Algorithms Lab

Project Evaluation Sheet

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Implementation Analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Algorithm/Data Structure | Used? (Yes/No) | How and where? | Space Efficiency | Time Efficiency |
| Arrays | Yes | Used in graph representation (adjacency list, matrix) and Heap | O(n) | O(n) for storage and access |
| Structures | Yes | Used to model Student data | O(1) | O(1) per operation |
| List | No | - | - | - |
| Stack | No | - | - | - |
| Queue | Yes | Used in BFS and priority queue in Dijkstra/Prim. | O(n) | O(n) for queue operations |
| Binary Tree | No | - | - | - |
| Binary Search Tree | No | - | - | - |
| AVL Tree | No | - | - | - |
| 2-3 Tree | No | - | - | - |
| Red-Black Tree | No | - | - | - |
| Trie | No | - | - | - |
| Heap | Yes | Used in Dijkstra’s algorithm | O(n) | O(log n) for insertion and deletion |
| Lookup Table | No | - | - | - |
| Sparse Table | No | - | - | - |
| Fenwick Tree | No | - | - | - |
| Segment Tree | No | - | - | - |
| Skip List | No | - | - | - |
| Union-Find | Yes | Used in Kruskal’s algorithm for cycle detection. | O(n) | O(n) for each find/union operation |
| Hashing | No | - | - | - |
| DFS | No | - | - | - |
| BFS | Yes | Breadth-First Search for the shortest route in the graph. | O(n) (For the queue) | O(V + E) for graph traversal |
| Bubble Sort | No | - | - | - |
| Selection Sort | No | - | - | - |
| Insertion Sort | No | - | - | - |
| Quick Sort | Yes | Used for sorting everything which is sorted in the project. | O(n) | O(n log n) |
| Merge Sort | No | - | - | - |
| Brute Force String Search | Yes | Used to match strings in student data | O(1) | O(n + m) |
| Rabin Karp | No | - | - | - |
| Boyer-Moore | No | - | - | - |
| Knuth-Morris-Pratt | No | - | - | - |
| Heap Sort | No | - | - | - |
| Kruskal | Yes | Used for MST with union-find and edge sorting. | O(E) | O(E log E) |
| Prim | No | - | - | - |
| Dijkstra | Yes | Used for the shortest path algorithm with priority queue (min-heap). | O(V + E) | O(E log V) |
| Floyd | No | - | - | - |
| Warshall | No | - | - | - |
| Bellman-Ford | No | - | - | - |
| Any Other | No | - | - | - |

**Other Parameters:**

Number of Lines of Code Written: above 500 lines

Number of Functions:47

Design Techniques and Principles used:

* Divide and Conquer (Quick Sort)
* Greedy Algorithm (Kruskal’s algorithms)
* Backtracking (BFS)
* Union-Find for cycle detection in Kruskal’s algorithm