Computer Vision (Fall 2018) Problem Set #1

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1a: Interesting Images

Image 1 - ps1-1-a-1.png

Image 2 - ps1-1-a-2.png

2a: Swapped Green and Blue

ps1-2-a-1.png

2b: Monochrome Green

Img1_green - ps1-2-b-1.png

2c: Monochrome Red

Img1_red - ps1-2-c-1.png

3a: Replacement of Pixels

ps1-3-a-1.png

4a: Image Stats

- Min, max, mean, and standard deviation

('The min pixel value of img1_green is', 1.0)

('The max pixel value of img1_green is', 255.0)

('The mean pixel value of img1_green is', 119.59683719758064)

('The std dev of img1_green is', 61.217416874395816)

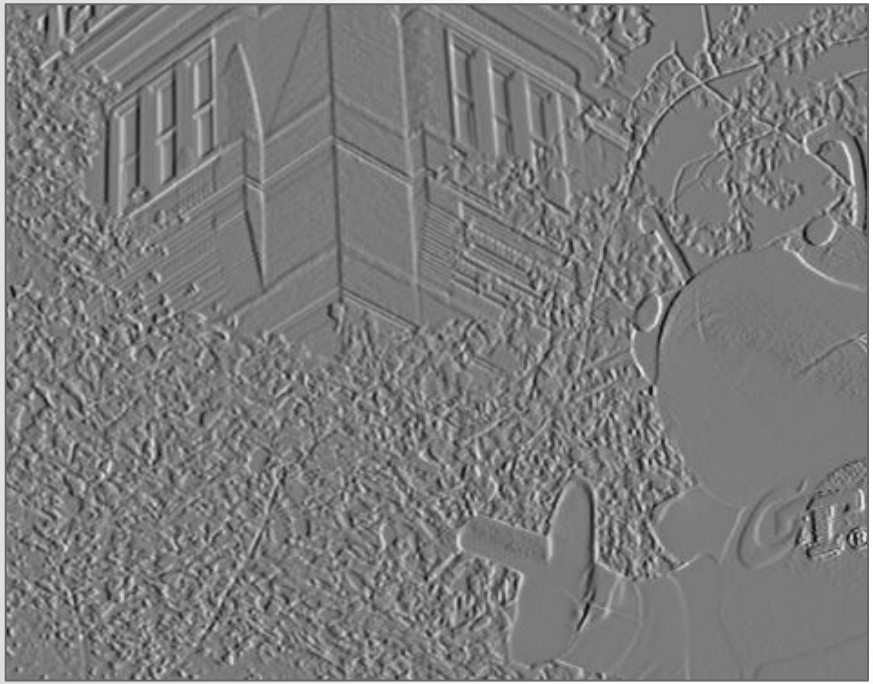
4b: Arithmetic Operation

ps1-4-b-1.png

4c: Shifted Image

ps1-4-c-1.png

4d: Difference Image



ps1-4-d-1.png

5a: Noisy Green Channel

ps1-5-a-1.png

5b: Noisy Blue Channel

ps1-5-b-1.png

6: Discussion

a. Between all color channels, which channel, in your opinion, most resembles a grayscale conversion of the original. Why do you think this? Does it matter for each respective image? (For this problem, you will have to read a bit on how the eye works/cameras to discover which channel is more prevalent and widely used)

   Between all the color channels, it appears that the green color channel is closest to the grayscale of the original. Looking at the images below, we can see this image has the least difference between the grayscale conversion. RGB are signal intensity values recorded by a camera in response to the three types of cones found in the human eye and the most common pattern used is the Bayer pattern, which places green filters over half the sensors, and a red and blue filter over the remaining. (CV - Algorithms and Applications page 86). Since there are twice as many green pixel filters as opposed to red and blue, the green luminance signal is the dominate one. Due to this, the image will not matter.

6: Discussion

The Grayscale Image

Red Image

Blue Image

Green Image

6: Discussion

b. What does it mean when an image has a negative pixel values stored? Why is it important to maintain negative pixel values ?

When an image has negative pixel values, that means the color that is it trying to represent is outside of the typical RGB model. The RGB color space are approximations to what the human eye can see, but is done so with an approximation. Due to this some things are missed. For example, if you take a picture with a camera that is sensitive to infrared light, the RGB value will lose this if negative values are not allowed.

6: Discussion

c. In question 5, noise was added to the green channel and also the blue channel. Which looks better to you? Why? What sigma was used to detect any discernible difference?

The noise to the blue channel performed less visible noise to me then the noise added to the green channel. The reason behind this is that the eye is most sensitive to the green channel and least sensitive to the blue channel. The human eye is most sensitive to changes in luminance rather than in chrominance (CV - Algorithms and Applications, page 86). When adding green noise, the luminance for that channel is increased thus producing a more visible noise. With a sigma value of 45 the green channel noise became apparent, but wasn't noticeable without close inspection on the blue channel. When increasing the noise to a value of around 90 is when the blue noise became noticeable, and the green noise was very apparent.