CSL 630 July 24, 2014

Lecture 1

Lecture notes : posted on the course page

Reference books

→ Cormen Leiserson Rivest

→ Aho Hopcroft Ullman

→ Dasgupta, Papadimitriou, Vazirani

→ Kleinberg & Tardos

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$

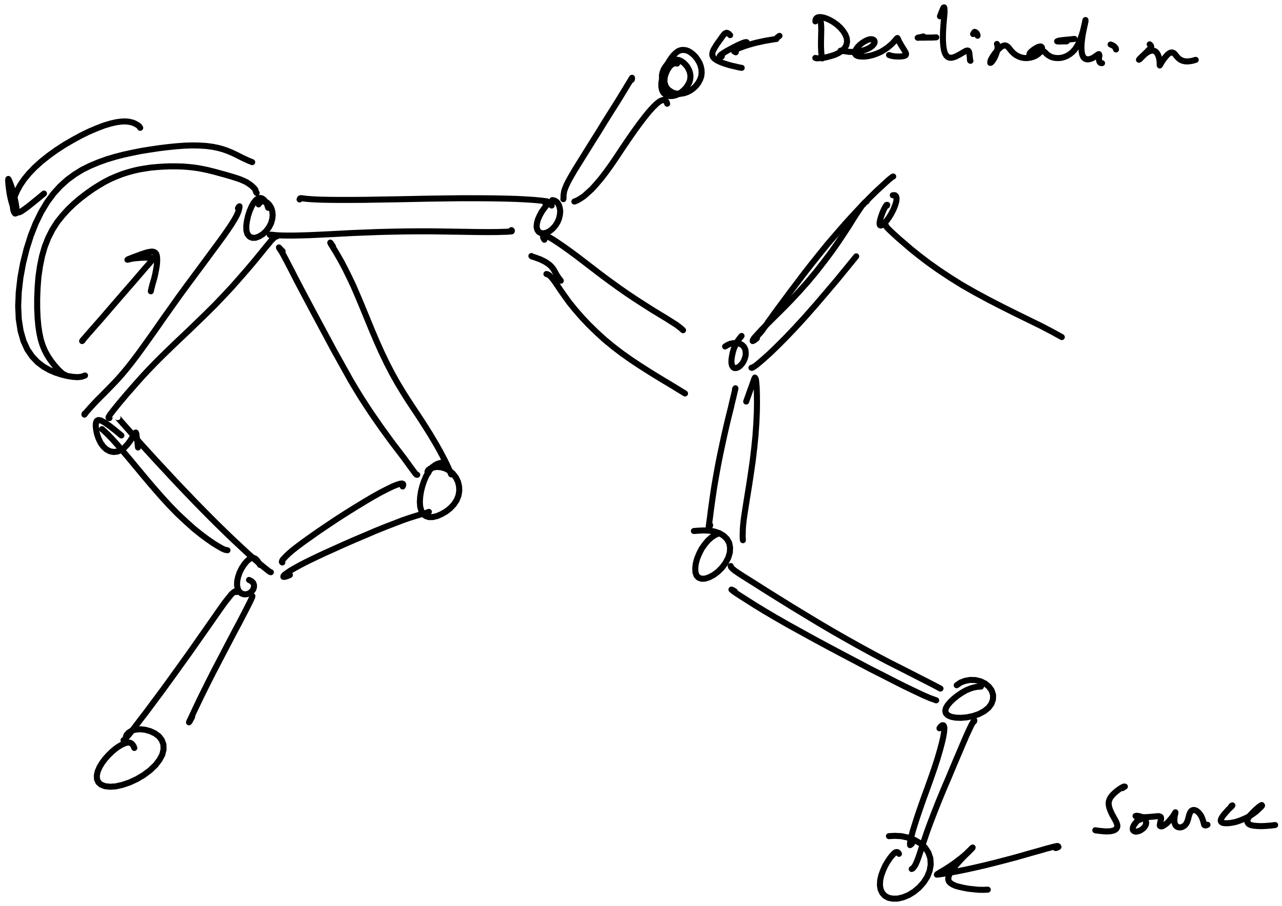
$$= 2T(\sqrt{n}) + n^2$$

Lecture Notes on discrete Structures

Evaluation components :

2 Minor Ex	Assignments (h.w. + prog)	Major
20% each	20%	40%

Shortest Path problem



Single source Shortest path

Dijkstra's algorithm

$$G = (V, E)$$

edges

set of vertex

$$w : E \to \mathbb{R}^+$$

$$V = U + W$$

U	W
all vertices for which we know the shortest path	Yet to be computed

Initialize $U \leftarrow s$

Labels on vertices $\delta(v)$ for $v \in V$

$$\delta(v) \leftarrow \infty$$

(upper bound on shortest path distance to v from s

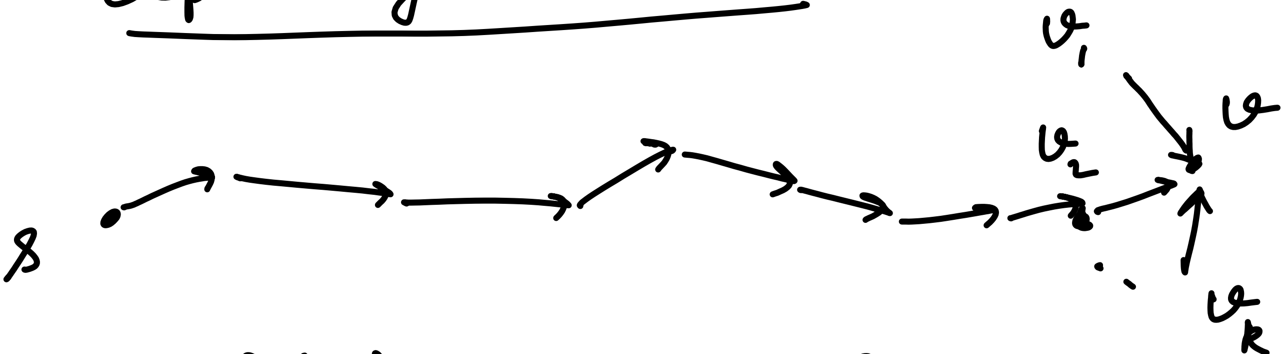
$D(v)$: exact shortest path distance

$$D(v) \leq \delta(v)$$

$$D(s) = 0 = \delta(s)$$

Over the iterations we improve $\delta(v)$ until $\delta(v) = D(v)$

Updating labels



$$\delta(v) \leq \min_i \delta(v_i) + w(v_i, v)$$

Shortcut

For any edge $(\overrightarrow{v_i, v})$ $\delta(v) := \delta(v_i) + w(v_i, v)$

Dijkstra vs. Bellman Ford

non-negative vs negative

<u>BF</u>:

Repeated $|V|-1$ times
[In any round, we shortcut all edges (in any sequence)
$O(|E|)$

$O(|V| \cdot |E|)$

<u>Correct</u>?

The no. of edges in a shortest path varies between 0 to $|V|-1$