MPRI Algorithms Lab: The Steiner Tree Problem

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1 Problem Modeling

1.1 Problem Definition: Minimum Steiner Tree

The following is the standard formal definition of the Minimum Steiner Tree problem, as found in the compendium.

Instance: A complete graph $G = (V, E)$, a metric given by edge weights $w : E \to \mathbb{Z}^+$, and a subset of required vertices $S \subset V$.

Solution: A Steiner tree, i.e., a subtree of G that includes all the vertices in S.

Measure: The sum of the weights of the edges in the subtree, which is to be minimized.

Good News: The problem is approximable within a ratio of $1 + \ln(3)/2 \approx 1.55$. In your project file, this approximation ratio is simplified to 2.

Bad News: The problem is APX-complete.

Garey and Johnson: ND12.