Project 2

# Problem 1 – Maze

A maze is represented as a matrix where is the position/cell located at row x and column . The value at is either the character or , representing an impassable or passable cell, respectively. Write a program to find a path for a robot as follows:

(a) Input the matrix A (MxN) from a text file named inpMC.txt

The file structure is as follows:

* The first line contains two numbers, M and N .
* The next M lines each contain N characters, either or .
* The following line contains a number K.
* The next K lines each contain four non-negative integers a, b, c, d.

(b) Determine whether there is a valid path for the robot

* The robot starts at and must move to .
* The robot can only move through adjacent cells (either in the same row or the same column) that contain the character .

(c) Output to a text file named outMC.txt

* The file should contain K lines, each containing or , corresponding to whether the robot can or cannot move from to .
* If or contains , the output should be .

Example

|  |  |
| --- | --- |
| inputMC.txt | outMC.txt |
| 5 5 O O O O X X X X O X X X O O X X O X O X X X X O X 4 0 0 4 3 0 4 1 3 0 2 1 1 0 0 3 1 | YES  NO  NO  NO |

# Problem 2 – Insert and Remove Elements

Write a program using Heap to perform the following tasks:

(a) Read input from a text name inpTB.txt

The file structure is as follows:

* The first line contains an integer N (N ≤ 10⁵).
* The second line contains an array A of N elements, where each element is a non-negative integer not exceeding 10⁹.
* The third line contains an integer M (M ≤ 10⁴).
* The next M lines each contain an integer Q, performing one of two operations:
* Q = -1: Output the smallest element in A and remove it from the array.
* Q is a non-negative integer (Q ≤ 10⁹): Insert Q into the array.

(b) Output to a text file named outTB.txt

* The file should contain a number of lines (≤ M), corresponding to lines where Q = -1.
* Each line should contain the smallest value in A at that moment.

|  |  |
| --- | --- |
| inpTB.txt | outTB.txt |
| 10 1 20 4 7 10 30 15 45 80 60 6 -1 2 5 -1 -1 -1 | 1  2  4  5 |