HW 2 Lab Report

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Part 1:  conduct image smoothing on a given image with the following methods.

a) Mean Filtering

b) Gaussian smoothing

c) Median Filtering

Part 2: Write a program that conduct image sharpening on a given image.

Part 3: Write a program that build a Gaussian Pyramid on a given image.

**Steps:**

Part 1: Image smoothing

1. **Mean Filtering**
   1. Create a kernel and set the weights
   2. Sum the weights and divide the kernel values by the weight
   3. Loop through the image indices
      1. Take the product of the index relative to the mask index
      2. Multiply the index value by the weight
      3. Sum the values/weight sum and store in center pixel
2. **Median Filtering**
   1. Create empty kernel
   2. Loop through the image indices
      1. Take the intensity value of the index relative to the mask and store in the mask
      2. Sort the indexes
      3. Pick the middle index and store it in the center pixel
3. **Gaussian Smoothing**
   1. Use cv2 function to create kernel
   2. Apply kernel to cv2 filter

Part 2: **Image Sharpening**

1. Create a kernel and set the weights
2. Loop through the image indices
   1. Take the product of the index relative to the mask index
   2. Multiply the index value by the weight
   3. Check edge cases for buffer overflow

Part 3: **Gaussian Pyramid**

1. Load in image
2. Set new image relative to size of previous (shrunk)
3. Apply Gaussian smoothing to image
4. Do steps b,c to new image
5. Get offset
6. Loop through number of desired iterations to create smaller images with Gaussian smoothing

**Explanation:**

**Issues:**

**Buffer overflow** was a frequent issue when apply steps. At many points the averaging and multiplication had to be done on each value individually to prevent the overflow. An alternative would have been to cast to int and then apply the manipulation.

**Optimization**, the overall process time is quite slow and could be optimized. One thing that would improve the speed drastically would be to separate the kernel into two 1d functions. The product of a column vector and row vector is the same as a 2D convolution of the vectors. The cost is shown below

  
 **migrating from Matlab**, Not only am I new to Digital Image Processing, I am also new to matlab and I dislike it. I chose slower runtime for interest in developing myself more in Python

**Code:**





 

 