leetcode.com /problems/rotate-image/description/

Unknown Title

48. Rotate Image

Medium

Topics

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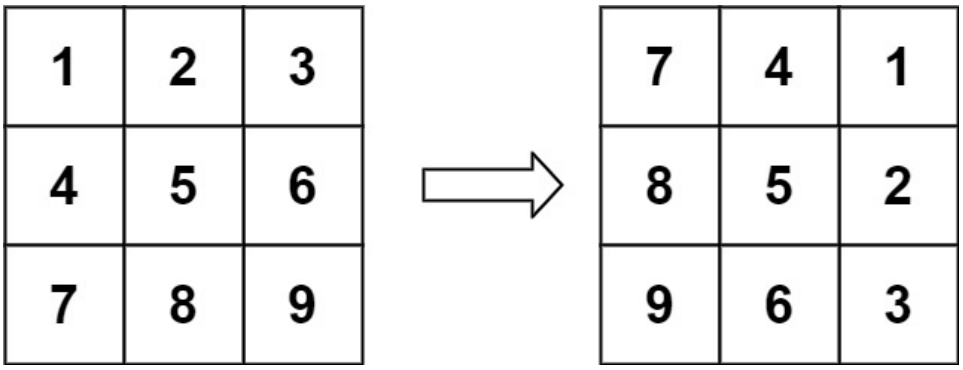
You are given an `n x n` 2D `matrix` representing an image, rotate the image by **90** degrees (clockwise).

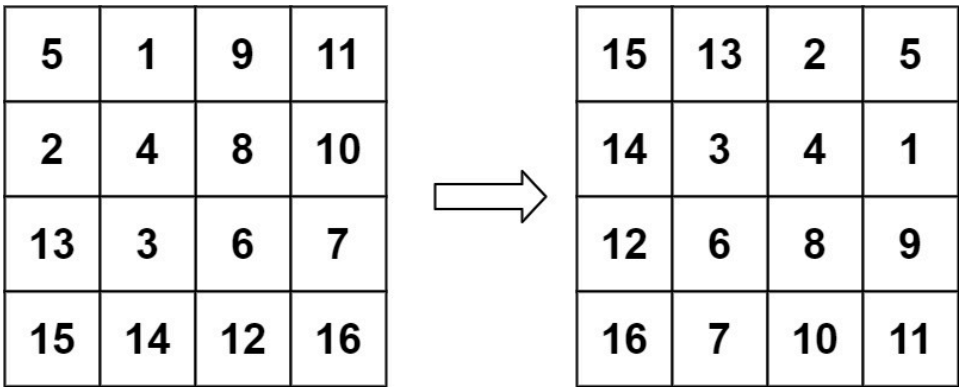
You have to rotate the image **in-place**, which means you have to modify the input 2D matrix directly. **DO NOT** allocate another 2D matrix and do the rotation.

Example 1:




```
Input: matrix = [[1,2,3],[4,5,6],[7,8,9]]
Output: [[7,4,1],[8,5,2],[9,6,3]]
```

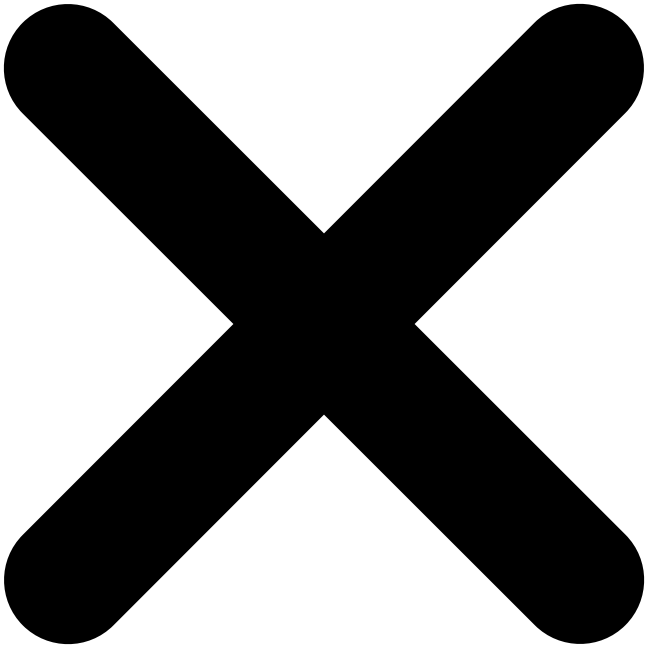
Example 2:



Input: matrix = [[5,1,9,11],[2,4,8,10],[13,3,6,7],[15,14,12,16]]
Output: [[15,13,2,5],[14,3,4,1],[12,6,8,9],[16,7,10,11]]

Constraints:

- n == matrix.length == matrix[i].length
- 1 <= n <= 20
- -1000 <= matrix[i][j] <= 1000



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2,600,185/3.3M

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Easy

Discussion (315)

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💡 Discussion Rules

1. Please don't post **any solutions** in this discussion.

2. The problem discussion is for asking questions about the problem or for sharing tips - anything except for solutions.

3. If you'd like to share your solution for feedback and ideas, please head to the solutions tab and post it there.

LazyBanda

Jul 28, 2020

I was asked this problem in Amazon for SDE III. I had hardly 25 mins to solve. Since in online interview, first 10 mins went into setup because my interviewer wasnt getting signals. next 25 mins for behavioural. and then this question. Its a tricky problem, nort sure what a company will check with this question. Probably my memorization technique.

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lowIQ_Rick_Sanchez

Sep 24, 2024

90 = transpose + reverse row
180 = reverse row + reverse column
270 = transpose + reverse col

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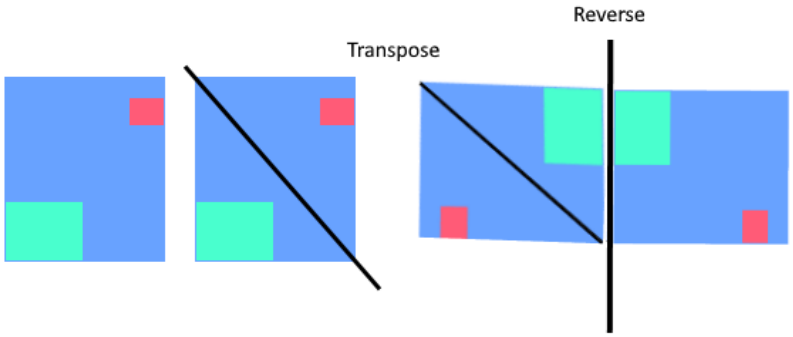
The Last Orca

Dec 09, 2020



Sorry for the bad images. I am terrible at it.

Transpose: Basically run a line from top left to bottom right as shown. Flip the 2 parts around the line.

Reverse: Flip the whole image around a line to the left or right.

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Bobzero

Nov 28, 2022

I'm always having fun reading the discussions 😃

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k30001

May 14, 2020

What exactly does it help measure? That the candidate can remember the trick of swapping rows?

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Saurabh Kapade

Jun 17, 2023

In this question only two things to do-

1. Find the transpose of the matrix
2. Reverse the rows of the matrix

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Tip

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MegaKnight

Sep 04, 2019

This post is for rotating the matrix anticlockwise. Sorry, when I post it I didn't notice it. But please read it, because I guarantee you can understand the thought process and came up with your solution for clockwise rotation.

So, we are required to rotate it in place.

Give a matrix, there are several operations can be done in matrix in place:

translation, and swap symmetrically(mirror against diagnal), and probaly some unexpected in place operations.

We are trying to break the rotation operation into these operations that are know to carry on easily in place.

For swap symmetrically, given coordinate (a,b), it will be swapped to (b,a) if following the upper left and buttom right diagnal as mirror.
For translation, given coordinate (a, b), we are able to traslate it to (a, whatever) or (whatever, b) with ease.

If rotated anticlockwise, element at (a,b) will be transfered to the new coordinate of (s-b-1 ,a) with s being the length or width of the matrix.
We are trying to find out the in place operations needed in order to transform the coordinate from (a, b) to (s-b-1, a), with some fundumantal operations' coordinate transformation characteristics in mind.

we are trying to fill in the logic path between (a, b) to (s-b-1, a) using the fundamental operations.

Let's try to fill the logic break reversely:
to get to (s-b-1, a) from (a, b), notice a is swapped, we guess the last operation may be mirror against diagnal. so the path now becomes:
(a,b) -> (a, s-b-1) -> (s-b-1, a)//the last mirror can be easily done in place

Now we try, how to get to (a, s-b-1) from (a, b) using fundamental in place operations? Well, draw a matrix, and you find out that this is not translation, but some swapping too. Don't worry, you see the operations does not change the row coordinate, so it can be done in place with ease. And you know at this point you design the algorithm for this problem.

This is how the logic flows trying to design the in place algorithm to rotate n*n matrix.
Basically, we are trying to break down the operations into easy atomic in place operations. How to break down? Analyze the coordinate characteristics with some basic patterns in mind.

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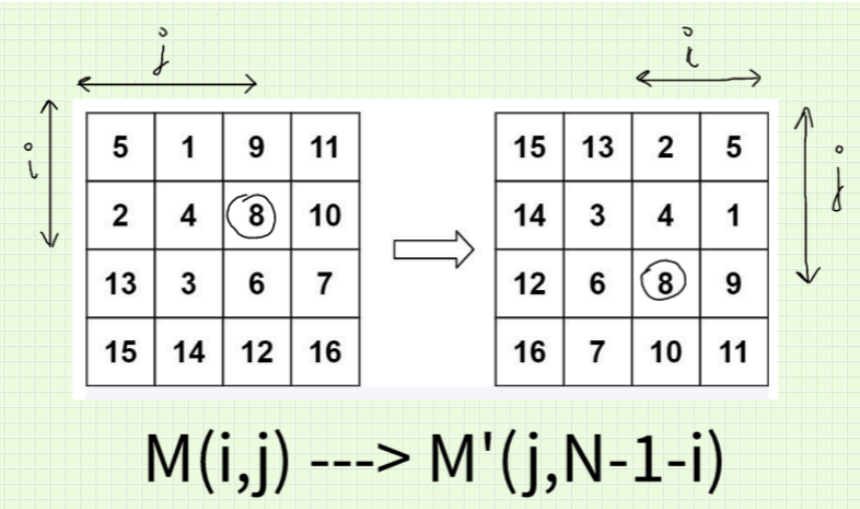
Dkode

Dkode

Sep 02, 2021

Diagram:



M[i,j] --> M'[j,N-1-i]

We know that transpose relation is

M[i,j]= M[j,i]

But the relation we got is slightly differernt

Think how to convert
M[i,j] to M[N-1-i,j]

This is equivalent to flipping the matrix horizontally.

M[i,j] to M[N-1-i,j]

Transpose (M[N-1-i,j]) --> M'[j,N-1-i]

Transpose and flipping are linear operation

Similary you can solve other cases like 90 degree, 180 degree, 270 degree etc

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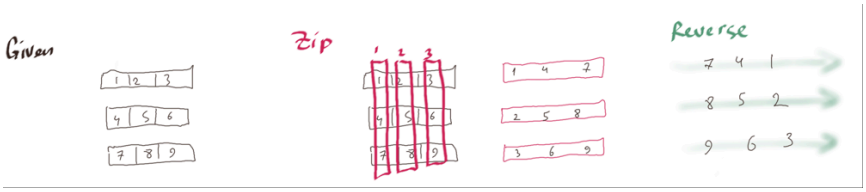
Wilmer

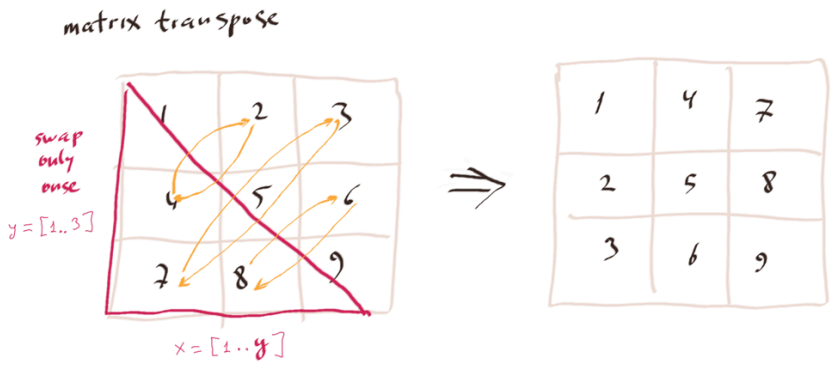
Aug 16, 2020

solution 1




```
def rotate(self, matrix: List[List[int]]) -> None:
    transposed = zip(*matrix)
    for idx, row in enumerate(transposed):
        matrix[idx] = reversed(row)
```

solution 2 (inplace modification)




```python
def rotate(self, matrix: List[List[int]]) -> None:
    """
    Do not return anything, modify matrix in-place instead.
    """
    # (1) transpose matrix
    size = len(matrix[0])
    for y in range(size):
        for x in range(y, size): # так как матрицу меняем inplace то косую строку уже перестроили (см картинку выше)
            matrix[x][y], matrix[y][x] = matrix[y][x], matrix[x][y]

    # (2) reverse rows
    for y, row in enumerate(matrix):
        matrix[y].reverse()
```

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chris3109692

Aug 15, 2020

The complexity analyses in the solution is incorrect. For a NxN matrix, the complexity is O(N^2), but our data size is N^2 by itself, hence the proper way to denote complexity should be O(n). Note big O is always measured against the data size, not the dimension size.

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40

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