CSE 101-02 1-24-23

How to extract a shortest path from Parent[ ].

Defn

Predecessor subgraph : $T = (V_p, E_p)$

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

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

This is a shortest paths tree.

See `printPath()` in /Examples

recursion !

Depth First Search (DFS)

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

- color[x] : w, g, b
- P[x] : Parent or Predecessor
- d[x] : discover time
- f[x] : finish time.

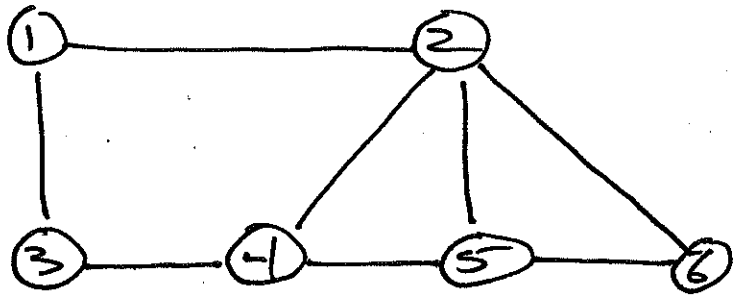
$$0 \leq time \leq 2 \cdot n$$

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

- helper function Visit(x), recursive.
- time is ~~static~~ over all calls to Visit().

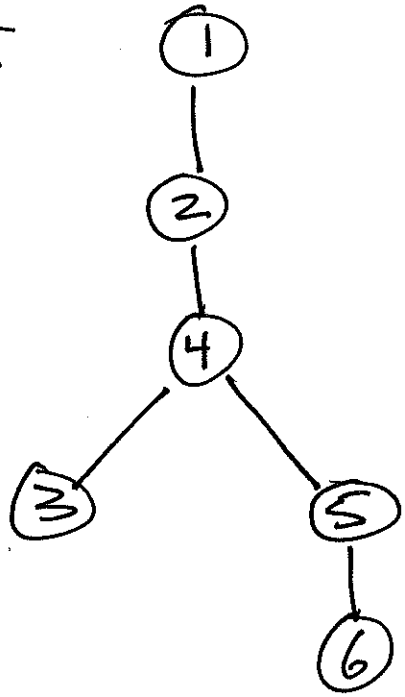
see DFS(G) and Visit(x):

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

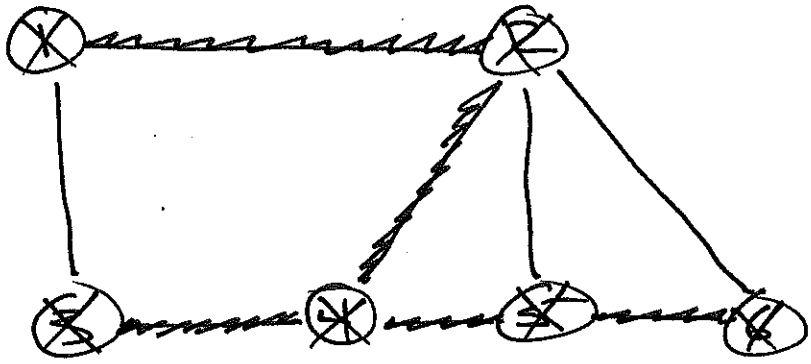
DFS Forest



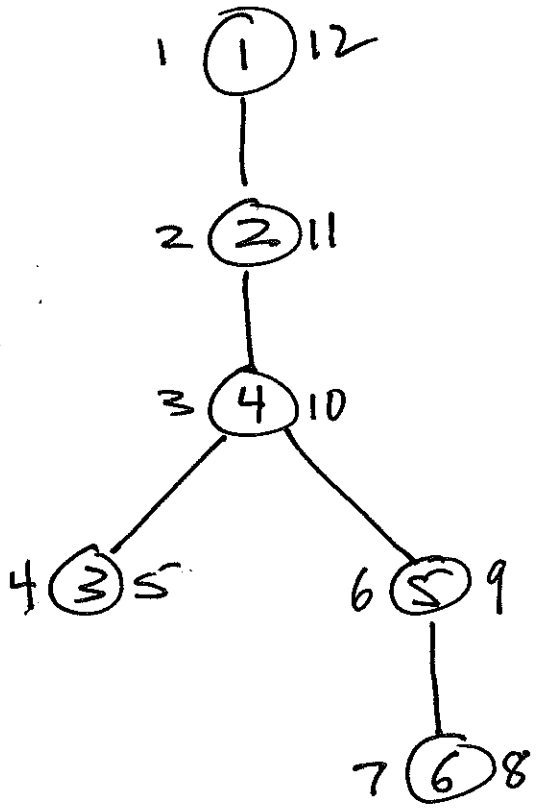
time

~~0~~
1
~~2~~
~~3~~
~~4~~
~~5~~
~~6~~
~~7~~
~~8~~
~~9~~
~~10~~
~~11~~
12

Ex. same

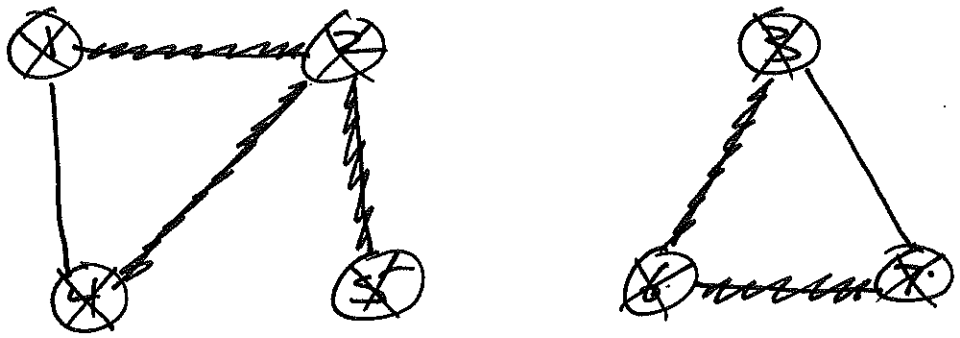


DFS Forest

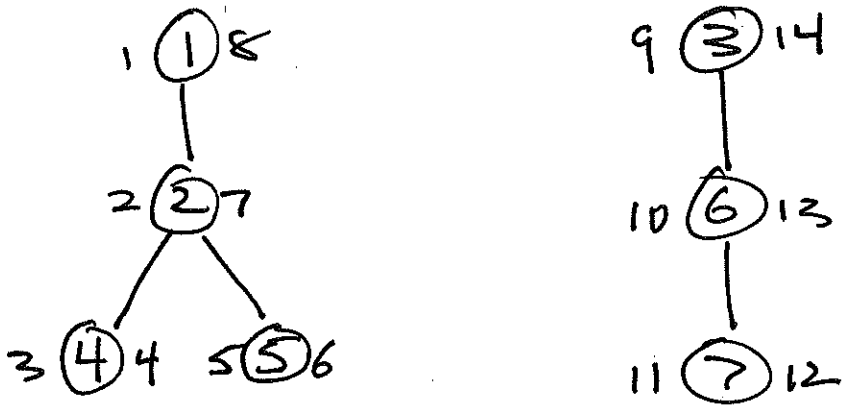


Ex. H_1 H_2

G



DFS forest

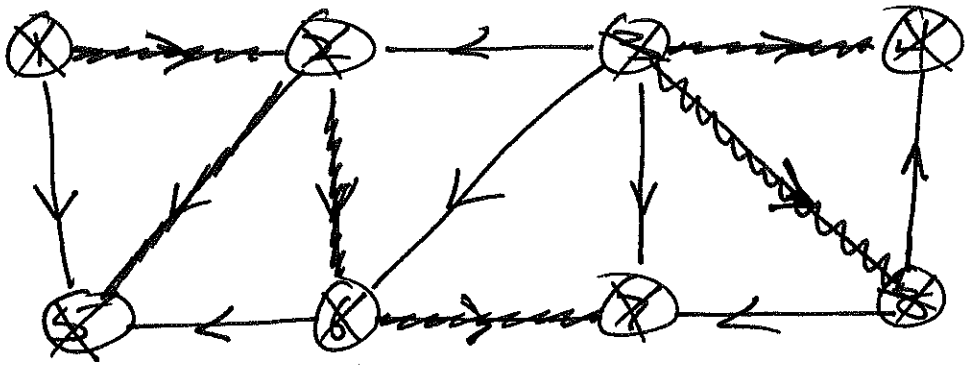


Connected components of G

$H_1 = (\{1, 2, 4, 5\}, \{12, 14, 24, 25\})$

$H_2 = (\{3, 6, 7\}, \{36, 37, 67\})$

Ex.



DFS Forest: