CS367 Lecture 29

Tuesday 5 August 2014

Announcements/Reminders:

- P4 due tonight

Last class:

- Graphs (cont'd)
    - Using Edge Representations
    - Searches/Traversals: Depth-First Search

Today:

- Graphs (cont'd)
    - Breadth-First Search
    - Dijkstra's Shortest Path Algorithm

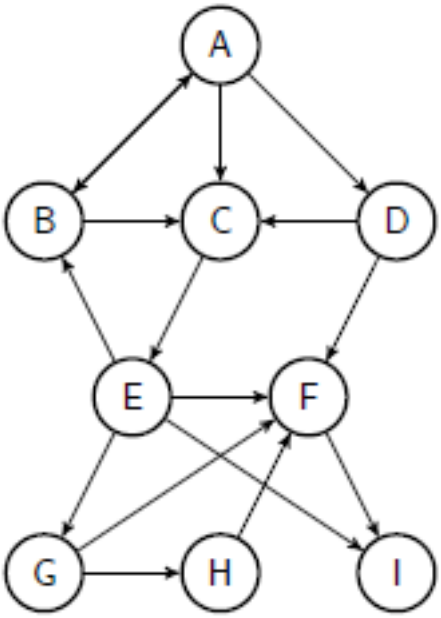
Breadth-First Search (BFS)

What kind of questions can we answer?

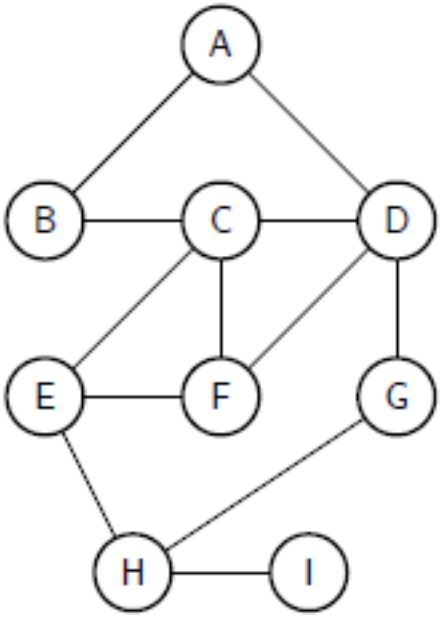
Using a queue:

BFS Examples

Graph 1



Graph 2



BFS node visit order beginning at A:

Graph 1:

Graph 2:

BFS spanning tree starting at A:

Graph 1:

Graph 2:

Graph Algorithms

What kind of questions do we want to ask about graphs?

Cycle Detection

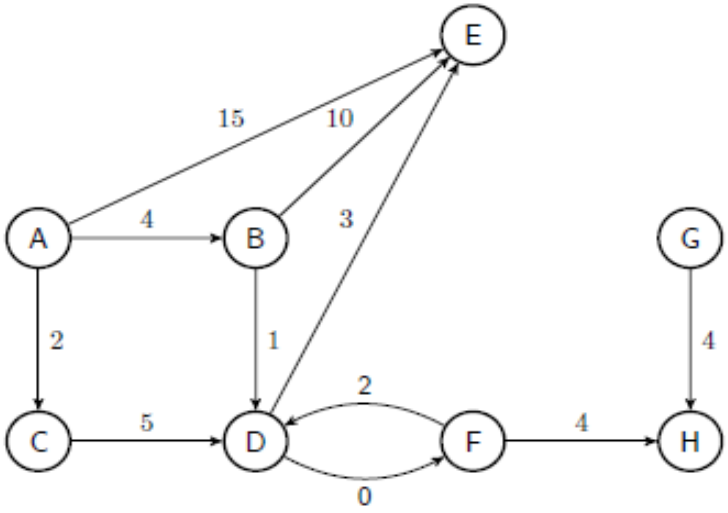
Path Detection

Finding Shortest Paths: Dijkstra's Algorithm

Problem:

Solution Strategy:

Example:



Priority Queue:

Costs and predecessors:

Dijkstra's Algorithm (cont'd)

Pseudocode:

```
Given: Start node s

foreach node u reachable from s:
    init u.dist to infinity
    init u.predecessor = null
    init u.visited = false

PQ = new priority queue
PQ.insert(<0,s>)

while PQ is not empty:

    <u.dist, u> = PQ.removeMin()

    foreach unvisited neighbor v of u:

        // if v.dist can be improved i.e.
        if v.dist > u.dist + cost(u,v):

            // update v.dist to be the path thru u
            v.dist = u.dist + cost(u,v)

            // set v's predecessor
            v.predecessor = u

            insert <v.dist, v> into PQ
            OR update if v is already in PQ

    mark u as visited
```

A `finished` node will never be visited again!