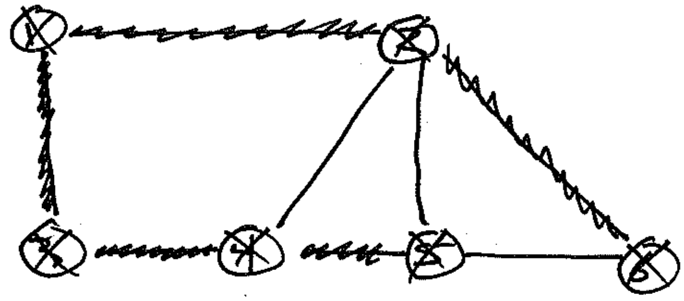
CSE 101 1-25-24

- Thur. mid 1 (2-1-24)

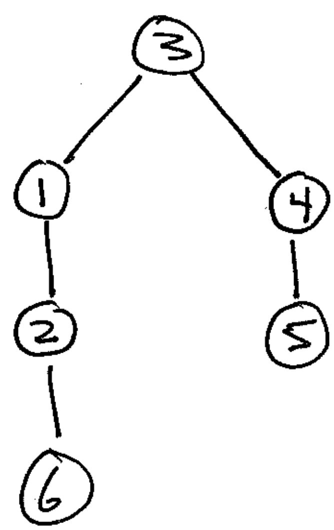
Ex

S=3



Q: 3 1 4 2 5 6

BFS Tree:



dist = depth

0

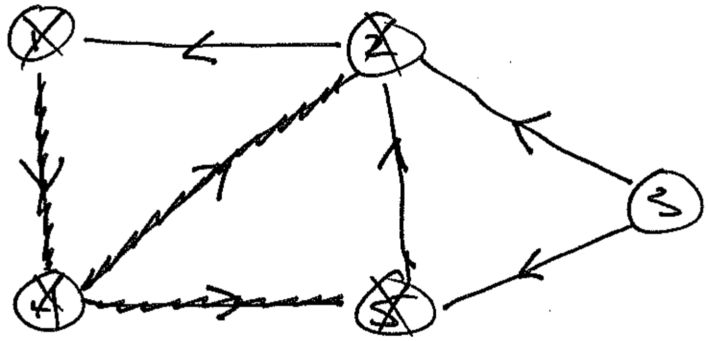
1

2

3

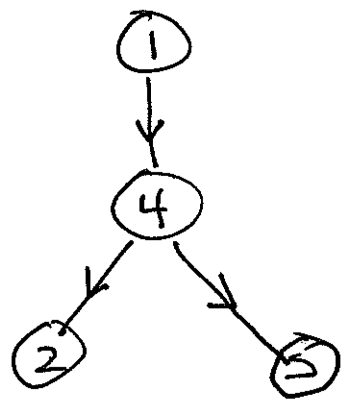
Ex.

s = 1



Q: 1 4 2 5

BFS tree:



dist

0

1

2

	adj	color	dist	parent
1	4	b	0	nil
2	1	b	2	4
3	2 5	w	∞	nil
4	2 5	b	1	1
5	2	b	2	4

Predecessor subgraph (BFS tree)

$$T = (V_p, E_p)$$

where

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

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

↑ ordered pair if digraph
unordered pair if graph

Theorem:
The predecessor subgraph is a shortest paths tree.

Depth First Search (DFS)

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

- color[x] : w, g, b
- P[x] : parent of x
- d[x] } : time stamps
- f[x] }

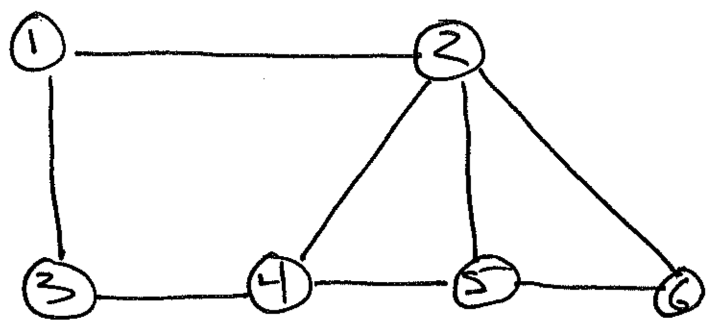
Visit(x) recursive sub-algorithm.

time: variable static over all calls to Visit()

$$0 \leq time \leq 2n$$

where $n = |V(G)|$.

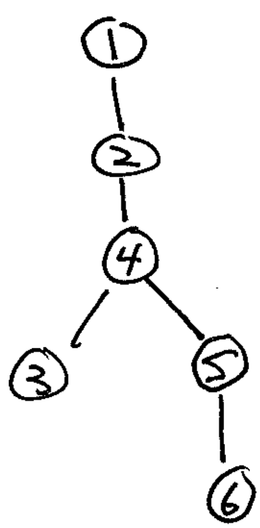
Ex



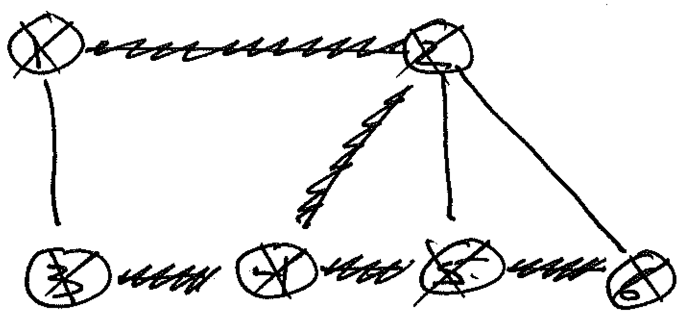
	adj	color	d	f	p
→ 1	2 3	~~w~~ ~~g~~ b	1	12	n
✓ 2	1 4 5 6	~~w~~ ~~g~~ b	2	11	~~n~~ 1
✓ 3	1 4	~~w~~ ~~g~~ b	4	5	~~n~~ 4
✓ 4	2 3 5	~~w~~ ~~g~~ b	3	10	~~n~~ 2
✓ 5	2 4 6	~~w~~ ~~g~~ b	6	9	~~n~~ 4
✓ 6	2 5	~~w~~ ~~g~~ b	7	8	~~n~~ 5

time = ~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~ ~~10~~ ~~11~~

DFS Forest:



Easy way:



DFS forrest: