Assignment-1

Computational Photography

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1.1 Implement a basic image processing pipeline (80 points)

1. RAW image conversion (5 points)

Generated the .tiff file using

```
dcraw -4 -D -T <RAW_filename>
```

Got the following parameters back:

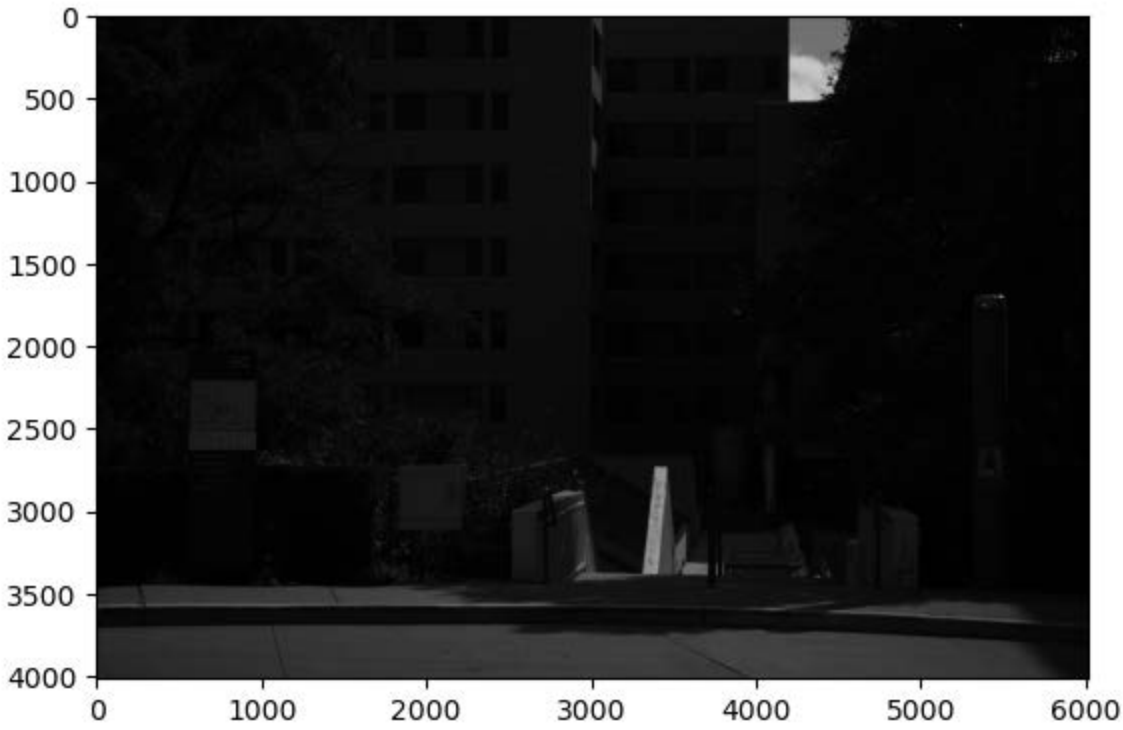
```
Scaling with darkness 150, saturation 4095, and
multipliers 2.394531 1.000000 1.597656 1.000000
```

2. Python initials (5 points)

Checking the image stats: 16 bit image

```
Height, Width = (4016, 6016)
DataType: uint16
```

3. Linearization (5 points)



4. Identifying the correct Bayer pattern (20 points)

The pattern was ‘rggb’ after white balancing

5. White balancing (10 points)

Gray-world balance

White balancing using preset values

White-world balance

Demosaicing (10 points)

Demosaiced image using grey-world balancing

Demosaiced image using preset balancing

Demosaiced image using white-world balancing

Since white world balancing looked green, I have used the grey world for the rest of the problems

Color space correction (10 points)

Brightness adjustment and gamma encoding (10 points)

Final result with gray world balancing

Balancing with preset values

White-world balancing

1.2 Perform manual white balancing (10 points)

Patch 1: Near the sky

Patch 2: Near the stairs

Results with patch 1

Results with patch 2

1.3 Learn to use dcraw (10 points)

```
dcraw -v -a -o 1 campus.nef
```

-a for auto white-balancing

-o 1 for output colorspace as sRGB

Image precessed with dcraw

Of the three processed images, the resulting images the camera and the dcraw look the most sharp. The contrast in the image provided by our pipeline is not good. The dcraw image also has a slight blue tint than the one given in the pdf file.

Gray-world balancing pipeline

dcraw pipeline

Image provided

2.1 Build the pinhole camera (70 points)

Screen size: 18cm x 21cm

Focal length: 28 cm

FOV: 2*artan(img_size/2f) = 2*arctan(10.5/28) ~ 42 degrees

Use your pinhole camera (30 points)

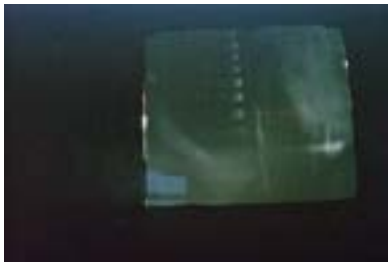
Diameters used: 0.5 cm, 0.2cm, 0.05cm

For the largest diameter the images are brighter but blurry. For the smallest diameter the images were dark and I had to increase the ISO to capture the image

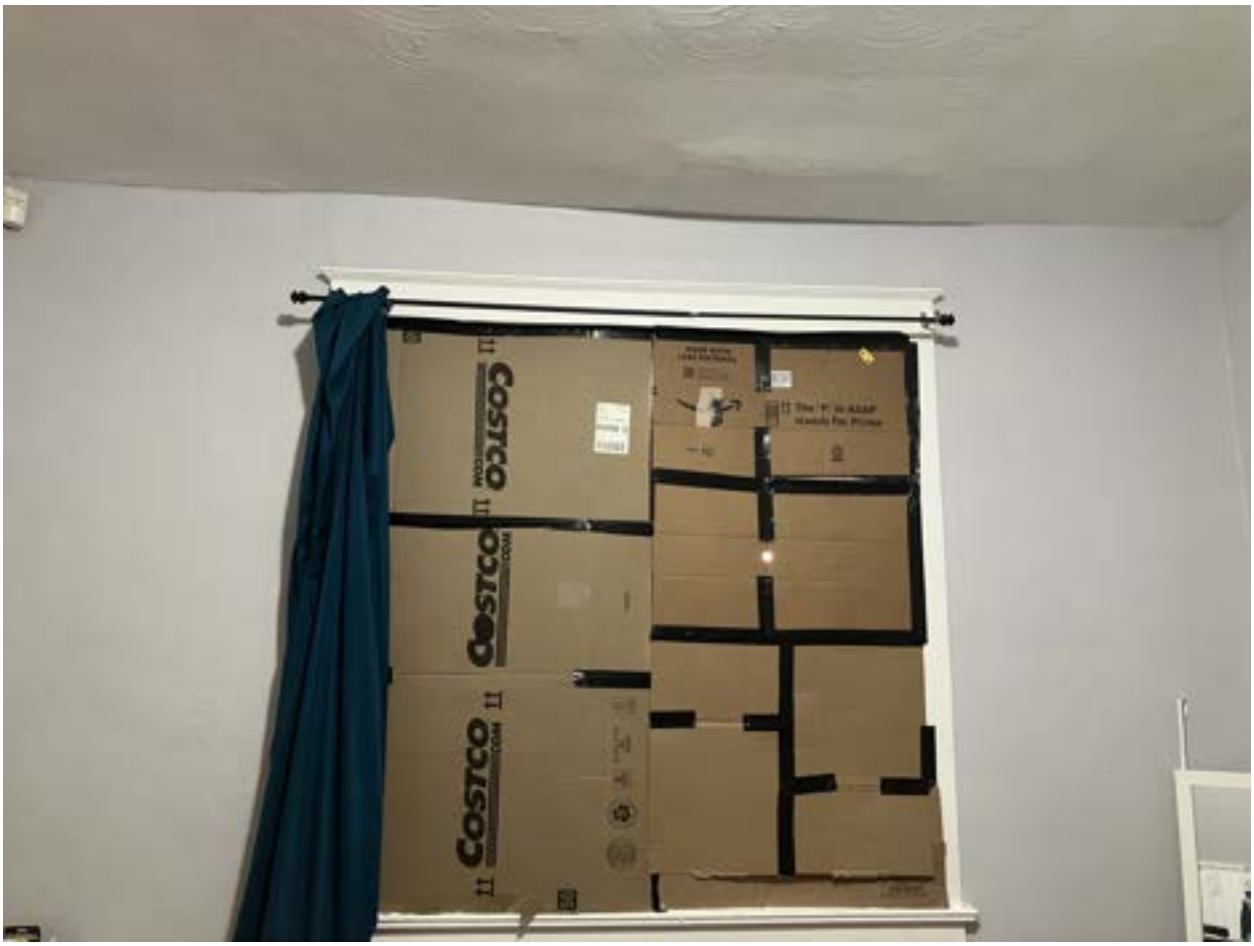
The images were captured with samller diameter left-to-right





2.3 Bonus: Camera obscura in your room (20 points)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