

1.224J Recitation #2

Integer Programs

Topics

- Questions & office hrs
- Sensitivity analysis review
- Importance of *linear* IP formulation
 - Branch and bound
- Modeling power of IP
- Two examples
 - Pure IP
 - MIP

Sensitivity analysis for LPs

- Reduced Costs
 - Associated with **OBJECTIVE FUNCTION**
 - Tells when a non-basic variable becomes “attractive”
- Shadow Prices
 - Associated with **CONSTRAINTS**
 - Also called dual vars
 - Tells how important each constraint is

Linear IP formulations

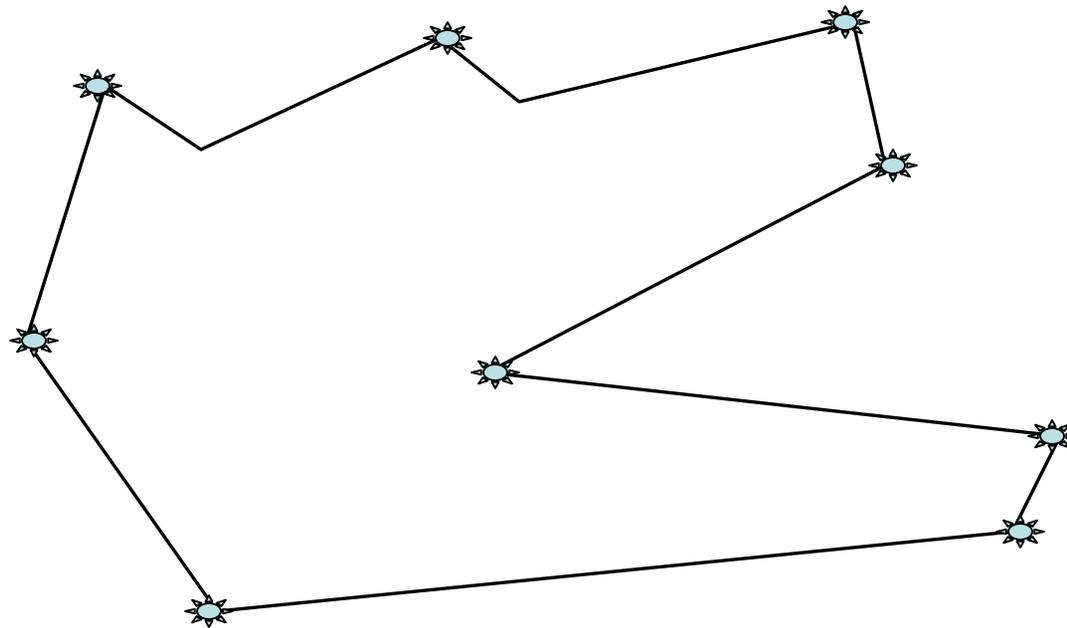
- IPs are solved using linear programming as the underlying strategy.
- At the blackboard:
 - Relaxation
 - Branch and bound
- Note: no difference in computational difficulty between IPs and MIPs.

Extra modeling power of IPs

- Fixed costs
- Range constraints for x
- Overtime pay

Example 1 (an IP): TSP

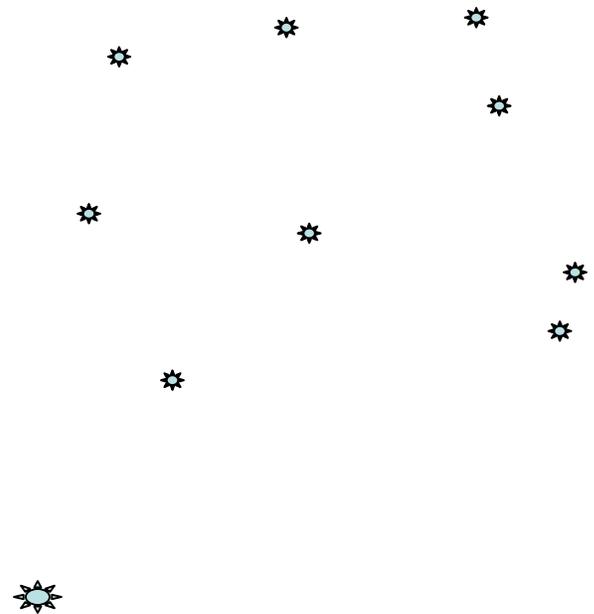
Traveling salesman problem (TSP): find the shortest path through all cities.



Example 2 (a MIP): *The Political coverage or Coffee seller or Missionary problem*

Which cities to visit, starting from your base city, and how long to stay there, to maximize converts (to your political party, coffee brand, or religion) subject to budget and time constraints.

Time in the air is time not converting people!



One more constraint...

How to model the following?

Due to airline flight deals, the person must stay at each destination city 1/2, 3, or 7 days.