Challenge III

Objective

In this challenge, the participant must get the particle from the start point to the end point in the fewest number of moves without ever passing a live cell = green. With each move the board changes, the participant must calculate the next state of the board and avoid all living cells.

This time our particle has a special power, its individuality. It can change the value of any cell on the board. It can use this trick up to 30 times.

Board

The board for this challenge is a rectangle formed by R * C cells. The cells are arranged in a grid of R rows (horizontal) and C columns (vertical). The rows are numbered 0 to (R - 1) from top to bottom and the columns 0 to (C - 1) from left to right. Each cell is given an ID based on its row and its column ai,j. The first cell is identified by a0,0 and is located in the upper left corner of the board. The first index corresponds to the rows and the second to the columns.

In this board each cell has a state = color, defined based on its value:

1 = alive (green)
0 = dead (white)

However, the initial (starting point) and final (target point) cells are exceptions to this rule. They never assume a value of 0 or 1, can be represented by the color yellow, and are immutable. As long as the particle is in a cell orthogonally adjacent to one of these points it can always access it.

Motion of the particle

The particle begins its trajectory on the initial cell, makes only one move per turn, always orthogonal (Right, Left, Down, Up). It cannot leave the board's limits and cannot finish its movement on a live cell.

The particle begins its move in the current state of the board, and ends its move in the next state. The particle can start movement toward a live cell, but cannot end its movement on a live cell.

Right - an increment in j in the particle's position. If the particle is in cell a3,4 and makes a rightward move it ends its move in cell a3,5

Left - an increment by j in the particle's position. If the particle is in cell a3,4 and moves left it finishes its move in cell a3,3

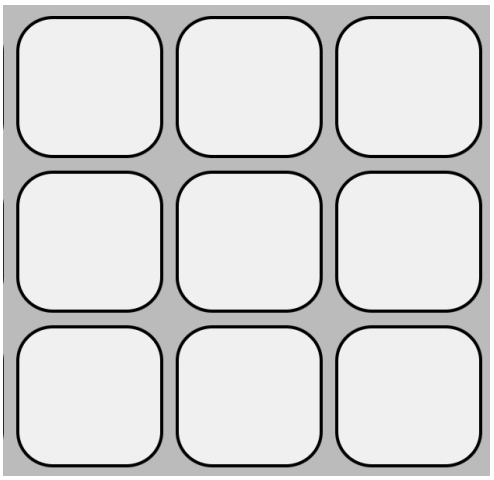
Down - an increment by i in the particle's position. If the particle is in cell a3,4 and moves right it finishes its move in cell a4,4
Up - an i-decrement in the particle's position. If the particle is in cell a3,4 and makes a move up it finishes its move in cell a2,4

Propagation rule

White cells turn green if they have a number of green adjacent cells greater than 1 and less than 5. Otherwise, they remain white.

Green cells remain green if they have a number of green adjacent cells greater than 3 and less than 6. Otherwise, they become white.

Two cells are considered adjacent if they have a border, either on the side, above, below or diagonally. In the example below, the white cell in the center therefore has 8 adjacent white cells.



Individuality

Throughout the challenge, before moving, the particle can activate its individuality by changing the value of any cell on the board, with the exception of the starting point, the end point and the current cell occupied by the particle. The particle can change the value of a cell from 0 to 1 or from 1 to zero.

You are allowed to use the individuality as many times as you want per turn, as long as you always do so before moving and do not exceed the limit of 30 times during the entire challenge.

Order of events:

The particle occupies a cell ai,j in row i and column j with the board in a given configuration. If the particle starts its move the board changes and the particle finishes its move in the changed state of the board and cannot finish its move in a live cell.

If before moving the particle uses its individuality it must only inform the cell that it will be changed, if it signals a live cell it becomes dead, if it signals a dead cell it becomes alive. After using the individuality the board now has a new configuration, then the particle starts its movement, the board is updated considering its state after using the individuality and the particle finishes its movement in the altered state of the board not being able to finish the movement in a live cell.

Input

For this challenge, the participant will receive the initial layout of the board in a text file. 3 represents the starting point and 4 represents the destination point. Immutable cells that never take on the value of 0 or 1. 0 represents dead cells = white and 1 represents live cells = green. Each line in the file represents a row of the board and the values in that row represent the cells. The values are separated by a space and an '\n' character represents the end of the line.

Output

The participant must formulate a text file with their response to the challenge. The file should be named as output3.txt and should contain only one line with all the movements of the particle separated by a space.

R - to the right
L - to the left
U - up
D - down

To signal the use of your individuality the participant must use the letter A followed by the row number and the column number of the cell that will be modified. Remember that the first row and column have number 0.

A 5 6

example of an answer:

R R R D D A 4 8 D R D A 8 2 U D A 85 75 A 28 39 A 39 66 R R

Notice that multiple uses of individuality in the same shift should be represented by multiple letters A's

Output limitation. 50,000 moves

Score

The maximum score for this challenge is 1500 points. The one who finds the shortest path to the destination, the path with the fewest moves, will receive the maximum score. The score of the other participants will be in reference to the score of the shortest path following the rule:

a - shortest path found
b - path found by the participant
n - score

$n = 1500 * a / b$

In case a participant doesn't reach the final point, he can still have a score, as long as he hasn't broken the rule of passing by a live cell. In the case of failing to reach the destination the participant's grade will be in reference to the grade of the candidate who reached the destination with the greatest number of steps:

d1 - orthogonal distance between the destination point and the final position of the particle following the path provided by the participant
d2 - orthogonal distance from the starting point to the destination point
nr - reference score of the candidate who reached the destination with the worst performance.

n - score
$n = nr * (1 - d1 / d2)$

If no participant reaches the destination, the candidate who gets closest to it will receive 1,000 points. In this case, the number of moves will be indifferent and the scores of the others will follow the second informed pattern.

Cases in which the score will be 0:

- File with incorrect name or incorrect formatting
- Not respecting the board limits
- Passing through a live cell