◇ 電子科学研究所学術講演会 ◇

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日 時: 令和 1 年 8 月 27 日(火) 10:30～12:00
場 所:電子科学研究所 1階 会議室

Approximation Algorithms on Some Network Optimization Problems

Given a metric graph $G = (V, E, w)$, a center $c \in V$, and an integer k, the **Star *k*-Hub Center Problem** is to find adepth-2 spanning tree T of G rooted by c such that c has exactly k children and the diameter of T is minimized. Those children of c in T are called hubs. A similar problem called the **Single Allocation *k*-Hub Center Problem** is to find a spanning subgraph H^* of G such that (i) C^* is a clique of size k in H^*; (ii) $V \setminus C^*$ forms an independent set in H^*; (iii) each $v \in V \setminus C^*$ is adjacent to exactly one vertex in C^*; and (iv) the diameter $D(H^*)$ is minimized. The vertices selected in C^* are called hubs and the rest of vertices are called non-hubs. Both **Star *k*-Hub Center Problem** and **Single Allocation *k*-Hub Center Problem** are NP-hard and have applications in transportation system, telecommunication system, and post mail system. In this talk, we give 5/3-approximation algorithms for both problems. Moreover, we prove that for any $\varepsilon > 0$, the **Star *k*-Hub Center Problem** has no $(1.5 - \varepsilon)$-approximation algorithm unless P = NP. Under the assumption P ≠ NP, for any $\varepsilon > 0$ the **Single Allocation *k*-Hub Center Problem** has no $(4/3 - \varepsilon)$-approximation algorithm.