6.819 PSET 6
11/02/2017

ISAAC KONTOMAH

Group: Devin Morgan , Kamoya Ikhofua,Isaac Kontomah , Andrew Zhang
Collaborators in Taking Photos: Anthony Rolland , Benjamin Waar,Afika Nyati , Suman Nepal

1. Building a Digital Camera Obscura

1.1 *Picture of camera obscura*

Figure 1: Camera obscura inside

Figure 2: Camera obscura box

1.2 *Taking a picture with the camera obscura*

Figure 3: Scene 1

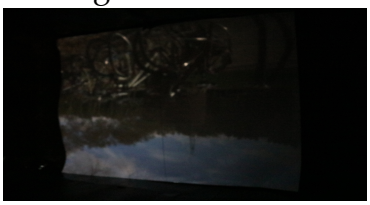


Figure 4: Scene 2

Figure 5: Scene 3

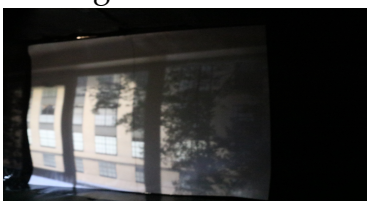


Figure 6: Scene 4

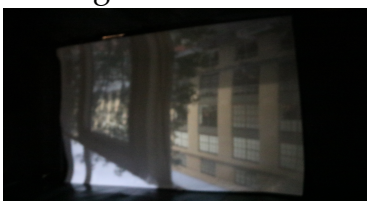


Figure 7: Scene 5

2. Anaglyph Camera Obscura
3d scenes

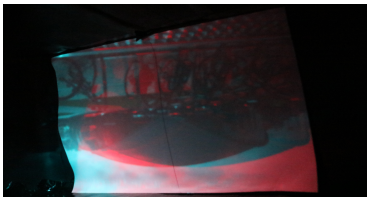


Figure 8: Scene 1

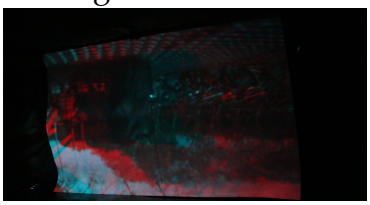


Figure 9: Scene 2

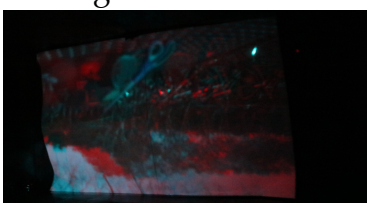


Figure 10: Scene 3

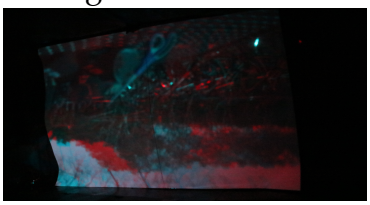


Figure 11: Scene 4

Figure 12: Scene 5

3. Calibration and Image Correction

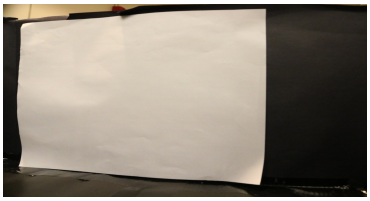


Figure 13: Distorted Image

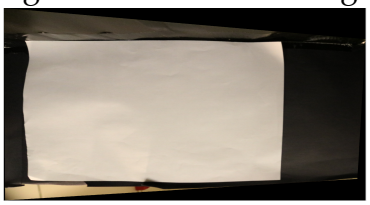
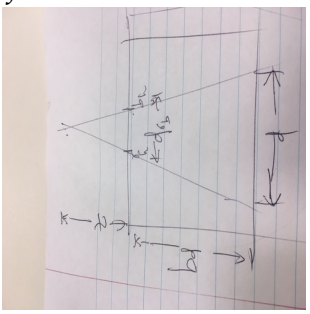


Figure 14: Corrected Image

4. Anaglyph Camera Obscura: A device to Measure Distances to Objects
An analytical expression that relates the distance between the two spots in the picture with the distance of the light with respect to the camera and the parameters of the camera (distance to the back wall, separation between the two holes, etc.)



Picture for proving relationship between z and d
$b_d =$ box distance
$z =$ distane of light from pinhole
$d_{RB} =$ distance between red and blue holes
$d =$ distance between two lights cast on the white paper
Using similarity of triangles ,
$\frac{z}{d_{RB}} = \frac{z+b_d}{d}$
$zd = zd_{RB} + b_d d_{RB}$
$zd - zd_{RB} = b_d d_{RB}$
$z(d - d_{RB}) = b_d d_{RB}$
$z = \frac{b_d d_{RB}}{(d - d_{RB})}$
Using 1 inch = 247.2727 image distance units, and the above formula , we can plots values for z and compare to those taken by camera with pre-

known *ds* or vice versa

Figure 15: z=17 inches

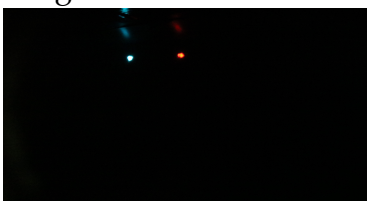


Figure 16: z=34 inches

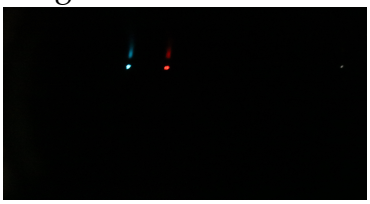


Figure 17: z=51 inches

Figure 18: z=68 inches

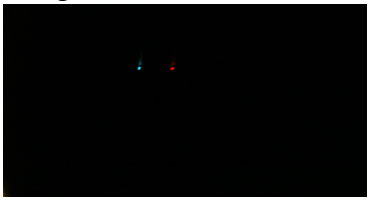


Figure 19: z=85 inches

lntuitively , as you go farther from the holes,ie. as z increases, the rays should converge to a smaller d value on the white paper , hence this is consistent with the graphs below since as z increases , d decreases.From

the scatter plots , it can be seen that generally as d increases z decreases and as d decreases , z increases both emperically and using the formula.

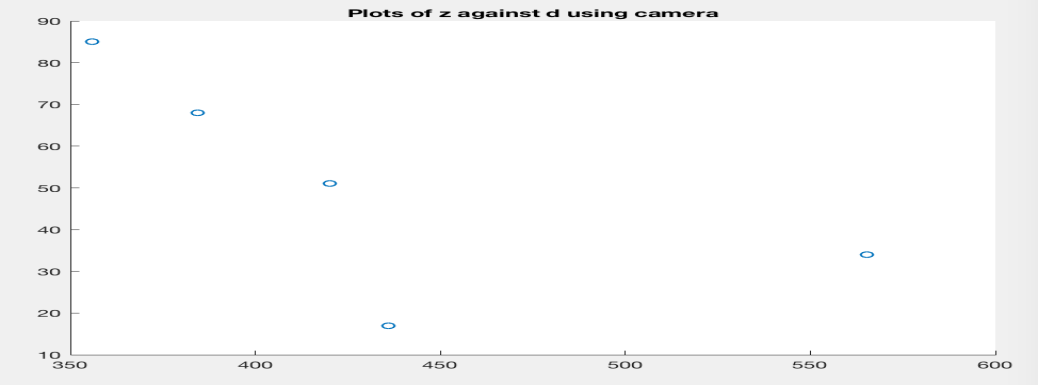


Figure 20: graph of z against d using camera images

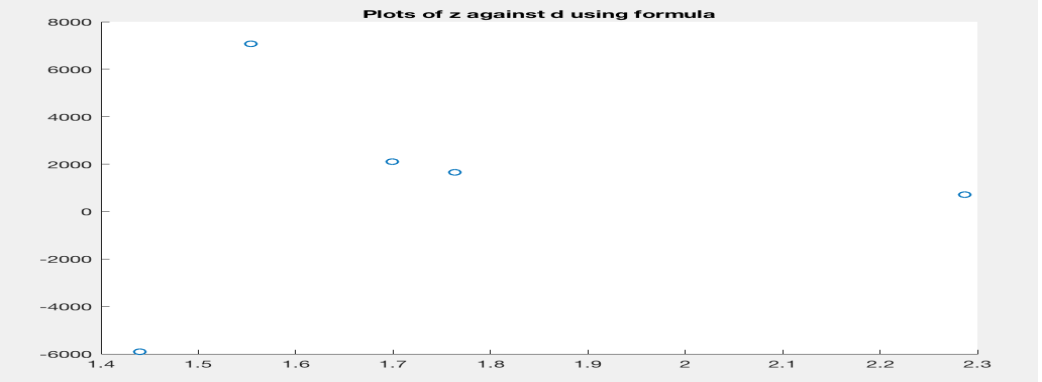


Figure 21: graph of z against d using pre-known d-values