

CSE 101

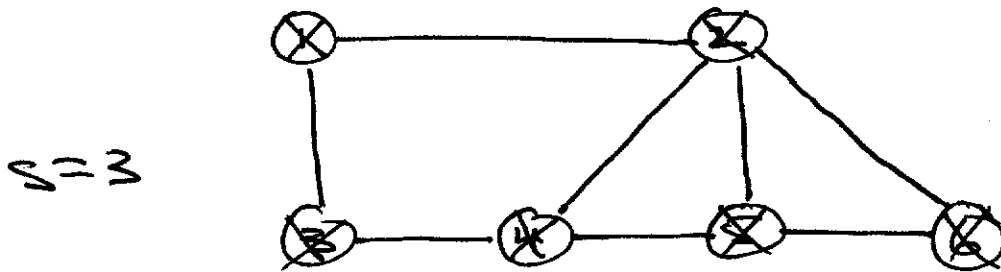
1-18-22

11

Pa2: ext 1 more day.

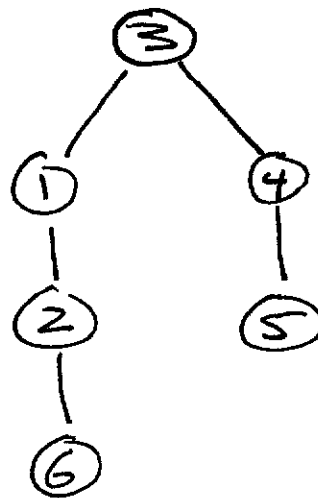
BFS, same example, same source

Quick way:



Q: ~~3~~ ~~1~~ ~~4~~ ~~2~~ ~~5~~ ~~6~~

BFS Tree:



dist

0

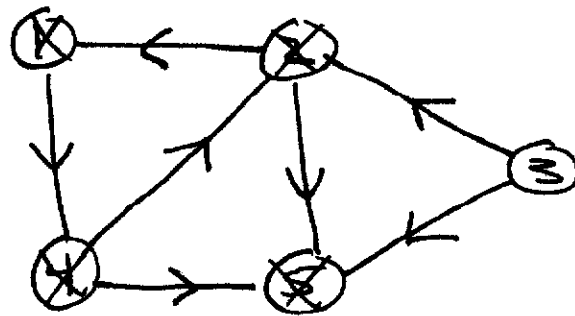
1

2

3

Bx

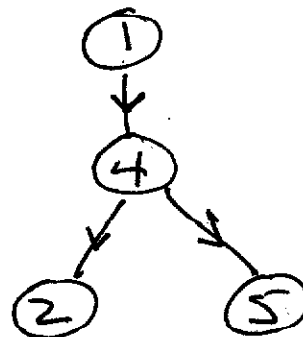
$S = 1$



	adj	color	d	p
1	4	b	0	nil
2	1 5	b	2	4
3	2 5	w	∞	nil
4	2 5	b	1	1
5		b	2	4

Q: X 4 2 5

BFS tree:



dist

0

1

2

Defn

The Predecessor Subgraph is

$$T = (V_p, E_p)$$

where

$$V_p = \{x \in V(G) \mid P[x] \neq \text{nil}\} \cup \{s\}$$

$$E_p = \{(P[x], x) \mid P[x] \neq \text{nil}\}$$

note: $|E_p| = |V_p| - 1$

also: T has no cycles.

Therefore: T is a tree

(connected and acyclic)

Exercise

Re-run BFS on both graphs with

- different sources
- different adj list orders.

make up other examples

How to extract shortest paths
from PLI array

see $\text{PrintPath}(G, s, x)$

adj-list rep source destination

Depth First Search

vertex attributes:

- $color[x]$: white, gray, black
- $P[x]$: Predecessor or Parent
- $d[x]$: discover time
- $f[x]$: finish time

variable: time $\in \{0, 1, 2, 3, \dots, 2n-1\}$ #vertices
↓

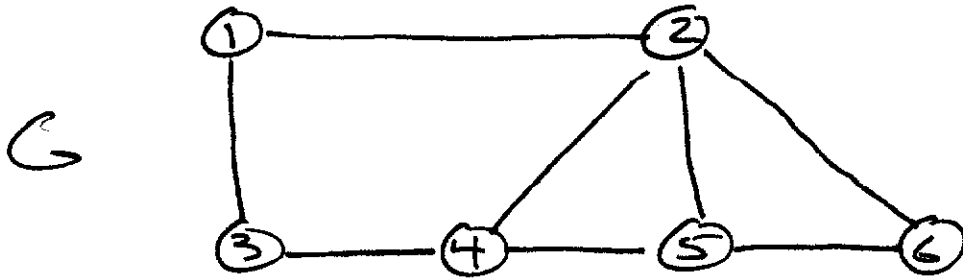
helper fn: $visit(x)$

Two fns: $\cdot DFS(G)$

- $visit(x)$, recursive

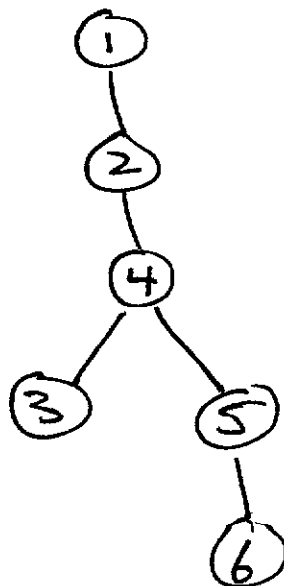
See Pseudo-code.

Ex,



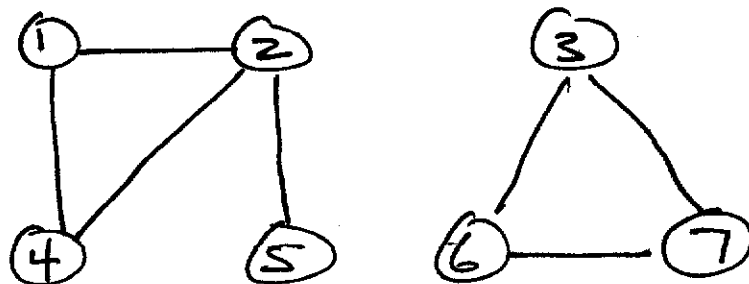
		adj	color	d	f	p
✓	1	<u>2</u> <u>3</u>	w/g/b	1	12	n
✓	2	<u>1</u> <u>4</u> <u>5</u> <u>6</u>	w/g/b	2	11	x/1
✓	3	<u>1</u> <u>4</u>	w/g/b	4	5	x/4
✓	4	<u>2</u> <u>3</u> <u>5</u>	w/g/b	3	10	x/2
✓	5	<u>2</u> <u>4</u> <u>6</u>	w/g/b	6	9	x/4
✓	6	<u>2</u> <u>5</u>	w/g/b	7	8	x/5

DFS Forest



Ex.

C



	adj	color	d	f	p
1	2 4	w			n
2	1 4 5	w			n
3	6 7	w			n
4	1 2	w			n
5	2	w			n
6	3 7	w			n
7	3 6	w			n

... next time ...