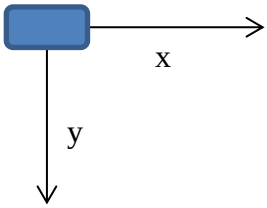
Brian Dinh
34546266
Homework 2

Questions

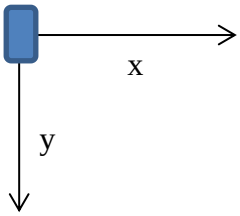
1. (1280x1024 pixels) / 15 mm per pixel = 85.3 x 68.26 mm

Vertical FOV = 2 * $\tan^{-1}$ (85.3 / (2*50)) = 80.93°
Horizontal FOV = 2 * $\tan^{-1}$ (68.26 / (2*50)) = 68.63°

Horizontal FOV, focal length 100 = 2 * $\tan^{-1}$ (68.26 / (2*100)) = 37.69°

2. 


z is pointed straight from the viewer's perspective. This means relative to the world coordinate system the camera (blue) is also pointed in z's direction




After rotating about the y axis 90 degrees (looking down from above), the camera should now be pointing in x's direction. Moving it to the left from the global coordinate system means to move in the negative x direction

Given coordinates (2,2,2):

Make homogenous = (2,2,2,1)

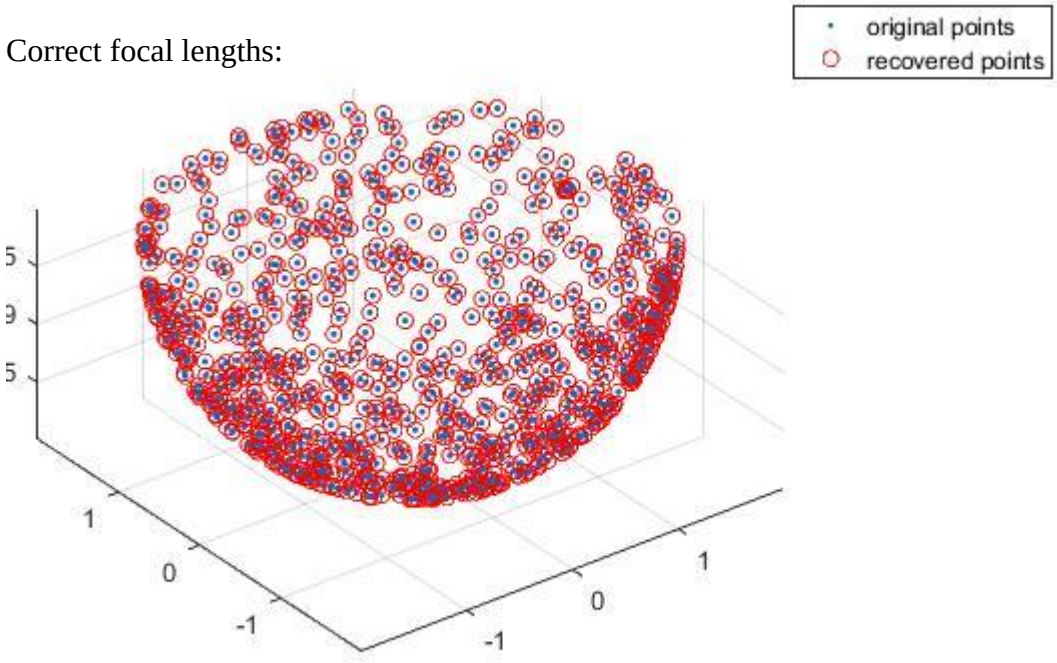
Y-axis 90° rotation $\begin{bmatrix} \cos\Theta & 0 & -\sin\Theta & 0 \\ 0 & 1 & 0 & 0 \\ \sin\Theta & 0 & \cos\Theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ = (-2,2,2,1)

Translating left 2 meters $\begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ = (-4,2,2,1)

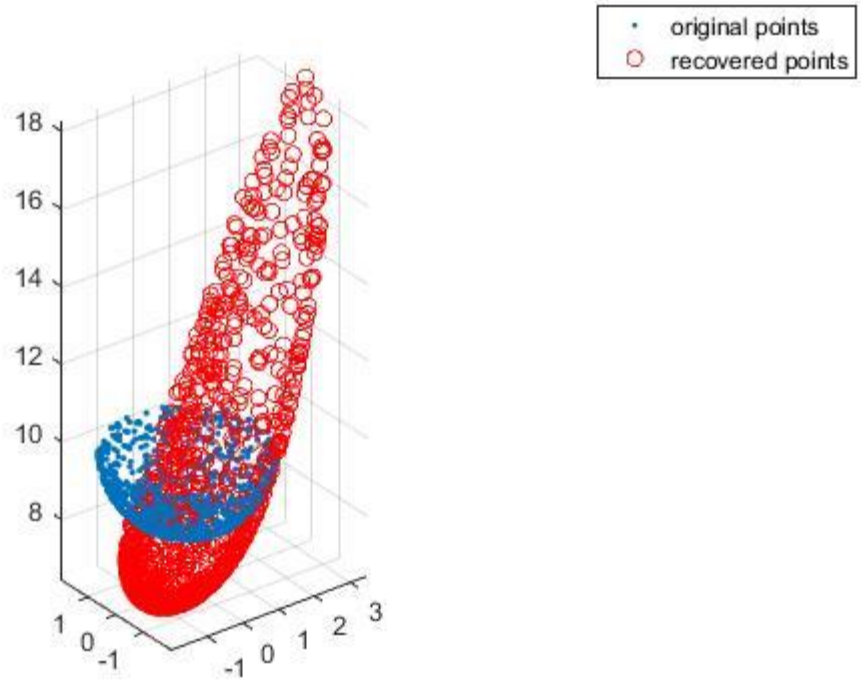
Final position after rotation + translation = (-4,2,2)

Brian Dinh
34546266
Homework 2

3. Correct focal lengths:




Left focal length 10% larger




Changing focal length skews the recovered shape. By increasing it, the recovered structure becomes stretched out. By decreasing it, it becomes smaller and compressed. I think there should only be at most 1% change in focal lengths, otherwise the recovered points are skewed too much.