Lecture 22

CSE 331

Oct 23, 2017

Graded mid-term-I

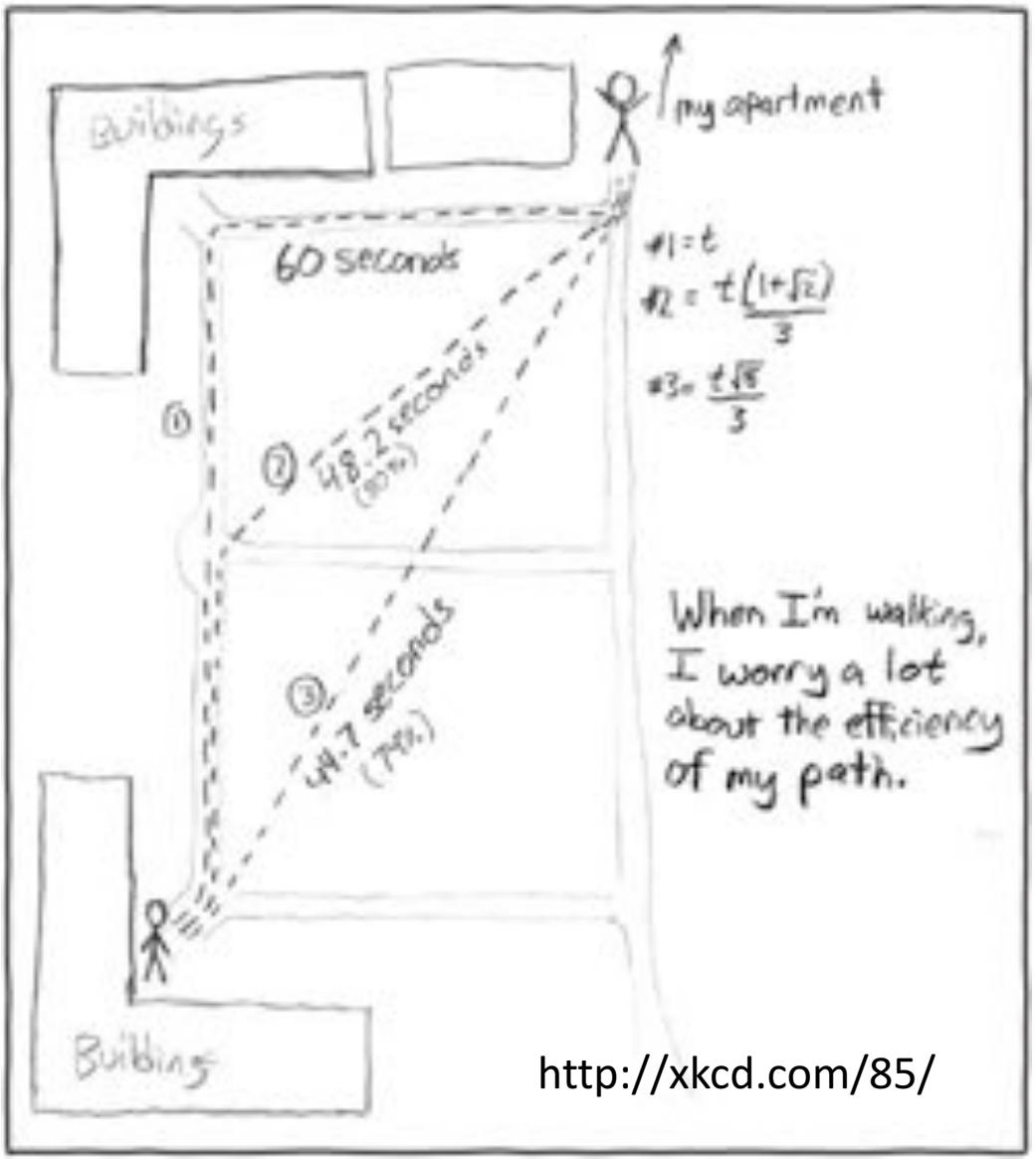
Grades for mid-term-I released on Autolab

mid-term 2 in a day or two

Temp letter grades

Today

Shortest Path Problem



http://xkcd.com/85/

Reading Assignment

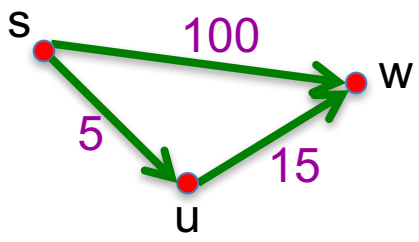
Sec 2.5 of [KT]

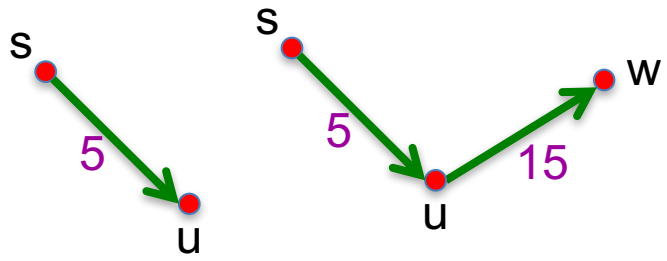
Shortest Path problem

Input: *Directed* graph G=(V,E)

Edge lengths, l_e for e in E

"start" vertex s in V





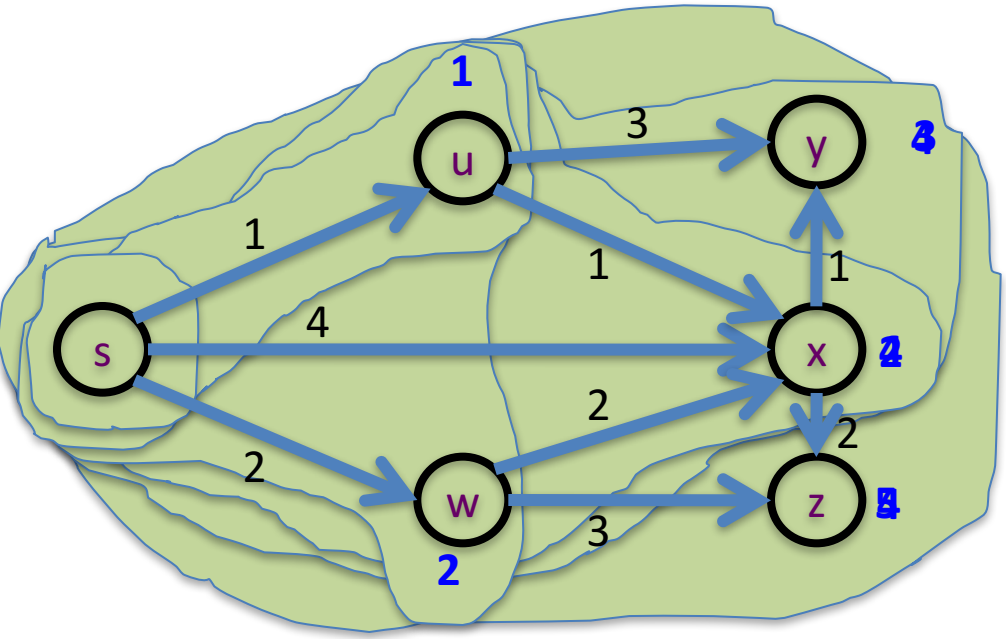
Output: All shortest paths from s to all nodes in V

Naïve Algorithm

$\Omega(n!)$ time

Dijkstra's shortest path algorithm

Dijkstra's shortest path algorithm



$d'(w) = \min_{e=(u,w) \text{ in } E,\ u \text{ in } R} d(u)+l_e$

d(s) = 0

d(u) = 1

d(w) = 2

d(x) = 2

d(y) = 3

d(z) = 4

Input: Directed G=(V,E), $l_e \geq 0$, s in V

R = {s}, d(s) =0

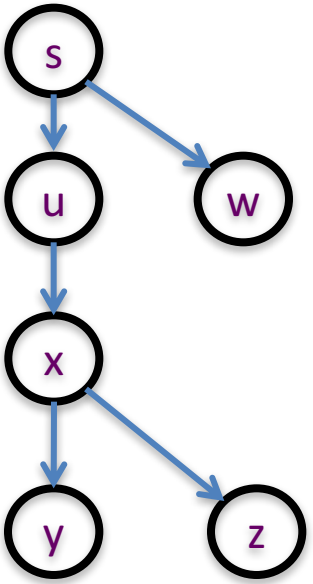
While there is a x not in R with (u,x) in E, u in R

Pick w that minimizes d'(w)

Add w to R

d(w) = d'(w)

Shortest paths



Couple of remarks

The Dijkstra's algo does not explicitly compute the shortest paths

Can maintain "shortest path tree" separately

Dijkstra's algorithm does not work with negative weights

Left as an exercise