Recent results of the exact algorithm for Steiner tree problem

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Abstract

The Dreyfus-Wagner algorithm is a well-known dynamic programming method for computing minimum Steiner trees in general weighted graphs in time $O^*(3^k)$, where k is the number of terminal nodes to be connected. We presented an algorithm in time $O^*(2.684^k)$ by showing that the optimum Steiner tree T can be partitioned into $T = T_1 \cup T_2 \cup T_3$ and each T_i is a minimum Steiner tree in a contracted graph G_i with less than $0.4361k$ terminals. A further improvement yielded $O^*((2+\epsilon)^k)$ for any $\epsilon > 0$.

Every rectilinear Steiner tree problem admits an optimal tree T^* which is composed of tree stars. Most algorithms for the rectilinear Steiner tree problem proceed by composing an optimum tree T^* from tree star components and the efficiency of these algorithms depends heavily on the number of tree stars (candidate components). At present, the best upper bound of tree stars is $O^*(1.38^k)$ which is showed by Fößmeier and Kaufmann. We improved the bound to $O^*(1.357^k)$ and showed that this is a tight bound.

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