CS 314 - Network Flow

Announcements

- HW up & due next Friday
- Final is May 7, 12-2 pm
  (so far, no conflicts)
A company wants to poll customers about their products.

- each customer gets asked about a subset of products they buy
- don't want to ask too many questions
- each product needs to have sufficient data collected
Formally: $n$ customers, $k$ products

- ask each customer about $c_i$ to $c_i'$ products
  - for each product, ask between $p_j$ and $p_j'$ different customers for opinion
  - for each customer, have a list of products that they have bought

How can we solve?
That's right — flow!

/customer i → product j if i bought j

Customer i

k products

n customers

Last circulations
Graph setup:

- create $n + k + 2$ vertices
- draw $O(nk)$ edges (according to list)
- draw $k$ edges to sink & label
  in edges from source
- call our circulation algorithm
Runtime:

Graph setup: $O(nkc)$

Use flow: flow on graph with $n'$ vertices + $m'$ edges

$O(n')^3$ \[ O(m'C) \leftarrow \]

$O(m'n')$ \[ O(m'^2 \log C) \]

$n' = n + k + 2 = O(n + k)$

$m' = nk + n + k = O(nk)$

$O(nk(n+k))$ or $O((n+k)^3)$
Remainder of Ch 7:

- Airplane scheduling
- Baseball elimination
- Image segmentation