Written Exercises

Homework 9 Graph

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1. What is the big-Oh space complexity of an adjacency list? Justify your answer.

If every m is the number of edges in a graph, then the space complexity if O(n + m), where n represents the number of nodes in the graph. In the worst case of a complete graph, which every node is connected to all other nodes in the graph the space complexity can be O(N^2 + N).

2. What is the big-Oh space complexity of an adjacency matrix? Justify your answer.

Assuming the graph has n vertices, the space complexity is O(N^2) for adjacency matrix. Given a graph, to build the adjacency matrix, we need to create a square n * n matrix and fill its values with 0 and 1, so it costs us O(N^2) spaces.

3. What is the big-Oh time complexity for searching an entire graph using depth-first search (DFS)? Does the representation of the graph make a difference? Justify your answer.

In the case of a graph, the time complexity for depth-first search is O(V+E) where V is the number of vertexes and E is the number of edges. The graph representation will make difference, for adjacency lists representation, the time complexity will be O(V+E), while for the adjacency matrix representation, the time complexity will be O(V + V^2) = O(V^2).

4. What is the big-Oh time complexity for searching an entire graph using breadth-first search (BFS)? Does the representation of the graph make a difference? Justify your answer.

In the case of a graph, the time complexity for depth-first search is O(V+E) where V is the number of vertexes and E is the number of edges. The graph representation will make difference, for adjacency lists representation, the time complexity will be O(V+E), while for the adjacency matrix representation, the time complexity will be O(V + V^2) = O(V^2).