Part I

COMPUTER SCIENCE
A GENERALIZED HYPERGREEDY ALGORITHM FOR WEIGHTED PERFECT MATCHING

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Abstract.

We give a generalization of the hypergreedy algorithm for minimum weight perfect matching on a complete edge weighted graph whose weights satisfy the triangle inequality. With a modified version of this algorithm we obtain a log $n$-approximate perfect matching heuristic for points in the Euclidean plane, in $O(n \log^2 n)$ time.

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1. Introduction.

Let $K(V)$ be a complete edge weighted graph with an even number, $n = |V|$, of vertices. Throughout the paper we shall assume that the edge weights satisfy the triangle inequality. A perfect matching of $V$ is a set of edges such that each vertex of $V$ is incident to exactly one edge. An optimal perfect matching of $V$ is a perfect matching with minimum total edge weight. The optimal perfect matching can be obtained by Edmonds’ algorithm [4, 5], in $O(n^3)$ time for general weights. The fastest algorithm for the case of Euclidean points in the plane, due to Vaidya [14], runs in $O(n^{2.5} \log^4 n)$ time. Special cases of the problem can be solved faster. For example, Marcotte and Suri [9] proposed an $O(n \log n)$ time exact algorithm for the case where the points are the vertices of a convex polygon.

For large $n$, finding approximate solutions, fast and within some error bounds, has been of both practical and theoretical interest. By the error of a heuristic algorithm we shall mean the worst case ratio of the weight of an approximate