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CSE 310

Professor Xue

Project 3 Report

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The density of graph network01 undirected is:

$$D_{undirected} = \frac{2(14)}{8(8-1)} = 0.5$$

The density of graph network01 directed is:

$$D_{directed} = \frac{(14)}{8(8-1)} = 0.25$$

The density of graph network02 undirected is:

$$D_{undirected} = \frac{2(179179)}{175813(175813-1)} = 0.0000116$$

The density of graph network02 directed is:

$$D_{directed} = \frac{179179}{175813(175813-1)} = 0.0000058$$

An adjacency list is better to show the data regarding sparse graphs, where $|E|$ is less than $|V|^2$, and an adjacency-matrix is better to show the data for dense graphs, where $|E|$ is closer to $|V|^2$. The space complexity while using an adjacency list to represent the graph is $\theta(V + E)$, whereas, an adjacency-matrix to represent the graph is cost $\theta(V^2)$ space. In the code, it will take less space to represent the graph as an adjacency-list.

The depth-first search performed on the undirected graph for network01will add 1 tree to the forest, and the DFS performed on the directed graph for network01will add 2 trees to the

forest. The depth-first search performed on the undirected graph for network02 and directed graph for network02 both will add 1 tree to the forest.

Depth-first search saves time, because it is useful in determining if a path exists in Dijkstra's algorithm. However, it does not guarantee that the path found will be the shortest. This is because of edge weights. In the graph, depth-first search will not be able to find the path if the destination vertex and source vertex are not located in the same tree.