Computer Vision (Spring 2021) Problem Set #1

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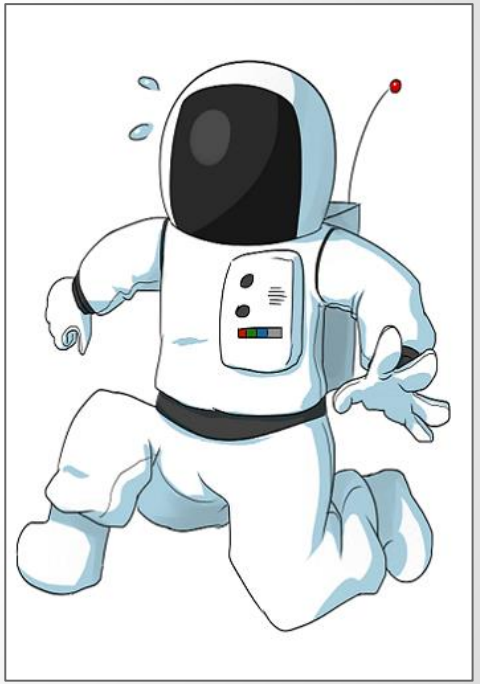
1a: Interesting Images

ps1-1-a-1



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 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)

In my opinion the green channel is the closest when compared to grayscale. I believe the reason is the overall number of green pixels within the image. Grayscale has many equations based on expected results, most common is the weighted sum of the three channels. If I were to use other images, it would make a difference based on the saturation of the color channel within the specific image. Images with a lot of red pixels, their red color channel will most resemble a grayscale conversion.

Blue

Green

Red

6b: Discussion

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

The first thing it would be is that the image is not stored as datatype uint8 which is typical for images which are to be displayed. Negative pixel values within an image still are considered information. When we clip the values between [0, 255], such as with uint8, we will lose information. For this reason, when manipulating images, the datatype should be adjusted accordingly.

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 sigma used to produce a noticable difference between the images was 100. The noise added to the blue channel looked the best. When you compare the two images, the green channel noise seems to be more distorted. The noise in the blue channel is very hard to see.

Blue Channel Noise

Green Channel Noise

7a: Hybrid Images

ps1-7-a-1

7b: Hybrid Images

Explain how the cut-off frequency impacts the final hybrid image

As the cut-off frequency is increased the resulting image shows more higher frequency filtering. Starting off with a cut-off frequency of 0, the dog is clearly seen. As the cut-off frequency is increased, less of the dog is visible, which is shown in the image on the right which used a cut-off frequency of 20.

Sources

- https://upload.wikimedia.org/wikipedia/commons/f/f1/Astronaut_animated_1.png
- https://pixy.org/src/442/4429145.png