

Due date: 10/12/2017 ; 23:55

**Task:** In this assignment, you'll implement a grid traversal application using 2D Arrays.

**Specifications:** The problem domain is a 2D grid. Each grid cell contains a label which encodes a score that is obtained when you visit that cell. Given a starting cell, user specifies a set of movements. Each movement will be a visit to one of its four neighboring cells: left, right, up and down. If the command leads to a cell that is inside the grid, you'll get the score specified for that cell. You will accumulate the scores during the traversal.

You can simply consider that there is an agent who is initially located in one of the cells inside the grid and according to the given directions he/she visits the other cells and collects some scores.

Here are some rules in this journey:

- 1) The agent can move to the specified location only if that location is inside the grid.
- 2) The grid cell scores will be provided using a character encoding; so, it needs to be decoded first.

Each cell comes with a character label, which will be any valid small or capital letter:

$$S \in \{a, b, c, \dots, z, A, B, C, \dots, Z\}$$

The decoding of the characters into scores will be performed as follows:

character	raw score	raw score =	letter - 'a' + 1
'a', 'A'	1	{	small
'b', 'B'	2		
'c', 'C'	3		capital
:	:		

You will convert the raw scores to an actual score after a modular arithmetic. The base number for the modular arithmetic will be provided in the input data.

Ex: if the base is 5, the score for 'e' or 'E' will be 0; 'f' or 'F' will be 1; etc.

- 3) Commands that encode possible movements and other actions:

- 'R' : move to the cell on the right
- 'L' : move to the cell on the left
- 'U' : move to the up
- 'D' : move to the down
- 'P' : print the accumulated score (so far)
- 'X' : print the accumulated score and exit (terminate the program)

- 4) In addition to the character encodings, a cell in the grid may contain some special markers. These marker characters are reserved and each encode zero score (0). These characters are:

- 'G' : marks the current position of the agent
- 'X' : marks an exit cell; the traversal is over when one of these cells are visited. The functionality of 'X' is applied.
- 'P' : marks a print cell; apply the same functionality with 'P'

MAX Grid Dim: 100x100

### Input Format:

- <Grid height> <Grid width> <Modulus>
- <Grid cell content : possible whitespaces between the chars>
- <Command sequence>

### Output Format

< Accumulated score (on demand) > '\n'  
a newline after each score

### Sample Input:

5 5 3 → 5x5 grid, Modulus: 3

a D b X k  
X c P f d  
P a a c X  
b b G g k  
X h i i P  
U R U R U L D L

grid → commands

a D b X k  
X c P f d  
P a a c X  
b b G g k  
X h i i P

actual scores

1	1	2	0	2
0	0	0	0	1
0	1	1	0	0
2	2	0	1	2
0	2	0	0	0

Traversal using U R U R U L D L:  
↓ ignore  
'X': exit cell!

- after U R U R U L on exit cell is visited.  
print the accumulated score and exit.

a D b X k  
X c P f d  
P a a c X  
b b G g k  
X h i i P

red marker depicts the trace of the visits.

The output will be : 4

Using the same sample grid, let's analyze some more command options and special cases:

### Example Command Sequence 2:

D L U L L L U U  
↓ ignore (invalid)  
P: print the score

a D b X k  
X c P f d  
P a a c X  
b b G g k  
X h i i P

red marker depicts the trace of the visits.

\* when the agent revisits a cell, which is already visited before, the score will be 0 in the later visits. Hence, the score drops down to 0 after a visit to a cell.

### Example Command Sequence 3:

L R U D L R X  
exit  
actual score = 'a' + 'b' + 0 → 3  
\* DO NOT use a cell score more than once!

a D b X k  
X c P f d  
P a a c X  
b b G g k  
X h i i P

Output : 3

**Bonus:** The students who provide sample (valid) input/output files to test PA3 on Moodle's news group will get 2% bonus to their PA average!

**Submission:** Name your source file as <Student-ID>.c

Upload your file using the Moodle link that we share with this PA.

Please use Moodle group news group for any PA related questions!

Have fun :)