

- email: Put CSE 101 in your subject line!!
- Pa1: ext. 1 last day
- Pa2: Posted

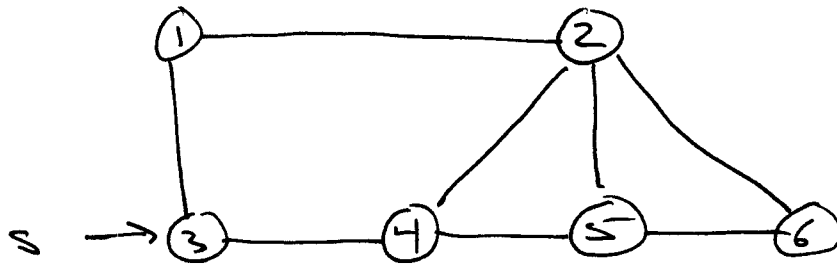
Breadth First Search (BFS)

Vertex attribute: $x \in V(G)$

- $color[x]$: white, gray, black
- $distance[x]$: stores $d(s, x)$
- $parent[x]$: stores Predecessor of x along a shortest $s-x$ Path.

Also use a FIFO Queue Q.

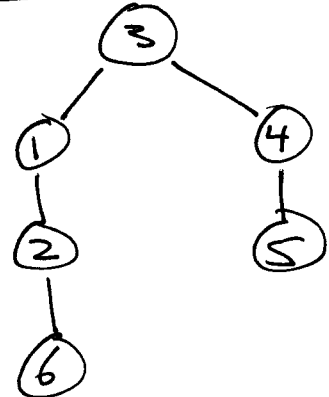
Ex



$$s = 3$$

	adj	color	d	p
1	<u>2</u> <u>3</u>	w g b	1	3
2	<u>1</u> <u>4</u> <u>5</u> <u>6</u>	w g b	2	1
3	<u>1</u> <u>4</u>	g b	0	n
4	<u>2</u> <u>3</u> <u>5</u>	w g b	1	3
5	<u>2</u> <u>4</u> <u>6</u>	w g b	2	4
6	<u>2</u> <u>5</u>	w g b	3	2

BFS-tree



Q: ~~2~~ ~~1~~ ~~4~~ ~~7~~ ~~5~~ ~~6~~

Defn

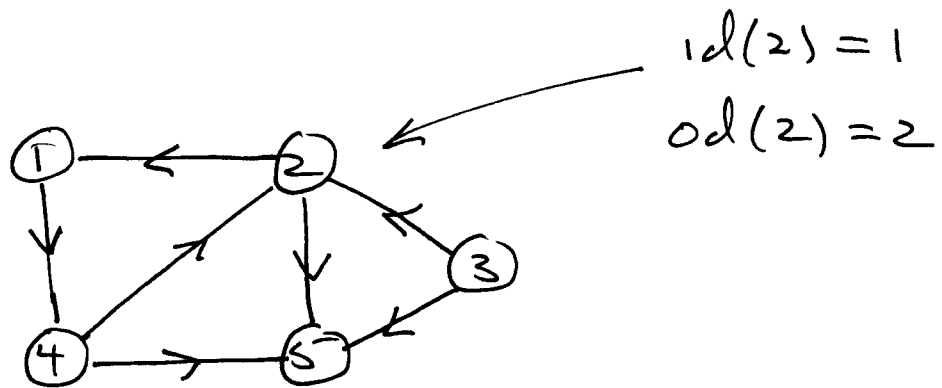
A directed g-graph (digraph) is pair

$$G = (V, E)$$

- $V \neq \emptyset$
- $E \subseteq V \times V$

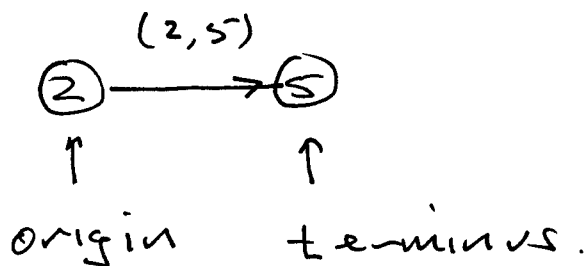
Ex.

$$\boxed{S=1}$$



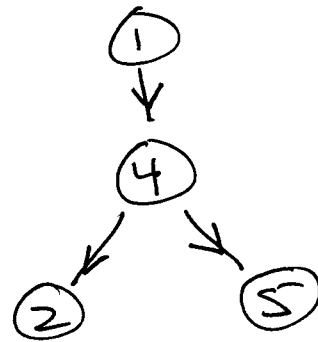
$$V = \{1, 2, 3, 4, 5\}$$

$$E = \{(1, 4), (2, 1), (2, 5), (3, 2), (3, 5), (4, 5)\}$$



adj list representation

	adj	c	d	p
1	<u>4</u>	g b	0	n
2	<u>1</u> <u>5</u>	w g b	2	4
3	2 <u>5</u>	w	2	n
4	<u>2</u> <u>5</u>	w g b	1	1
5		w g b	2	4

Q: $\times \neq \neq \neq$ RFS-treeP-ancestor subgraph : $G_p = (V_p, E_p)$

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

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

ordered pair in digraph

unordered pair in (undirected) graph

how to extract shortest Paths
from Parent[] ?

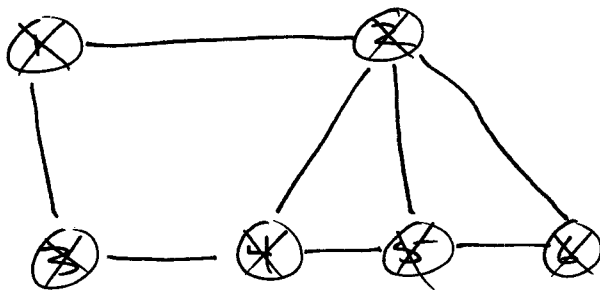
use recursion!

PrintPath(G, s, x)

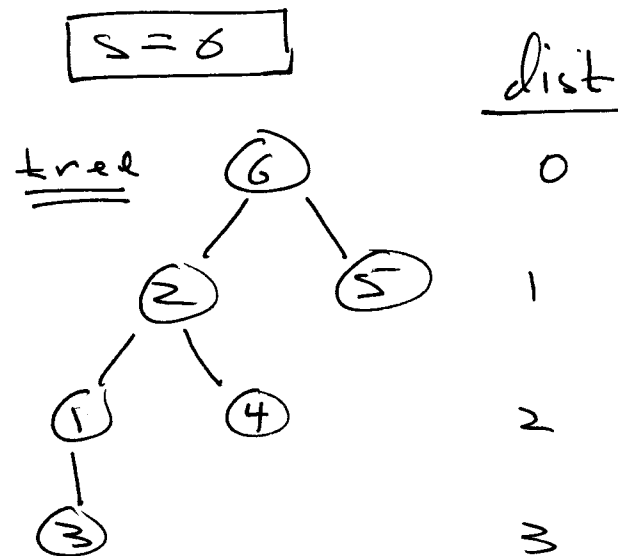
Precond: BFS(G, s) was run

i.e. s is most recent source.

Ex. first example again, diff source.

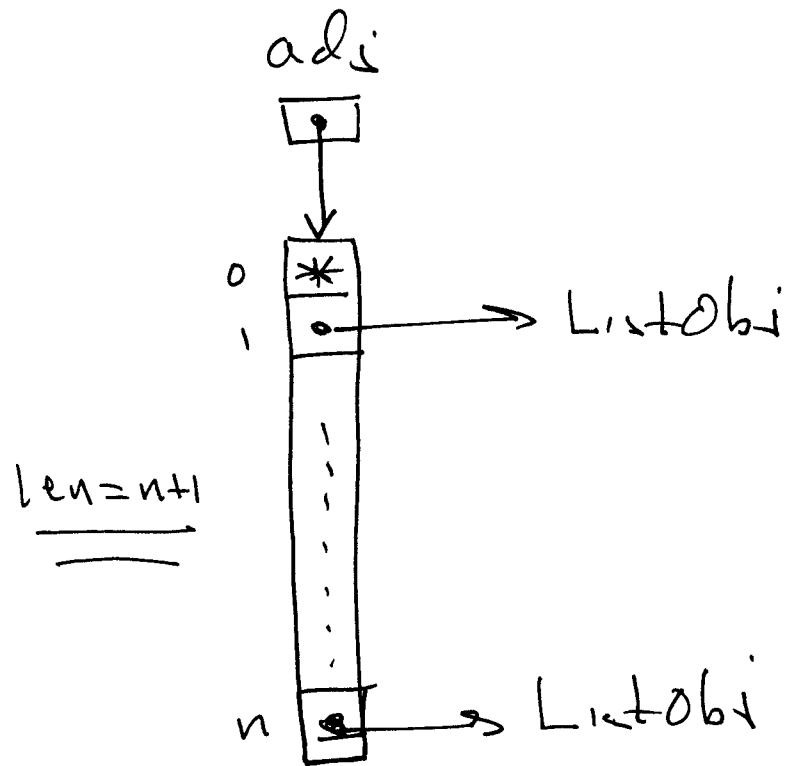


Q: 6 7 8 9 4 3



Par 2 : Graph Obj

field for adj list rep



`List* adj;`

in Graph constructor

new Graph(n)

Graph G = malloc(sizeof(GraphObj));

G->adj = calloc(n+1, sizeof(List));

Pal :

input file :

one-two \n
 \n
 three \n
 \n
 four \n \EOF

0	1	2	3	4	5	6
t	h	r	e	e	\n	0

↑ fgets()

array:

0	1	2	3	4
"one-two"	" "	"three"	" "	"four"