Homework 1 Report

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Submitted Photos
For Problem 1.1:

See files in **data/final**

Each image's name corresponds to their balancing algorithm

Ex - **WB**CameraScale_Final == white balanced using the camera white balancing values

• For Problem 1.2:

See files in **data/final**

WBManual_Stair_final - balanced using data from the stair highlight as the white

WBManual_Cloud_final - balanced using data from the cloudshighlight as the white

• For Problem 1.3: The .PNG file produced by dcraw.

See files in **data/final**

Campus.nef & campus.png

• For Problem 2.1: At least two photographs of your constructed pinhole camera.

See files in **data/pinholePictures**

mybeautifulCamera.jpg & mybeautifulCamera2.jpg

• For Problem 2.2: At least nine photographs captured with your pinhole camera (three different scenes, each captured with three different pinholes).

See files in **data/pinholePictures**

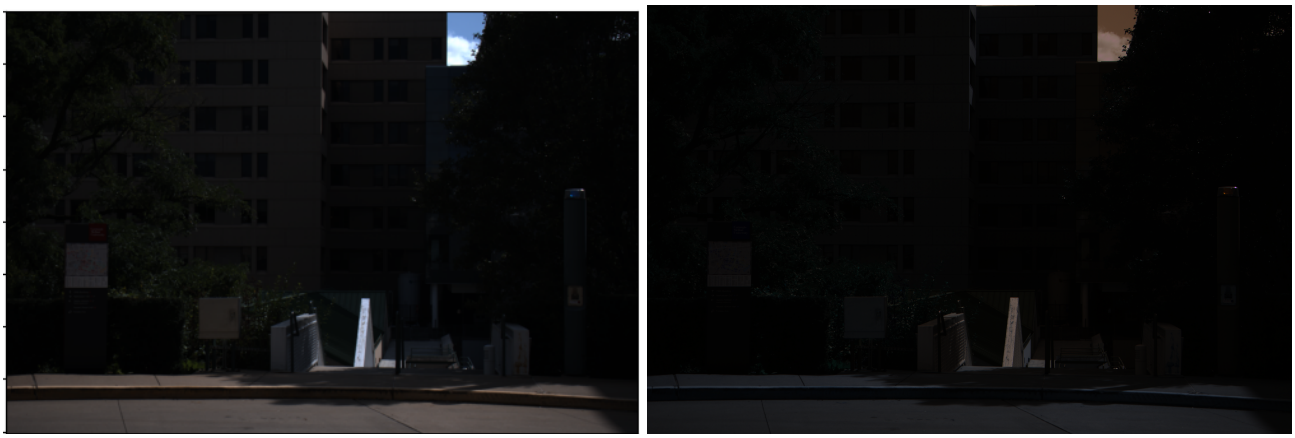
• For Bonus Problem 2.3: A photograph of your room's "screen" with the projection of the view from outside, as well as a photograph of your covered window "pinhole".

See files in **data/CameraObscura**

Identifying the correct Bayer pattern

This was mostly trial and error for me. “Rggb” and “bggr” are the two patterns without significant green hue shifts to the entire image. And between those two, the key to me finally deciding on using “rggb” was that it correctly showed the red on the CMU logo on the road sign -- and after white balancing, it was more obvious that “bggr” had the sky in the wrong color.

(Left: rggb after white balancing; Right: bggr after white balancing)



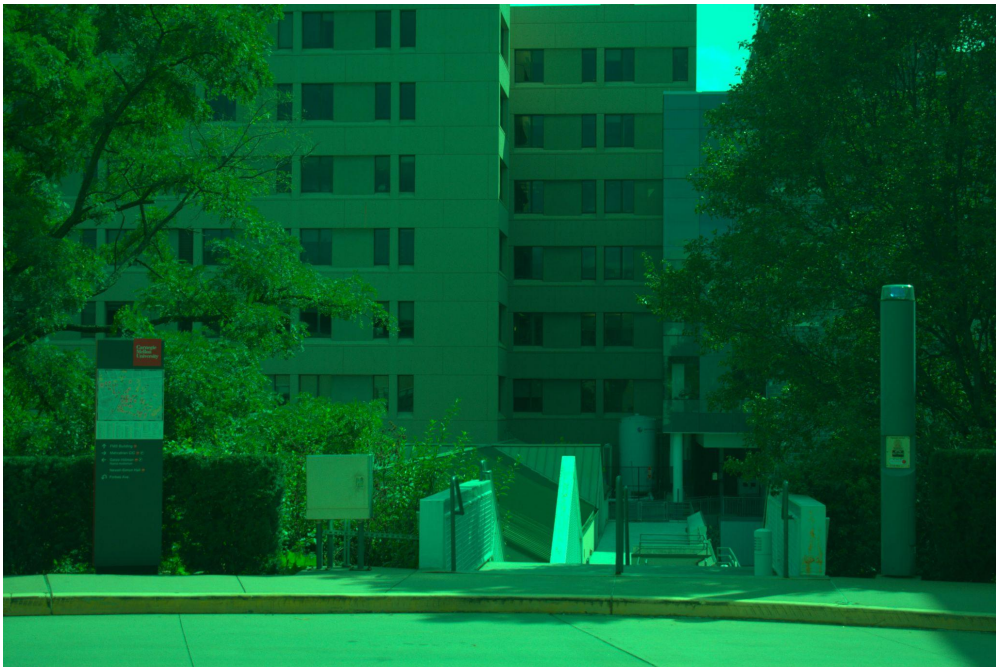
(Using bggr as the final render pattern can also generate interesting results)

White balancing

Basically followed the instructions in the slides. All the methods provided in the slides does not balance the green channel, thus the later process just uses the green channel from the raw data.
The white world balancing didn’t work as well as intended because according to methods described in the slides we are finding the largest RGB values in the entire image -- which is most likely just 1. White

balancing is supposed to correct the scene based on a patch that we know is white -- that's not what's happening here in the algorithm. The manual white balancing method works a lot better.

(using WhiteWorldBalancing algorithm described in the slides)



Demosaicing

For Red and Blue:
Feed the mosaic(with correct indexing) into interp2D and let it do its job
For Green:
For each 2*2 grid, take the upper green pixel (imGTop) and the bottom green pixel(imGBot), interpolate them with their respective image coordinates (in the same fashion as Red and Blue), and then take the average between the interpolated values.

This does technically cause more blurring than intended, but since passing in the coordinates for each Green pixel results in overflow error from interp2D, this was my best solution.

Color space correction

Followed exactly what's described in the handout.

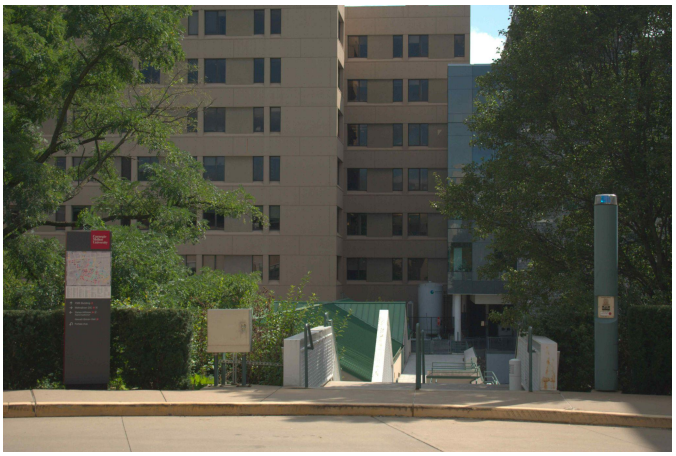
Compression

Can you tell the difference between the two files?
I really can't tell.

The compression ratio is the ratio between the size of the uncompressed file (in bytes) and the size of the compressed file (in bytes). What is the compression ratio?
PNG to JPG = 5.567
By changing the JPEG quality settings, determine the lowest setting for which the compressed image is indistinguishable from the original. What is the compression ratio?
Quality (at least for me) = 35
Ratio = 35.88

Manual White Balancing

Balanced based on two patches: the white clouds in the sky(left), and the brightest spot on the stairs(right).

Process: Hovered mouse over the areas and collected pixel information through the skimage display, then manually averaged them and used the data to balance the images.

I think the white balanced version based on the stairs worked better. Most of the scene is occupied objects within the same distance as the stairs, and a white balancing process based on the object in the same physical space yields better results. Although clouds are objectively white, this method doesn't quite take into account of what's in the scene and the spatial relationship between objects.

Learn to use dcraw

Which of the three images do you like best?
I like mine the best because I made it :)

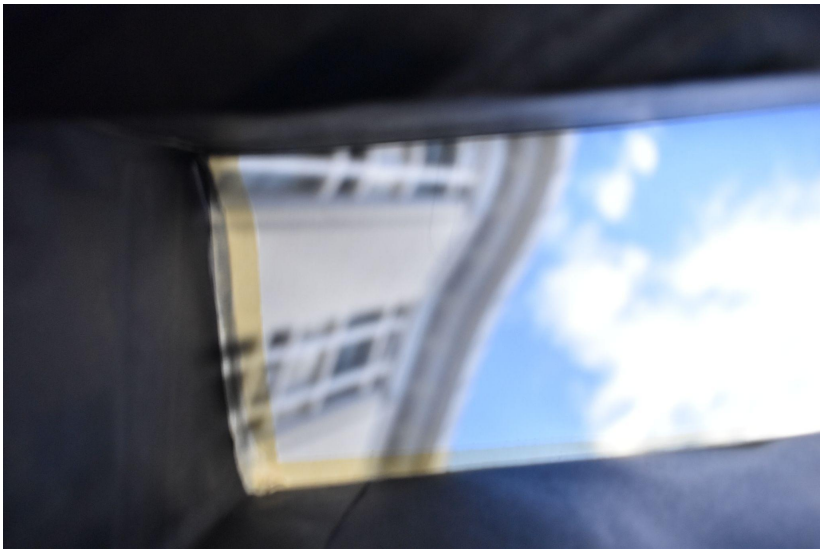
IMAGES:

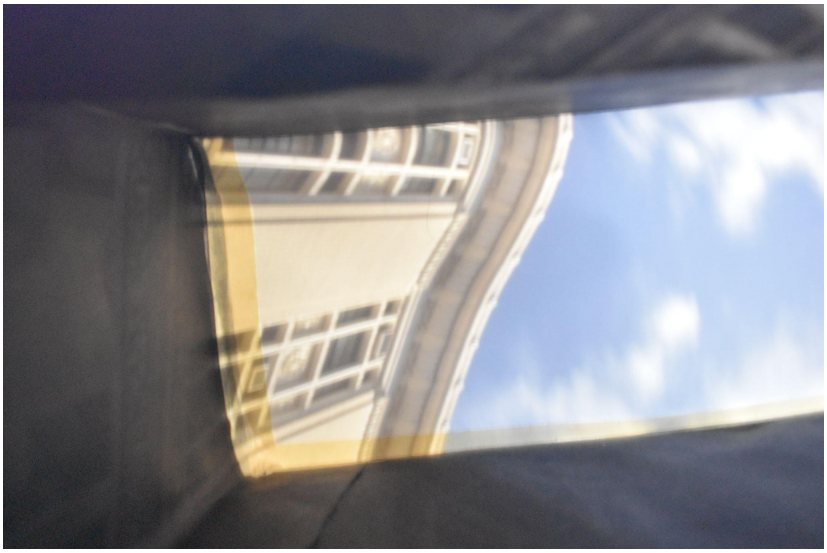
Template:
Pinhole Aperature - Exposure time - ISO

Images are on the next page

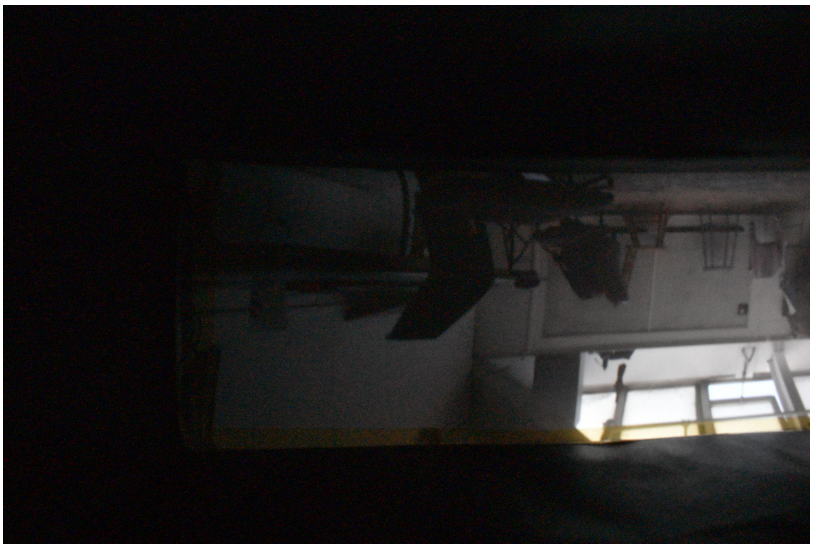
Behind Baker Hall
5mm - 5s - 800 ISO
1mm - 10s - 3200ISO
Tiny - 30s - 3200ISO

The Sky, Near CFA (it's cool that I can see the clouds move)
5mm - 5s - 1600 ISO
1mm - 30s - 3200 ISO
Tiny - 30s - 3200 ISO





My Studio, CFA top floor (notice the hatch on the window blurring)
5mm - 8s - 800 ISO
1mm - 30s - 6400ISO
Tiny - 30s - 6400ISO



Bonus:

Turning CFA Room 313 into a camera obscura.