Computer Vision (Spring 2021) Problem Set #1

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1a. Interesting Images

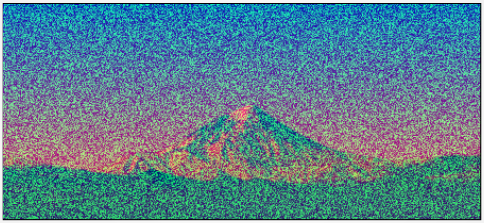
Image 1 - ps1-1-a-1

Image 2 - ps1-1-a-2

4d: Difference Image

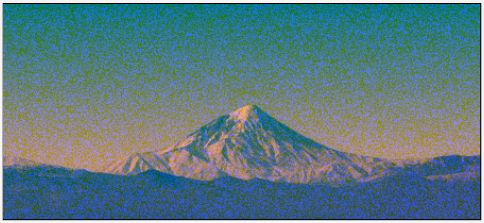
ps1-4-d-1

5a: Noisy Green Channel



ps1-5-a-1

5b: Noisy Blue Channel



ps1-5-b-1

6a. Discussion

Between all color channels, which channel, in your opinion, most resembles a gray-scale 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)

The color channel that is most like the greyscale image is the green color channel.
The reason for this is twofold: due to the fact that green is more uniformly distributed across the image, and the human eye is more photo-sensitive to the green color channel.
This can also be attributed to the fact that green is not highly apparent in the image at all, so it is mostly a filter for the image that exists in lesser quantities in darker regions, thus a high similarity to the greyscale image.

This result is largely image independent, and this would likely also be the case for another image due to the color sensitivity to green.

However, images utilizing green landscapes would not have as definite a result.

6b. Discussion

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

When an image has negative pixel values, it generally means that the color represented is outside the human visual spectrum. For example, sometimes a camera may have infrared visual capability, and those color would be represented as negative pixel values. Negative pixels are important to represent a wider spectrum of color values which may have some usefulness in image analytics and processing tasks, independent of whether a human can see them or not.

6c. Discussion

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

The blue noise channel looks better to me.
This question hearkens back to Question 6a. The green channel is more apparent to the human eye, so any changes in that color channel will be more apparent.
On the green color channel, a discernible difference was detectable around a sigma of 5. On the blue color channel, a discernible difference was detectible around a sigma of 15.

7a: Hybrid Images

ps1-7-a-1

7b. Hybrid Images

Explain how the cutoff-frequency impacts the final hybrid image

The cutoff frequency will determine the representation of the lower and higher frequencies.
As the cutoff frequency is lowered, the lower frequency image (the dog) will have a greater representation in the image,
but beyond a cutoff frequency of 3, the higher frequency image (the cat) will have a dominant representation in the image.

It seems that the frequency representation is about equal around a cutoff frequency of 2.