

MSSC 6000

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Feb 16, 2022 - Day 11

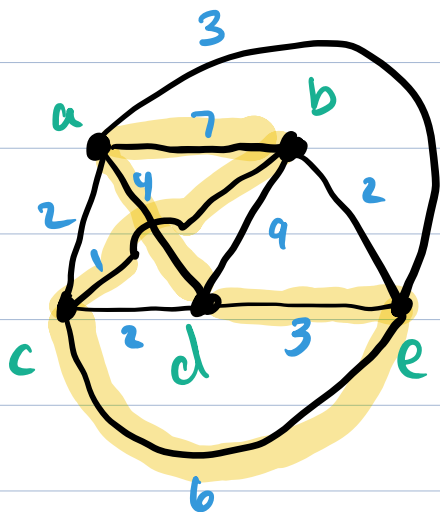
Lecture 3 - Greedy Algorithms (continued)

Problem #5 - Traveling Salesman Problem (TSP)

There are n cities that a salesman needs to visit, and then return home.

What is the shortest route that visits each city exactly once and then returns back to the starting place?

More formal: Consider a weighted graph G . Which ordering of the vertices gives you the smallest sum of the edge weights?



$a \rightarrow d \rightarrow e \rightarrow c \rightarrow b \rightarrow a$

$$4 + 3 + 6 + 1 + 7 = 21$$

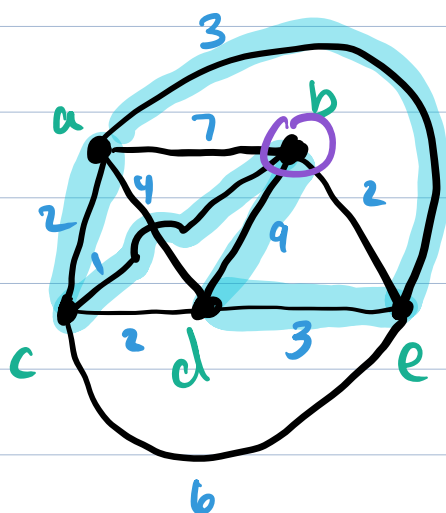
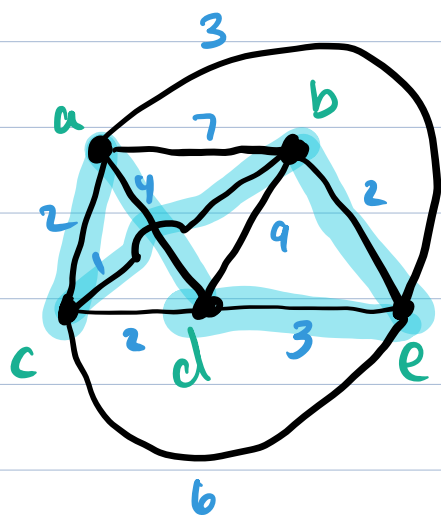
$e \rightarrow c \rightarrow b \rightarrow a \rightarrow d \rightarrow e$

Same 5 edges = 21

$a \rightarrow c \rightarrow b \rightarrow e \rightarrow d \rightarrow a$

$$2 + 1 + 2 + 3 + 2$$

$$= 10$$



Greedy algo:

- * pick a start vertex v_1 randomly
- * pick v_2 to be the closest (minimal weight) neighbor of v_1 that we have not visited yet
- * ... repeat until all vertices have been visited and then return to v_1

$v_1 = b$ $v_5 = d$
 $v_2 = c$ $v_6 = b$
 $v_3 = a$
 $v_4 = e$

$$1 + 2 + 3 + 3 + 9 = 18$$

~~n^n~~ n^n

Brute force:

$(n-1)!$

(much bigger than exponential!)

Dynamic Programming:

$O(n^2 \cdot 2^n)$
 still exponential

Lecture 4- Using the Unix command line.

Unix was an operating system (OS) framework developed in the 70s.

Precursor to all OSes today except Windows

Mac and Linux come with terminals where you can use Unix commands and "Git for Windows", which we installed is a Unix terminal emulator.

This lecture: very basic commands to navigate and manipulate the file system.

Why it's useful to know this stuff:

- On your computer, a lot can be done with the GUI, but using the terminal can be more efficient.

Ex: If you want the first 10 lines of a 1gb text file:
head filename.txt

- If you have to work on a remote machine via SSH, there is no GUI.