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Weighted Coloring

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Let $G = (V, E, w)$ be a vertex weighted graph such that $w : V \to \mathbb{R}_+^*$. Let $c = (S_1, \ldots, S_k)$ be a vertex proper k-coloring of G where S_i corresponds to the stable set of vertices colored i.

The *weight of a color* i is defined as:

$$w(S_i) = \max_{v \in S_i} w(v).$$

The *weight of the coloring* c is defined as:

$$w(c) = \sum_{i=1}^{k} w(S_i).$$

The goal of the Weighted Coloring problem [1] is to determine the *weighted chromatic number* of G, i.e., the minimum weight of a proper coloring of G:

$$\chi_w(G) = \min_{\text{proper coloring } c} w(c).$$

To the best of my knowledge, the complexity of computing $\chi_w(T)$, for a given vertex weighted tree T is not known, even though there is a PTAS for this class of graphs [2].

References

[1] D. Guan and X. Zhu, "A coloring problem for weighted graphs," *Information Processing Letters*, vol. 61, pp. 77–81, 1997.

[2] B. Escoffier, J. Monnot, and V. T. Paschos, "Weighted Coloring: further complexity and approximability results," *Information Processing Letters*, vol. 97, pp. 98–103, 2006.