LPCO Problem Set 3

February 21, 2021

For the problems below, try to come up with a primal-dual algorithm:

Problem 1. Given a directed graph $G = (V, A)$, a root vertex r, and weights $w_{ij} \geq 0$ on each edge $(i, j) \in A$, find the minimum cost set of arcs $F \subseteq A$ such that for every vertex $v \in V$, there is exactly one directed path in F from r to v.

Problem 2. Given n agents, n items, and a cost function giving the cost $c_{ij} \geq 0$ of assigning item j to agent i, find a minimum cost assignment of the items to the agents if each agent gets a different item and all items need to be allocated.

Problem 3. You have seen primal-dual algorithms for shortest path and minimum spanning trees (Kruskal) in class. What happens when you use Prim's instead of Kruskal's?