CIVIL-557
Decision-Aid Methodologies in Transportation
Lecture III
Exercises: SPPs

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Outline

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Exercise 1

Use the code provided to solve the SPP and answer the following questions:

1. Is there a cycle in the solution? if so which nodes are cycling?
2. Is the solution a feasible solution? Explain!
3. Is the solution the optimal solution? Explain!
4. If we are using branch and price to solve the VRP and this SPP was the relaxation of the pricing problem (ESPPRC), can we add this path to the RMP (Restricted Master Problem) as a column? Explain!

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Exercise 2.1

Solve the SPPRC by adding time constraints to the model. Answer the following questions:

- Why did the cost of the solution increase from the solution of the SPP in exercise 1?
- Identify all cycles in the solution.
- Why is the path leaving negative cost cycles and not continuing to cycle as in exercise 1?
- Is the solution feasible? Explain!
- Is the solution the optimal solution? Explain!

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Exercise 2.2

Add capacity constraints to the code.

- Identify all cycles in the solution.
- Why did the cost increase with respect to the previous solution value of the SPPRC (time windows)

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Exercise 3

Use the Ng-route relaxation to solve the problem:

- Identify all cycles
- Is this solution also the optimal solution of the ESPPRC? Explain!
- Increase the value of the size of the Ng_set, i.e., Ng_v, from Ng_v = 2, Ng_v = 5, Ng_v = 10, Ng_v = 15, and Ng_v = 20.
  (Warning: if your computer takes longer then a minute, stop!)
  - At what point are the cycles eliminated?
  - Why does the algorithm take more time as you increase Ng_v? Explain!

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