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NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » **GPU Architectures and Programming (course)**

Announcements (announcements)

About the Course (https://swayam.gov.in/nd1_noc20_cs41/preview) Ask a Question (forum)

Progress (student/home) Mentor (student/mentor)

Due on 2020-03-13, 23:59 IST

Let us consider the 2D convolution operation for a 2D Matrix of floating point numbers. It is a neighborhood operation where each output element in the matrix is the weighted sum of a collection of neighboring elements of the input matrix. The weights used in the weighted sum are typically stored in an array called the convolution mask. This mask is applied across each element of the input to yield a convolved output. Let us focus on a specific convolution operation, namely average convolution. This operation considers a 3x3 mask and for every element $A[i][j]$, considers the nearest 8 neighbors contained in the 3x3 mask centered at the element $A[i][j]$, takes the average of these 8 values and the value of $A[i][j]$ and stores in the output matrix $B[i][j]$.

Implement a CUDA program which takes as input i) the number of test cases and for each test case i) the integer n , iii) the values of each element of an $n \times n$ matrix; apply the average convolution operation and produce an $n \times n$ output matrix.

Refer to the following representative input output example.

Input

1

3

```
3.0 3.0 3.0
```

```
3.0 3.0 3.0
```

```
3.0 3.0 3.0
```

Output

```
1.0 3.0 1.0
```

```
2.0 3.0 2.0
```

```
1.0 3.0 1.0
```

Note for boundary elements, assume a padding of 0.0. In the above example, for element `input[0][0]`, placing the 3x3 mask with its center at `input[0][0]`, produces

the $output[0][0] = output[0][0] = 0.0/9 + 0.0/9 + 0.0/9 + 0.0/9 + 3.0/9 + 3.0/9 + 0.0/9 + 3.0/9 + 3.0/9 = 1.3$. The values of the 3x3 mask is 1/9 here.

Similar to previous assignments, complete the incomplete code (`assignment_skeleton.cu` (<https://drive.google.com/open?id=1aB3S7NtAd-4d9yOMgC0QJ07EiM19dApM>)) and verify using the sample input (`sample_input.txt` (https://drive.google.com/open?id=15cfPieJNU_WpEC0ldK_JanHcJM7obsF0)) and output (`sample_output.txt` (<https://drive.google.com/open?id=1jE7jlm0Geg1hVEvGgADubUhVY9qSTXMG>)) cases.

Your Submission:

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

