:
global routing in VLSI design; approximation algorithms; integer programming model