Finishing flow and talking about greed

10/18/24

Recall: Network flow

- Compute max “flow” that can be moved through a directed weighted graph
- Ford-Fulkerson: Repeatedly find an augmenting path and update graph
- Value of max flow is same as value of minimum cut

Where we left off: K&T Exercise 7.5

Let G be an arbitrary flow network, with a source s, sink t, and an integer capacity for every edge. Suppose (A,B) is a minimum s-t cut. Now suppose we add 1 to every edge capacity. Is (A,B) guaranteed to be a minimum s-t cut for the new network?

A. Yes

B. No

K&T Exercise 12

Given a flow network with unit-capacity edges, find k edges to delete so that the maximum flow is as small as possible.

You and your roommates (*n* of you) believe in eating together; on each night, one of you will cook for the whole group. You incorporated everyone's constraints into a bipartite graph to determine when everyone should cook over the next *n* nights. It has 1 vertex per person and 1 vertex per night, with an edge connecting people to nights when they can cook. One of you then made a schedule showing who cooks each night. Unfortunately, only after the schedule was agreed upon did you notice that it has a night when 2 people are cooking and a night when no one cooks.

a) What is the running time to find a new schedule from scratch using Ford-Fulkerson?
b) Give an $O(n^2)$-time algorithm to find a schedule that starts with the partial schedule your roommate constructed.