ON 2-CAPACITATED PERIPATETIC SALESMAN PROBLEM[1]

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The undirected m-Capacitated Peripatetic Salesman Problem (m-CPSP) [3] is a problem of finding m Hamiltonian cycles of least or greatest total cost in a given graph $G = (V, E)$, where each edge $e \in E$ has a cost c_e and an capacity C_e, such that no edge e is used more than C_e times. Edge weights are from an integer segment $\{1, q\}$. The probability that $C_e = 2$ is p and the probability that $C_e = 1$ is $(1 - p)$ for every $e \in E$ It is known that the m-CPSP is NP-hard problem [3].

In the [2] it is considered the case of the 2-CPSP with a common weight function for both cycles. The approximation polynomial algorithm and its approximation ratio are presented.

In the present work a more general problem 2-CPSP^d is considered: every Hamiltonian cycle has its own weight function. Nevertheless even for this more general problem the similar results were shown. Under the assumption that it is known algorithm with approximation ratio Δ for solving TSP$_{min}$(TSP$_{max}$) on the graph G, a polynomial algorithm for 2-CPSP$^d_{min}$(2-CPSP$^d_{max}$) with guarantee approximation ratio in average for all possible inputs is presented.

In particular, for the problems with edge weights 1 and 2, using an 7/6-approximation algorithm [4] for the TSP$_{min}\{1, 2\}$ the presented algorithm for the 2-CPSP$^d_{min}$ has approximation ratio $(19 - 5p)/12$, and using an 8/9-approximation algorithm [1] for the TSP$_{max}\{1, 2\}$ the presented algorithm for the 2-CPSP$^d_{max}$ has approximation ratio $(25+7p)/36$, in average for all possible inputs.

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