Khulna University Of Engineering & Technology

KUET

SESSIONAL REPORT

Course No. CSE-4128

Department Of CSE

Experiment No. 01

Name of the Experiment Convolution and its implementation using different kernels.

Remarks

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Objectives:

① To learn about convolution.

② To perform convolution on different images

③ To learn different image representation.

Introduction: Image processing converts image to a digital form apply various function to enhance it. Image can be represented via grayscale or color image. Color image composed of multiple color channel, each channel can be considered as a gray-scale image.

Convolution is a operation performed on two functions (f, g) to produce a third function. In image processing, it finds the corresponding output value at every pixel using convolution. It can be mathematically written as:

$$F * I(x,y) = \sum_{j=-N}^{i=N} \sum_{i=-N}^{N} F(i,j)\ I(x-i, y-j)$$

In case of image, a point is considered as center, usin and this point is put-down on the corresponding pixel and then convolution is performed. Before that the kernel is flipped in both direction.

	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

image

	0	1	2
0	1	2	3
1	4	5	6
2	7	8	9

kernel

For finding the convoluted value at(1,1), kernel is flipped horizontally and vertically then multipled.

3	2	1
6	5	4
9	8	7

kernel (horizontally flipped)

9	8	7
6	5	4
3	2	1

vertically flipped

∴ Convoluted value at (1,1) will be:

$$1\times9 + 2\times8 + 3\times7 + 4\times6 + 5\times5 + 6\times4 + 7\times3 + 8\times2 + 9\times1$$

Convolution plays a crucial role in image processing. It has many Application like

(i) To create blurred effect.
(ii) To sharpen an image.
(iii) For detecting edges in image.
(iv) For removing noise from image.

Discussion: Convolution is a fundamental feature of image processing. It involves applying a filter, also known as kernel to an image to enhance the image or extracts feature from it. It basically performs an weighted average among neighbour values. A kernel is used which performs the type of operation. It is typically smaller and ~~const~~ odd size. There are different types of kernel available for performing various operation.

Conclusion: Convolution serves as a fundamental tool in image processing. It allow us to extract features, manipulate image to improve the image quality, decrease the noise. In digital image processing, it is ~~the~~ one of the basic operation.

References:

① Documents from lab (LAB1.ppt).
② https://www.tutorialspoint.com/dip/concept_of-convolution.htm
③ https://medium.com/analytics-vidhya/2d-convolution-using-python-numpy-43442ff5538 1
④ https://www.adeveloperdiary.com/data-sciencecomputer-vision/how-to-Implement-sobel-edge-detection.