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COMP 590-175

ISP Homework Report

Values found after running dcraw:
White = 0
Black = 16383
R_scale = 1.628906
G_scale = 1.0
B_scale = 1.386719

Values of the baby image:
Bits per pixel = 16
Width = 4284
Height = 2844

Bayer Pattern:

To identify the correct bayer patter, I used plt.imsave to save a 2x2 grid of the top left corner of the baby image, which resulted in the following image. Since the top right and bottom left are the same color, then the pattern must be either rggb or bggr. After experimenting with both options, rggb is clearly the correct choice because it causes the baby's shirt to be red, not blue.

White Balancing:

After completing all three white balancing algorithms, the original baby still looks green. The algorithm using camera presets has the darkest green tint, so my personal favorite image is the one which uses the white world balancing algorithm, although the gray balanced image looks very similar.

Brightness adjustment and gamma encoding:

I chose a mean value of 0.2, which causes the image to be slightly darker than the post-brightening mean value 0.25.

Compression:

After saving the image as a .png file with no compression, as a jpeg with no compression, and a jpeg with quality parameter 95, it is very difficult to tell any difference between the three images.

JPEG compression ratio: 23.96

At a compression ratio of 16.94, the image starts to become noticeably different.

Manual White Balancing:

At first I assumed the top right corner of the image would work the best, as it appears to be completely white. However, choosing points in this area does not give a good image. I then chose the white patch to be the door in the left hand side of the image, which does a good job of correcting the colors.

DCRAW:

dcraw -v -w -q 3 -o 1 -g 2.4 12.92 ISP_homework/data/baby.nef

convert ISP_homework/data/baby.ppm newbaby.png

My preferred image, using camera presets and manual white balancing:

JPEG image:

PNG image from dcraw:

I prefer the image using the dcraw image processing pipeline converted to a .png file, which appears to have the most definition and is slightly darker than the jpeg image and my image.

Camera Obscura:

The camera obscura was made of a shoebox, surrounded with black paper on all sides except for the screen, which was white. The corners of the box were surrounded with extra paper and tape so that it was completely lightproof. It has a focal length of approximately 4 inches between the pinhole and the screen, and a screen size of about 4 in x 12 in, although the field of view is smaller than this, especially when the pinhole is smaller.

To take pictures, I attached a camera next to the pinhole and took a photo with a long exposure time, creating multiple images with pinhole sizes of approximately 0.2 mm, 1mm, and 4 mm. The 0.2 mm image was very dark because not a lot of light was being let in, so many of the images are more difficult to make out. A 1 mm hole produced the best images, while a 4 mm

hole let in too much light and produced images that were too bright and most detail was lost. With this camera obscura, I took images of myself, a fire hydrant, and a car. I experimented with different photographs, and found that the pictures turned out better in a place with more light, such as outside.

I also created a camera obscura in a room by using either black paper or multiple layers of colored paper and tape which resulted in a reflected image showing up on the opposite wall.