Problem 499: The Maze III

Problem Information

Difficulty: Hard
Acceptance Rate: 51.10%
Paid Only: Yes
Tags: Array, String, Depth-First Search, Breadth-First Search, Graph, Heap (Priority Queue), Matrix, Shortest Path

Problem Description

There is a ball in a `maze` with empty spaces (represented as `0`) and walls (represented as `1`). The ball can go through the empty spaces by rolling **up, down, left or right** , but it won't stop rolling until hitting a wall. When the ball stops, it could choose the next direction (must be different from last chosen direction). There is also a hole in this maze. The ball will drop into the hole if it rolls onto the hole.

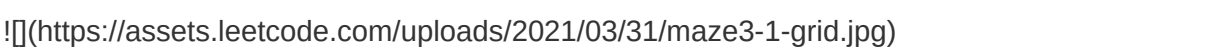
Given the `m x n` `maze`, the ball's position `ball` and the hole's position `hole`, where `ball = [ballrow, ballcol]` and `hole = [holerow, holecol]`, return _a string_`instructions` _of all the instructions that the ball should follow to drop in the hole with the**shortest distance** possible_. If there are multiple valid instructions, return the **lexicographically minimum** one. If the ball can't drop in the hole, return `"impossible"`.

If there is a way for the ball to drop in the hole, the answer `instructions` should contain the characters `'u'` (i.e., up), `'d'` (i.e., down), `'l'` (i.e., left), and `'r'` (i.e., right).

The **distance** is the number of **empty spaces** traveled by the ball from the start position (excluded) to the destination (included).

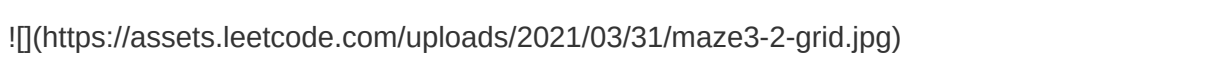
You may assume that **the borders of the maze are all walls** (see examples).

Example 1:



Input: maze = [[0,0,0,0,0],[1,1,0,0,1],[0,0,0,0,0],[0,1,0,0,1],[0,1,0,0,0]], ball = [4,3], hole = [0,1] **Output:** "lul" **Explanation:** There are two shortest ways for the ball to drop into the hole. The first way is left -> up -> left, represented by "lul". The second way is up -> left, represented by 'ul'. Both ways have shortest distance 6, but the first way is lexicographically smaller because 'l' < 'u'. So the output is "lul".

Example 2:



Input: maze = [[0,0,0,0,0],[1,1,0,0,1],[0,0,0,0,0],[0,1,0,0,1],[0,1,0,0,0]], ball = [4,3], hole = [3,0] **Output:** "impossible" **Explanation:** The ball cannot reach the hole.

Example 3:

Input: maze = [[0,0,0,0,0,0,0],[0,0,1,0,0,1,0],[0,0,0,0,1,0,0],[0,0,0,0,0,0,1]], ball = [0,4], hole = [3,5] **Output:** "dldr"

Constraints:

* `m == maze.length` * `n == maze[i].length` * `1 <= m, n <= 100` * `maze[i][j]` is `0` or `1`. * `ball.length == 2` * `hole.length == 2` * `0 <= ballrow, holerow <= m` * `0 <= ballcol, holecol <= n` * Both the ball and the hole exist in an empty space, and they will not be in the same position initially. * The maze contains **at least 2 empty spaces**.

Code Snippets

C++:

```
class Solution {
public:
string findShortestWay(vector<vector<int>>& maze, vector<int>& ball,
vector<int>& hole) {

}
};
```

Java:

```
class Solution {
public String findShortestWay(int[][] maze, int[] ball, int[] hole) {

}
}
```

Python3:

```
class Solution:
def findShortestWay(self, maze: List[List[int]], ball: List[int], hole:
List[int]) -> str:
```