

CSC420: Assignment 1

Xiangyu Kong, kongxi16

September 22, 2019

Problem 1

1. The computational cost for $h * I$ when h is not separable is $O(n^2m^2)$.

This because each pixel in I gets computed for m^2 time, and there are n^2 pixels in total.

2. The computational cost for $h * I$ when h is not separable is $O(m^22n)$.

Problem 2

Canny Edge Detection Steps:

1. Filter the image with derivative of Gaussian in both horizontal and vertical directions.
 - The purpose of this is to smooth the image and remove the noise.
 - To do this, we apply Gaussian filter to convolve with the image.
2. Find the magnitude and direction for the gradients
 - The purpose of this is to find the possible edges
 - To do this, we apply edge detection filters (for example, Sobel) with different directions and convolve with the image.
3. Non-maximum suppression
 - Get rid of the spurious response from edge detection produced by noise.
 - To do this, we only take local maximum or minimum of the edges.
4. Linking and Thresholding
 - The purpose of this is to connect the unlinked edges.
 - To do this, define 2 thresholds low and high. We use the high threshold's results to start the edge curves and use low threshold's results to connect the unlinked edges.

Problem 3

Pseudocode

Algorithm 1 Process(A, B)

```
1: if  $A = B$  then  
2:    $C =$  empty list ▷ comment  
3:   return true  
4: else  
5:   while  $A \neq \emptyset$  do  
6:     Do something
```

Problem 4

Listing 1: Caption

```
def function(a):  
    return a
```