Discrete Math: 6.5 Brute Force & Nearest Neighbor Algorithms
Date:

Name:
Period:

Key

The Brute Force Algorithm:

1. list all possible Hamilton Circuits
2. Calculate weights
3. Choose optimal tour

The Nearest Neighbor Algorithm:

1. Pick a start vertex
2. Go to nearest neighbor (w/ smallest weight)
3. Go to nearest neighbor each time until all vertices have been visited.
4. Return to starting vertex.

Optimal Algorithm:

produces optimal solution

Inefficient Algorithm:

# of steps needed to solve grows disproportionately w/ size of the problem (BF algorithm)

Efficient Algorithm:

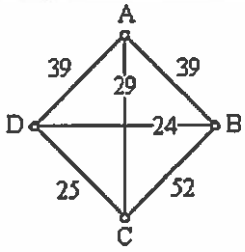
Computational effort grows proportionally to input of the problem.

Relative Error: $\varepsilon = \dfrac{(\text{cost of tour} - \text{cost of optimal tour})}{\text{cost of opt. tour}}$

Approximate Algorithm:

solutions reasonably close to optimal solution.

For the weighted graph , find the indicated tour and give its cost.



1. The Brute Force tour

ABCDA = 155 ↔ ACDBA = 117
ABDCA = 117 ↔ ADBCA = 144
ACBDA = 144 ↔ ADCBA = 155

2. The nearest neighbor tour with starting vertex A

A, C, D, B, A = 117

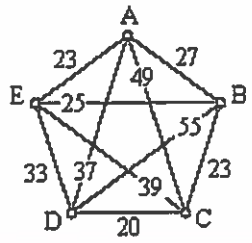
3. The nearest neighbor tour with starting vertex B

B, D, C, A, B = 117

4. The nearest neighbor tour with starting vertex C

C, D, B, A, C = 117

A delivery service must deliver packages at city A, city B, city D, and city E, and then return to city C, the home base. The figure shows a graph of the estimated travel times in minutes between the cities.



5. Find the nearest neighbor tour with starting vertex C.

C, D, E, A, B, C

6. Find the nearest neighbor tour with starting vertex D.
Write the tour as it would be traveled if starting and ending at vertex C.

D, E, A, B, C

Darren is a sales representative whose territory consists of the six cities in the mileage chart. Darren wants to visit customers at each of the cities, starting and ending his trip in his home city of Atlanta. His travel costs (gas, insurance, etc.) average $0.75 per mile.

Mileage Chart

	Atlanta	Columbus	Kansas City	Minneapolis	Pierre	Tulsa
Atlanta	*	533	798	1068	1361	772
Columbus	533	*	656	713	1071	802
Kansas City	798	656	*	447	592	248
Minneapolis	1068	713	447	*	394	695
Pierre	1361	1071	592	394	*	760
Tulsa	772	802	248	695	760	*

7. Find the nearest neighbor tour with Atlanta as the starting city. What is the total cost of the tour? A → C → KC → T → M → P → A

533 + 656 + 248 + 695 + 394 + 1361 = 3887 miles

Cost = 3887(0.75) = $2915.25

8. Find the nearest neighbor tour using Kansas City as the starting city. Write the tour as it would be traveled by Darren, who must start and end the trip in Atlanta. What is the total cost of this tour?

Ch 6: 30-36 evens, !34c