

Maximum Independent Set in a Tree

For any vertex $x \in T$. Let T_x denote the subtree rooted at x . Let $w(x)$ be the weight of x . Let W_x be the value of an optimal solution if we force x into the solution. Let W'_x be the value for T_x if we force x out of the solution. If O_x is the optimal value for T_x then:

If x is not a leaf,

$$O_x = \max(W_x, W'_x) \quad (1)$$

Let $C(x)$ be the children of x ,

$$W_x = w(x) + \sum_{y \in C(x)} W'_y \quad (2)$$

$$W'_x = \sum_{y \in C(x)} O_y \quad (3)$$

If x is a leaf,

$$W_x = w(x)$$

$$W'_x = 0$$

The algorithm is post order in which recurrence relations (1), (2), (3) are used to compute O_x, W_x, W'_x for all $x \in V$.

Time complexity is $O(n)$ where $n = |V|$.