Graphs II

Announcements

• Huffman – Due tomorrow
  • Burrows-Wheeler – Due Thursday
• APT Set 7 – Posted tomorrow
  • graphs and make-up APTs
### Results

- One of my favorite TV shows
• Graphs!
  • Examples
  • DFS
  • BFS
  • Dijkstra’s Algorithm
Facebook

- Graph Search
  - https://www.facebook.com/about/graphsearch

PageRank

- Google web search algorithm for measuring importance
PageRank

• Google web search algorithm for measuring importance
  • Named for inventor Larry Page

Today

• Graphs!
  • Examples
  • DFS
  • BFS
  • Dijkstra’s Algorithm
DFS

```java
private void dfs(String vertex, Set<String> visited){
    if(visited.contains(vertex)) return;
    visited.add(vertex);
    System.out.print(vertex + " ");
    for(String adj : myGraph.get(vertex)){
        dfs(adj, visited);
    }
}
```

What is a DFS from Winterfell?
What is a DFA from King’s Landing?
private void bfs(String vertex, Queue<String> q) {
    Set<String> visited = new TreeSet<String>();
    q.add(vertex);
    visited.add(vertex);

    while (!q.isEmpty()) {
        String v = q.remove();
        System.out.print(v + " ");
        for (String adj: myGraph.get(v)) {
            if (!visited.contains(adj)) {
                q.add(adj);
                visited.add(adj);
            }
        }
    }
}
What is the shortest path from The Wall to Essos?

Dijkstra’s Algorithm

• Solve shortest-path problem from A to B for non-negative path weights.
Dijksra’s Algorithm

- Solve shortest-path problem from A to B for non-negative path weights.

What is the shortest path from The Wall to Essos?

![Graph showing shortest path from The Wall to Essos with distances and weights]
What is the shortest path from The Wall to Essos?

- The Wall
- Winterfell (4)
- Essos (∞)
- Riverrun (∞)
- King's Landing (∞)
- Harrenhal (∞)
- The Twins (4)

Path: The Wall → Winterfell → Essos
Distance: 4

Path: The Wall → Riverrun → Essos
Distance: ∞
What is the shortest path from The Wall to Essos?
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What is the shortest path from The Wall to Essos?
What is the shortest path from The Wall to Essos?

```
      The Wall
      /   \
    4    4
  Winterfell    The Twins
  /  \
4     10
Riverrun        Harrenhal
  /  \
5     19
  King's Landing
  /  \
6     34
    Essos
```

What is the shortest path from The Wall to Essos?

```
      The Wall
      /   \
    4    4
  Winterfell    The Twins
  /  \
4     10
Riverrun        Harrenhal
  /  \
5     19
  King's Landing
  /  \
6     34
    Essos
```

```
What is the shortest path from The Wall to Essos?

Your turn. What is the shortest path from Riverrun to Essos?
Today

• Graphs!
  • Examples
  • DFS
  • BFS
  • Dijkstra’s Algorithm