10720 CS 512200 VLSI Design for Manufacturability

Programming Homework 107062612 熊祖玲

1. Given

   Given an undirected graph $G = (V, E)$, where V is the set of vertices and E is the set of edges. Each vertex has a weight and each edge also has a weight.

2. Goal

   Find a dominating independent set P in G that minimizes the cost function:

   $F(P) = \sum_{u \in P} w(u) + \sum_{v \in V - P} \min\{w(v, u) | u \in N[v] \cap P\}$

3. Objective function

$$\sum_{v \in V} x_v w(v) + \sum_{e \in E} z_e w(e)$$

4. Constraint

   A. $x_v + x_u \leq 1$ for $e = (u, v) \in E$

   確保任一 edge 之兩端 nodes 中至多一個被揀選。

   B. $x_v + x_u \leq y_e$ for $e = (u, v) \in E$

   確保當一 edge 可以被揀選，其兩端 nodes 中至多一個被揀選；反之，則其兩端 nodes 都不可被揀選。

   C. $z_e \leq y_e,$ for $e \in E$

   確保當一 edge 可以被揀選，實際上可以被選或不被選；反之，則實際上不可以被揀選。

   D. $x_v + \sum_{u \in N(v)} x_u \geq 1$ for $v \in V$

   確保任一 node 及與其相鄰的 node(s)之中至少有一個被揀選。

   E. $x_v + \sum_{e \in \delta(v)} z_e \geq 1$ for $v \in V$

   確保任一 node 及與其相連的 edge(s)之中至少有一個被揀選。

   F. $x_v \in \{0,1\}$ for $v \in V$

   1 if v is chosen for the solution

   G. $y_e \in \{0,1\}$ for $v \in V$

   1 if e can be chosen

   H. $z_e \in \{0,1\}$ for $v \in V$

   1 if $e \in E$ is selected for connecting a non-chosen node to a chosen one