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An improved approximation ratio to the partial-terminal Steiner tree problem

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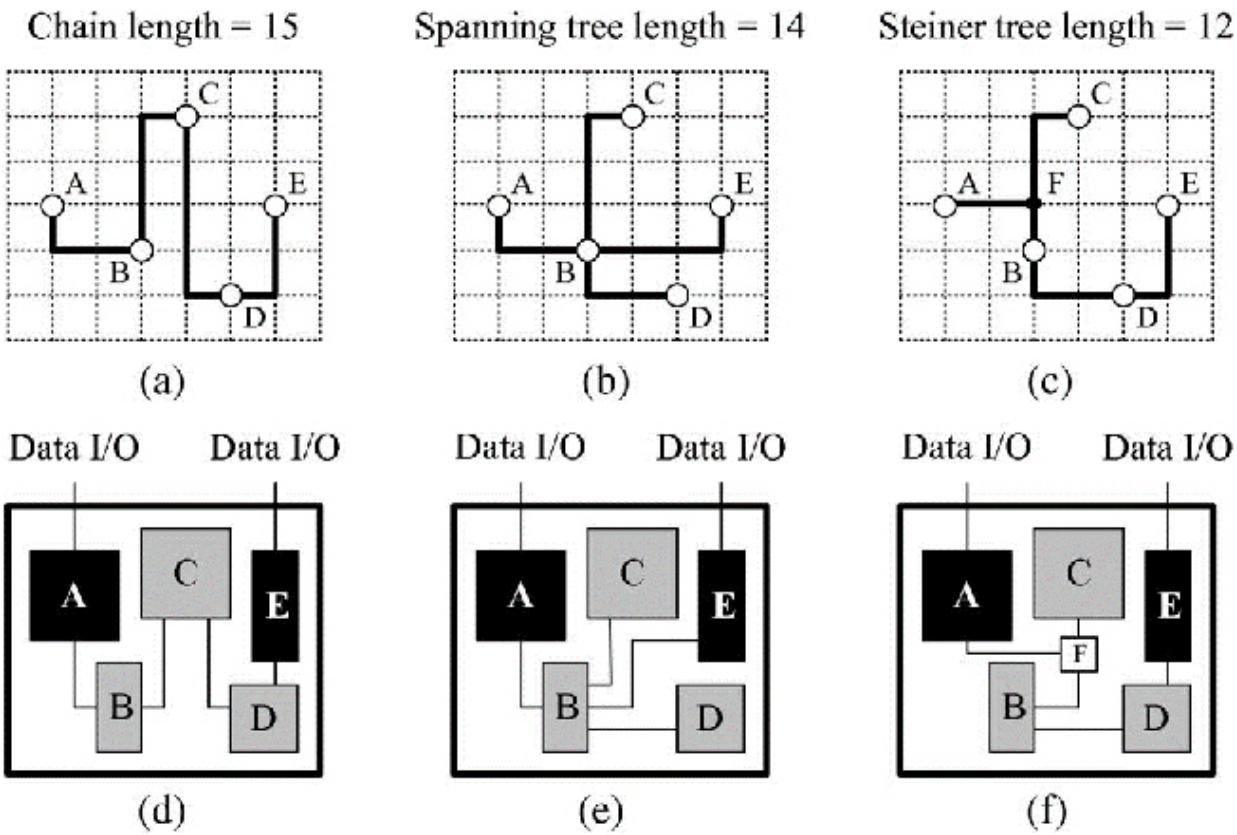
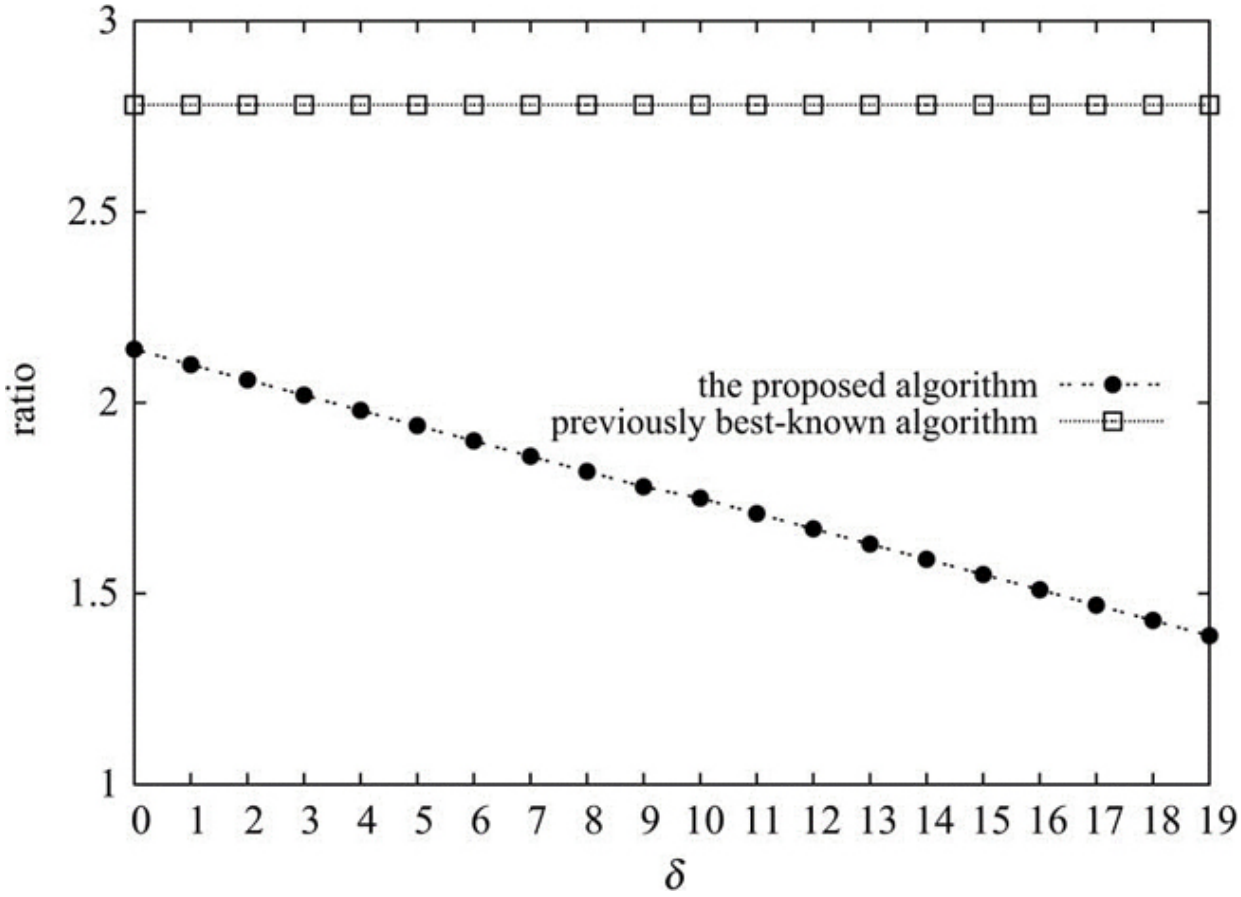
Given a complete graph $G = (V, E)$ with a metric cost function c: $E \rightarrow$ + and two proper subsets R V and R' R, a Steiner tree is a connected and acyclic subgraph of G which contains all vertices in R. We consider a generalization of the classic Steiner tree problem and the terminal Steiner tree problem, a partial-terminal Steiner tree is a Steiner tree which contains all vertices in R such that all vertices in R' must be leaves. The partial-terminal Steiner tree problem is to find a partial-terminal Steiner tree of the minimum cost in G.



The application of the partial-terminal Steiner tree problem on IC design.

The previously best-known approximation ratio of the problem is 2ρ, where ρ is the approximation ratio of the Steiner tree problem. In this paper, we improve the approximation ratio from 2ρ to $2\rho-[(\rho)/(3\rho-2)]-f$, where f is a non-negative function whose value is between 0 and $\rho-[(\rho)/(3\rho-2)]$.



The approximation ratios of the proposed algorithm and previously best-known algorithm.