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Project 2 - Social Network (Undirected Graph Application)

Documentation

Brief description of the implementation of Graph Representation, Breadth-First Search, and Depth-First Search

To model the graph data structure, we used an adjacency list representation, where the list of vertices and the adjacent vertices of each vertex were represented using a linked list. Also, this is to model its structure accurately and flexibly, regardless of the number of inputted vertices. For the traversal algorithms, we used our previous stack and queue data structures from MCO1 with some notable modifications. We refactored it to accommodate the vertices, as well as, integrate a linked list structure to achieve consistency.

To formulate the algorithm for both traversals, we followed the sequence specified in the discussions using stacks and queues effectively. We used a queue to facilitate the traversal using Breadth-first Search. First, we enqueued and dequeued the root vertex to simulate visiting a vertex. After that, whenever a vertex is dequeued (visited), we would enqueue their adjacent vertices, if any, and do subsequent enqueuing and dequeuing following that motif. Every time a vertex that is not the root vertex is dequeued, the previously dequeued vertex will now point to the newly dequeued vertex, hence forming a linked list that follows the traversal. For Depth-first Search, we used a stack to facilitate the traversal. First, we pushed the root vertex and the adjacent vertices following the longest path ascendingly to simulate visiting. After that, we would pop the stack until we reached a vertex adjacent to other unvisited vertices. We would then follow this motif until every vertex is visited and the stack is empty.

Limitations

This program is limited by what is specified in the specifications. Additionally, the program is designed to take vertex ID inputs of a maximum size of 10 and file name inputs of a maximum size of 255. Lastly, the program is designed to handle only vertices of unique IDs.

Distribution of Tasks

- Ethan Axl Burayag - Graph Representation & Depth-First Search
- Ezra Jeonadab Del Rosario - Breadth-First Search

Test Cases

- Test cases are grouped into increasing difficulty.

Legend

BFS - Breadth-first Search
DFS - Depth-first Search

Administrative

Test Description	Sample Input	Expected Output	Actual Output	P/F
Invalid File Input	Invalid.txt	Invalid.txt not found.	Invalid.txt not found.	P
Invalid Starting Vertex Input	Invalid	Vertex Invalid not found.	Vertex Invalid not found.	P

Assume a valid file and starting vertex input from the following test cases

Easy

Test Description	Sample Input	Expected Output	Actual Output	P/F
Sample graph in the Specifications Starting vertex: Bruce	4 Bruce Diana -1 Clark Diana Hal -1 Diana Bruce Clark Hal -1 Hal Clark Diana -1	BFS: Bruce Diana Clark Hal DFS: Bruce Diana Clark Hal	BFS: Bruce Diana Clark Hal DFS: Bruce Diana Clark Hal	P
Sample graph in the Specifications Starting vertex: Clark	4 Bruce Diana -1 Clark Diana Hal -1 Diana Bruce Clark Hal -1 Hal Clark Diana -1	BFS: Clark Diana Hal Bruce DFS: Clark Diana Bruce Hal	BFS: Clark Diana Hal Bruce DFS: Clark Diana Bruce Hal	P
Sample graph in the Specifications Starting vertex:	4 Bruce Diana -1 Clark Diana Hal -1 Diana Bruce Clark Hal -1	BFS: Diana Bruce Clark Hal DFS: Diana Bruce Clark Hal	BFS: Diana Bruce Clark Hal DFS: Diana Bruce Clark Hal	P

Diana	Hal Clark Diana -1			
Sample graph in the Specifications Starting vertex: Hal	4 Bruce Diana -1 Clark Diana Hal -1 Diana Bruce Clark Hal -1 Hal Clark Diana -1	BFS: Hal Clark Diana Bruce DFS: Hal Clark Diana Bruce	BFS: Hal Clark Diana Bruce DFS: Hal Clark Diana Bruce	P

Medium

Test Description	Sample Input	Expected Output	Actual Output	P/F
Graph 2: More Vertices and Edges Starting Vertex: A	8 A B C D -1 B A E -1 C A F G -1 D A H -1 E B -1 F C -1 G C -1 H D -1	BFS: A B C D E F G H DFS: A B E C F G D H	BFS: A B C D E F G H DFS: A B E C F G D H	P
Graph 2: More Vertices and Edges Starting Vertex: B	8 A B C D -1 B A E -1 C A F G -1 D A H -1 E B -1 F C -1 G C -1 H D -1	BFS: B A E C D F G H DFS: B A C F G D H E	BFS: B A E C D F G H DFS: B A C F G D H E	P
Graph 2: More Vertices and Edges Starting Vertex: C	8 A B C D -1 B A E -1 C A F G -1 D A H -1 E B -1 F C -1 G C -1 H D -1	BFS: C A F G B D E H DFS: C A B E D H F G	BFS: C A F G B D E H DFS: C A B E D H F G	P

Graph 2: More Vertices and Edges Starting Vertex: D	8 A B C D -1 B A E -1 C A F G -1 D A H -1 E B -1 F C -1 G C -1 H D -1	BFS: D A H B C E F G DFS: D A B E C F G H	BFS: D A H B C E F G DFS: D A B E C F G H	P
Graph 2: More Vertices and Edges Starting Vertex: E	8 A B C D -1 B A E -1 C A F G -1 D A H -1 E B -1 F C -1 G C -1 H D -1	BFS: E B A C D F G H DFS: E B A C F G D H	BFS: E B A C D F G H DFS: E B A C F G D H	P
Graph 2: More Vertices and Edges Starting Vertex: F	8 A B C D -1 B A E -1 C A F G -1 D A H -1 E B -1 F C -1 G C -1 H D -1	BFS: F C A G B D E H DFS: F C A B E D H G	BFS: F C A G B D E H DFS: F C A B E D H G	P
Graph 2: More Vertices and Edges Starting Vertex: G	8 A B C D -1 B A E -1 C A F G -1 D A H -1 E B -1 F C -1 G C -1 H D -1	BFS: G C A F B D E H DFS: G C A B E D H F	BFS: G C A F B D E H DFS: G C A B E D H F	P
Graph 2: More Vertices and Edges Starting Vertex: H	8 A B C D -1 B A E -1 C A F G -1 D A H -1 E B -1 F C -1 G C -1 H D -1	BFS: H D A B C E F G DFS: H D A B E C F G	BFS: H D A B C E F G DFS: H D A B E C F G	P

Difficult

Test Description	Sample Input	Expected Output	Actual Output	P/F
Graph 3: More Vertices and Edges Starting Vertex: A	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: A B C D E F G H I J K DFS: A B E F C G H J D I K	BFS: A B C D E F G H I J K DFS: A B E F C G H J D I K	P
Graph 3: More Vertices and Edges Starting Vertex: B	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: B A E F C D G H I J K DFS: B A C G H J D I K E F	BFS: B A E F C D G H I J K DFS: B A C G H J D I K E F	P
Graph 3: More Vertices and Edges Starting Vertex: C	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: C A G H B D J E F I K DFS: C A B E F D I K G H J	BFS: C A G H B D J E F I K DFS: C A B E F D I K G H J	P
Graph 3: More Vertices and Edges	11 A B C D -1 B A E F -1 C A G H -1	BFS: D A I B C K E F G H J DFS: D A B E F C G H J I K	BFS: D A I B C K E F G H J DFS: D A B E F C G H J I K	P

Starting Vertex: D	D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1			
Graph 3: More Vertices and Edges Starting Vertex: E	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: E B A F C D G H I J K DFS: E B A C G H J D I K F	BFS: E B A F C D G H I J K DFS: E B A C G H J D I K F	P
Graph 3: More Vertices and Edges Starting Vertex: F	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: F B A E C D G H I J K DFS: F B A C G H J D I K E	BFS: F B A E C D G H I J K DFS: F B A C G H J D I K E	P
Graph 3: More Vertices and Edges Starting Vertex: G	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: G C A H B D J E F I K DFS: G C A B E F D I K H J	BFS: G C A H B D J E F I K DFS: G C A B E F D I K H J	P
Graph 3: More Vertices	11 A B C D -1	BFS: H C J A G B D E F I K	BFS: H C J A G B D E F I K	P

and Edges Starting Vertex: H	B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	DFS: H C A B E F D I K G J	DFS: H C A B E F D I K G J	
Graph 3: More Vertices and Edges Starting Vertex: I	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: I D K A B C E F G H J DFS: I D A B E F C G H J K	BFS: I D K A B C E F G H J DFS: I D A B E F C G H J K	P
Graph 3: More Vertices and Edges Starting Vertex: J	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: J H C A G B D E F I K DFS: J H C A B E F D I K G	BFS: J H C A G B D E F I K DFS: J H C A B E F D I K G	P
Graph 3: More Vertices and Edges Starting Vertex: K	11 A B C D -1 B A E F -1 C A G H -1 D A I -1 E B -1 F B -1 G C -1 H C J -1 I D K -1 J H -1 K I -1	BFS: K I D A B C E F G H J DFS: K I D A B E F C G H J	BFS: K I D A B C E F G H J DFS: K I D A B E F C G H J	P