

Density-Reduction-Oriented Layer Assignment for Rectangle Escape Routing

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Abstract

Given a set of n buses in a pin array, the layer assignment(LA) for rectangle escape routing can be divided into five different problems: LA-1, opposite LA-2, corner LA-2, LA-3 and LA-4 problems for rectangle escape routing. Based on the optimality of a left-edge algorithm for interval packing, the LA-1 problem can be transformed into an interval packing problem and optimally solved in $O(n \log n)$ time. Furthermore, based on the definition of an exact low-bound and the concept of the density reduction, the opposite LA-2 problem can be optimally solved by using density-reduction-oriented layer assignment in $O(n \log n)$ time. Finally, by using the optimal results in the LA-1 and opposite LA-2 problems, the corner LA-2, LA-3 and LA-4 problems can be solved by using two-phase density-reduction-oriented layer assignment in $O(n \log n)$ time. Compared with Ma's approximation algorithm[6] for the LA-4 problem, the experimental results show that our proposed algorithm obtains the same optimal result but reduces 91.6% of CPU time for eight tested examples on the average.

Keyword : PCB design, Escape routing, Layer assignment