# Analyzing Performance of Spatial-Domain Linear Filtering on Multi-Channel Images using OpenMP

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**Abstract**

Typically, Image Processing Algorithms are massively parallelizable and are performed on specialized hardwares such as Graphics Processing units(GPUs) that offer high-throughput. This experiment aims to analyze the performance of parallelized Spatial-Domain linear filtering for multi-channel images using OpenMP.

## 1 Theory

### 1.1 Spatial-Domain Linear Filtering

**Linear Filtering** is neighborhood operation, in the which the value of any given pixel in the output image is represented as a linear function of the pixel values in the neighborhood of the corresponding input pixel. Linear filtering in spatial domain is performed using **convolution**.

**Mean Filtering** is a linear filtering in which value of any given pixel in the ouput image is the mean of values of pixel in a $kxk$ window centered at the corresponding input pixel (where k is an odd number).

### 1.2 Sections in OpenMP

The section construct in OpenMP is a way of distributing different independent blocks of codes (each performing a task) to different threads. The sytax of the sections construct is:

```
#pragma omp parallel
{
  #pragma omp sections
  {
    #pragma omp section
    {
      //structured block 1
    }

    #pragma omp section
    {
      //structured block 2
    }

    #pragma omp section
    {
      //structured block 3
    }

    ...
  }
}
```

## 2 Results [1]

The experiments were conducted on a three-channel (red, green and blue) image of size 384x512 for varying size of filter kernels. Each section block performed mean filtering of one channel of the image.

## 3 Infererence

[1] The experiments were conducted on a computer with $6^{th}$ Generation Intel(R) Core(TM) i7-6500U Processor (4M Cache, upto 3.10 GHz) and 4GB Single Channel DDR3L 1600M Hz (4GBx1) RAM.