Graphs

Tuesday, November 24, 2020 5:00 PM

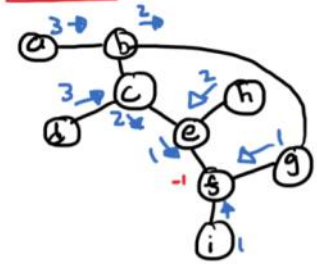
Reminder: lab 7 is due next Monday :)

BFS: O(V+E)

Example: (from last Thursday)

Isaiah

Example:



Figo

f/i/e/g/b/h/a/c/d

Code:

(12) v_{12} v_6 v_5 v_3 v_2 v_1

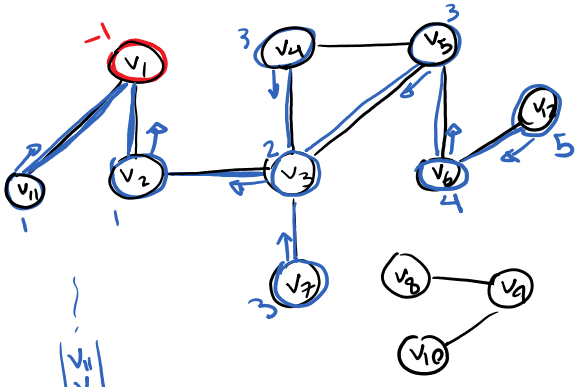
null ← v.parent

null ← v.dst

→ v.adj

start vertex

BFS(S)



v_{11} v_2

for ($v_i \in u.adj$)

if $v_i.p$ == null

{

}

end

Khai

```
BFS(s)
    s.parent = s or -1
    s.dst = 0
    queue = []
    queue.append(s)
    dst = 1
    while(queue.size > 0)
        curr = queue.pop(0) // current node
        neighbors = curr.adj // list of neighbors
        size = neighbors.length
        for i = 1:size)
            if(neighbors[i].parent == null)
                neighbors[i].dst = (curr.dst+1)
                neighbors[i].parent = curr
                queue.append(neighbors[i])
```

Fifo

Θ(1)

at most V times

O(V)

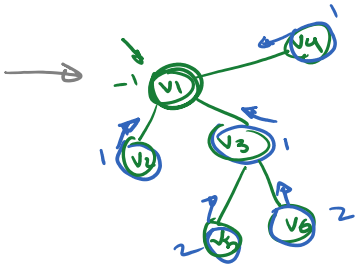
O(V)

deg(v_1)

deg(v_2)

while

O(E)



runtime = Θ(1) + O(V) + O(E)

= O(V+E)

V	
5	0

V	deg(v_i)
5	5

$$\sum_{j=1}^{|V|} \text{for loop} = \sum_{j=1}^{|V|} \sum_{i=1}^{deg(v_j)} c$$

$j=1$ ← while loop

$$= \sum_{j=1}^{|V|} deg(v_j) = \begin{cases} 2E & \text{undir} \\ E & \text{dir} \end{cases} = O(E)$$

$deg(v_1) + deg(v_2) + deg(v_3) + \sim\sim$

another way

while (3 lines + for loop)

$$\sum_{j=1}^{|V|} (3 + \text{for loop}) \leq \sum_{j=1}^{|V|} (3 + deg(v_j)) \leq 3|V| + O(E)$$

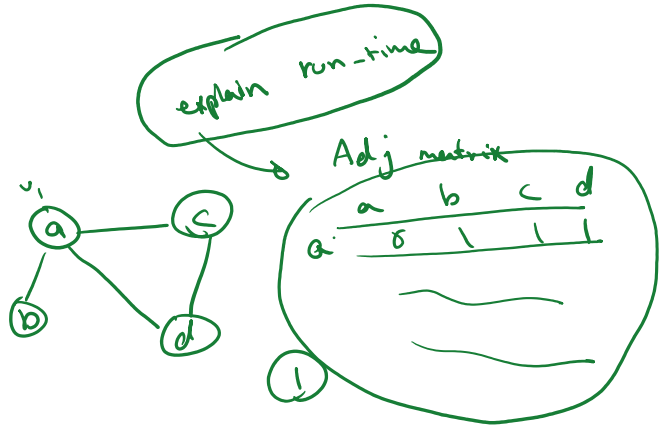
$$\Rightarrow O(V + E)$$

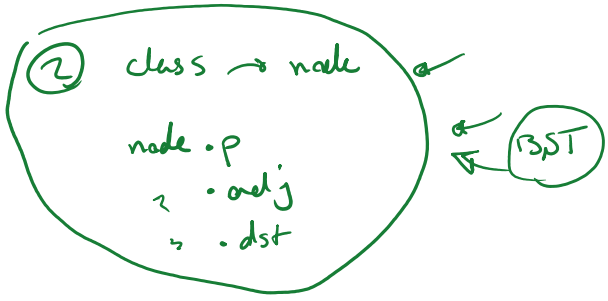
lab 7

part 1 → BFS (b , adj)

(b)

for → dist
↳ direction





2nd PDF file

① print output

② explain runtime for BFS if using adj matrix to present graphs

Part 2

Bipartite