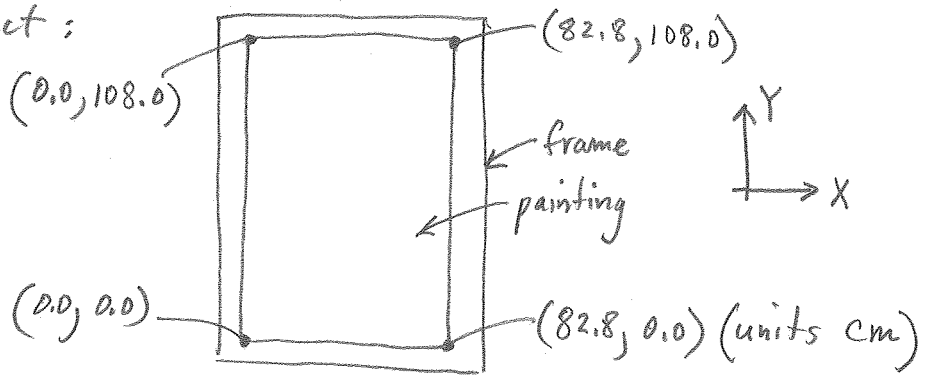
Photogrammetry I Homework 3

assigned Tuesday 12 Feb, due Tuesday 26 Feb

1. Retrieve the file ccal.zip from homework page.

(A) 2. Get file img-7174.jpg, an oblique photo of a painting of Prof. Woods (former CE head). Measure the corners of the painting (photoshop, units: pixels, or matlab: A = imread('img-7174.jpg'); image(A); zoom in for detail, measure with  icon, x = column, y = row, also use "axis equal")

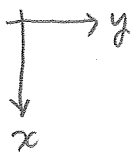
3. Use object coordinates derived from measurements on the object:



4. Interchange image measurement coordinates so

x = row, y = column

now it is right-handed



5. Solve linear equations for $a_0, a_1, a_2, b_0, b_1, b_2, c_1, c_2$

$$x = \frac{a_0 + a_1 X + a_2 Y}{1 + c_1 X + c_2 Y}$$

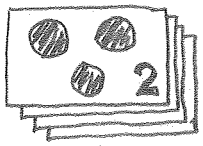
$$y = \frac{b_0 + b_1 X + b_2 Y}{1 + c_1 X + c_2 Y}$$

(remember - rearrange so it is linear in a, b, c)

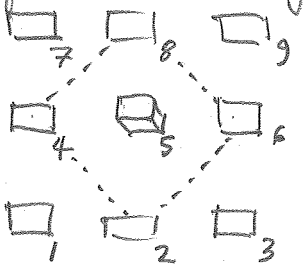
6. now that you have object → image transformation rectify the image. Use GSD = ½ mm,

limits $X_{min} = -10.0$, $X_{max} = 92.8$,
$Y_{min} = -10.0$, $Y_{max} = 118.0$

use bilinear interpolation. Save as .jpg file
submit matlab code, measurements, transformation parameters, and resulting rectified image (.jpg)
original image has $w = 2304$ & $h = 3456$ (rotated portrait format)

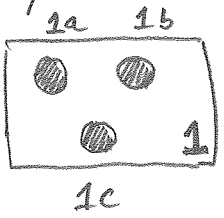
(B) 1. Acquire imagery for camera calibration. print targets2.pdf 

1-9. Lay them out and tape to the floor in a large space, in a square grid pattern

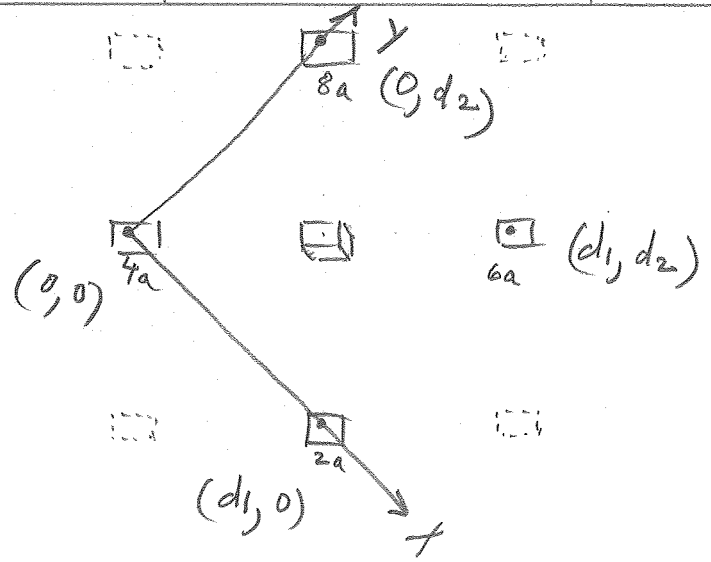


elevate target 5 by ≈ 5 in. / 13 cm.

2. We will name the points as:



3. We will use 4a, 8a, 6a, 2a as reference points to get approximate orientation, so measure $4a \to 2a = d_1$ and $4a \to 8a = d_2$, then assign coordinates:



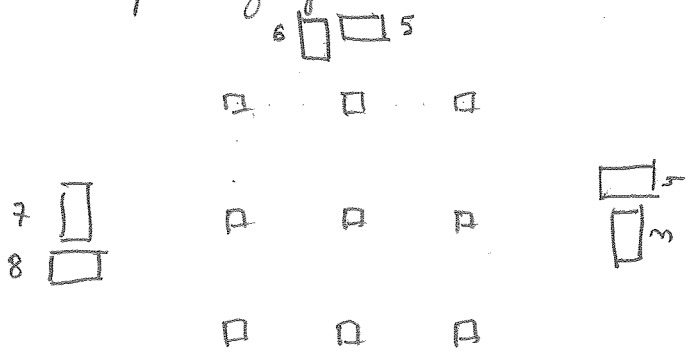
4. put these coordinates into text file : rect.txt

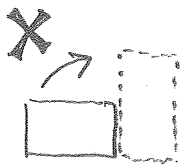
4a	0	0	0
2a	d_1	0	0
8a	0	d_2	0
6a	d_1	d_2	0

5. configure another text file ca.txt with camera info :

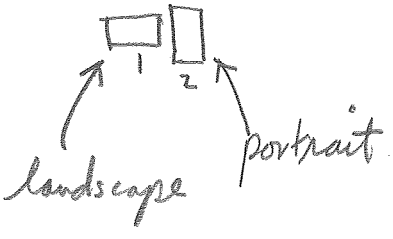
wwww ← image width pixels
hhhh ← image height pixels
ffff.ff ← approx. focal length, pixels

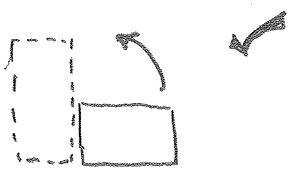
6. take 8 photographs





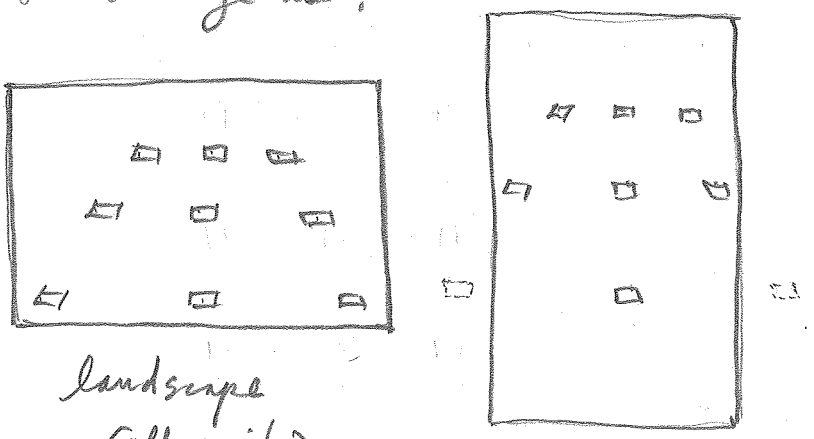
not this way.





landscape to portrait

7. Try for coverage as:



landscape (all points)

portrait (missing 2 points)

8. nominal distance from camera to target array should match the object distance that you plan to use for latter 3D object mapping / reconstruction project. But obviously a limit on space available and visibility.

9. learn measure program CCmeas.m to measure all points visible in all 8 images. Image_file.jpg → Image_file.txt. 8 Text files

10. for each measurement file, run apx_eo.m to approximate EO. results will be logged into "pho.dat" edit this in case of repeat measurements.

11. submit photo 1, all measurement files, listing from apx_eo.m runs, and the file pho.dat.