Wanke, Egon

k-NLC graphs and polynomial algorithms. (English) Zbl 0812.68106

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Summary: We introduce the class of k-node label controlled (NLC) graphs and the class of k-NLC trees. Each k-NLC graph is an undirected tree- structured graph, where k is a positive integer. The class of k-NLC trees is a proper subset of the class of k-NLC graphs. Both classes include many interesting graph families. For instance, each partial k- tree is a $(2^{k+1}-1)$-NLC tree and each co-graph is a 1-NLC graph. Furthermore, we introduce a very general method for the design of polynomial algorithms for NP-complete graph problems, where the input graphs are restricted to tree-structured graphs. We exemplify our method with the simple max-cut problem and the Hamiltonian circuit property on k-NLC graphs.

MSC:

68R10 Graph theory (including graph drawing) in computer science
68Q25 Analysis of algorithms and problem complexity
05C78 Graph labelling (graceful graphs, bandwidth, etc.)
05C05 Trees

Keywords:

k-node label controlled graphs; simple max-cut problem; Hamiltonian circuit property

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