Computer Vision
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 : 0.0

The max pixel value of img1_green is : 255.0

The mean pixel value of img1_green is : 59.169

The std dev of img1_green is : 67.76

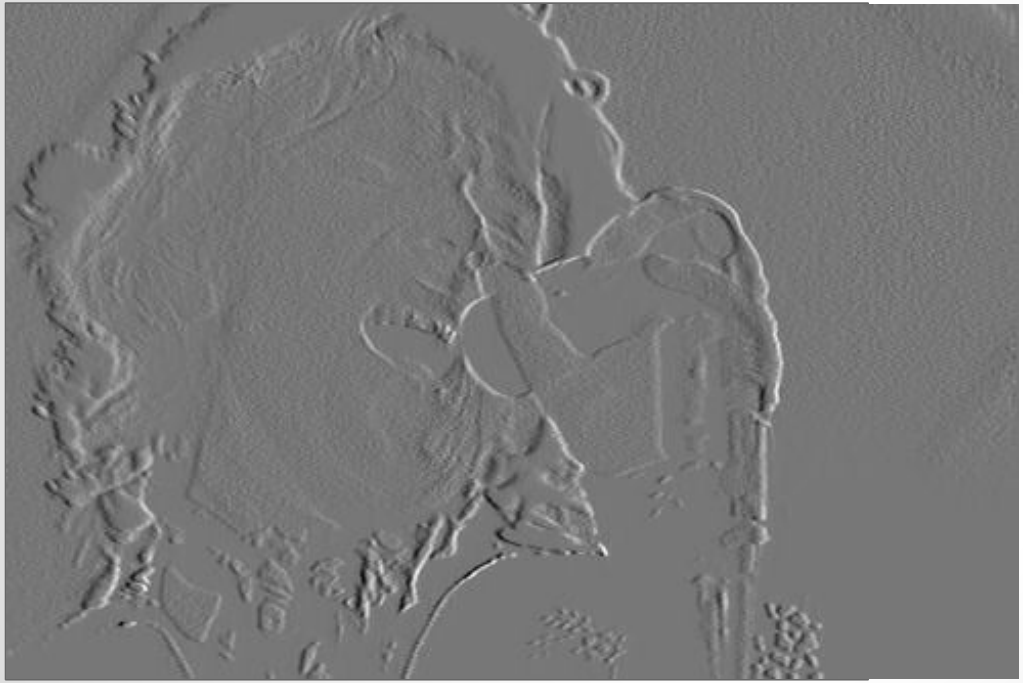
4b: Arithmetic Operation

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

6A: Discussion

Between all color channels, which channel, in your opinion, most resembles a grayscale conversion of the original.

I would thing the green image.

Why do you think this? The main detail in the image is the Y shaped line drawn over the person's face. This is somewhat broken in the two other image, which exposes problems in the image.

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)

Most RGB color cameras use CCDs or CMOS imagers that incorporate a Bayer filter that attempts to copy the spectral response and sensitivity of the human eye. This results in a pattern where 50% of the pixels are green, 25% red, and 25% blue. Unlike the human eye, however, these filters only provide an approximation of spectral response, sensitivity, and resolution. {Ref : https://www.vision-systems.com/articles/print/volume-14/issue-7/features/colors-everywhere.html }. Due to this the green channel predominantly captures the image through spectral response, sensitivity, and resolution.

6: Discussion

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

For RGB images (ie. solely 3 channels using 256 pixel range) we do not have negative values. However for other signals such as infrared, x-ray images and astronomical photos the pixels may fall into negative territory.

6B: Discussion

In question 5, noise was added to the green channel and also to the blue channel.

Which looks better to you?

The blue looks better.

Why?

I would infer that the green is too noisy because the noise green channel is more predominant. Therefore noise applied to that channel is more predominant in the final image. Both of these images were taken with the same sigma - ie. 20.

What sigma was used to detect any discernable difference?

For the green channel, the sigma of 20 made a difference noticeable but for the blue channel, the sigma needed to be move up to 60 to see a distance.