Convolution

ZPRAC-16-17-Lab12

CONVOLUTION [30 Points]

ANNOUNCEMENT:
Up to 20% marks will be allotted for good programming practice. These include
- Comments for non trivial code
- Indentation: align your code properly
- Use dynamic memory allocation whenever array (any dimensional) is needed, not doing so will lead to zero marks (except for the kernel matrix)
- Use the function definition given, changing the definition will lead to zero marks.

In image processing and computer vision, convolving an Image with a Kernel matrix is a common technique use for blurring, edge detection, and various image filters. Given an n x n image (i.e n x n matrix of integers) A and 3 x 3 kernel matrix k, generate a (n-2) x (n-2) matrix C after convolving the image with the kernel.

Go generate the convolved matrix, C[i][j] can be given by multiplying A[i][j] with the center element of the kernel, the pixel to the top left of A[i][j] with the element on the top left of the kernel, the element above A[i][j] with the element above the center element in the kernel and so on and then adding all of these together. See that the kernel matrix has 9 elements (3 X 3 matrix) hence it takes the neighbourhood of A[i][j] (i.e. 8 neighbours plus itself so 9 elements), multiplies them with the corresponding kernel entry and adds them saves them in C[i][j]. Since the edge elements don't have neighbours, they are not convolved, so we get an (n-2) x (n -2) convolved image.

Input:
First line contains an integer n
The next line contain the n x n image matrix
The next three lines contain the kernel matrix k

Note - you must complete the given initial template as it is, otherwise penalty will be incurred.

Example:
Input:

4
1 2 3 4
6 8 9 0
4 2 3 1
0 2 1 0
0 1 0
1 -3 1
0 1 0

Output:
-5 -13
11 4

Explanation: 0*1 + 1*2 + 0*3 +1*6 + -3*8 +1*9 +0*4 +1*2 + 0*1 = -5