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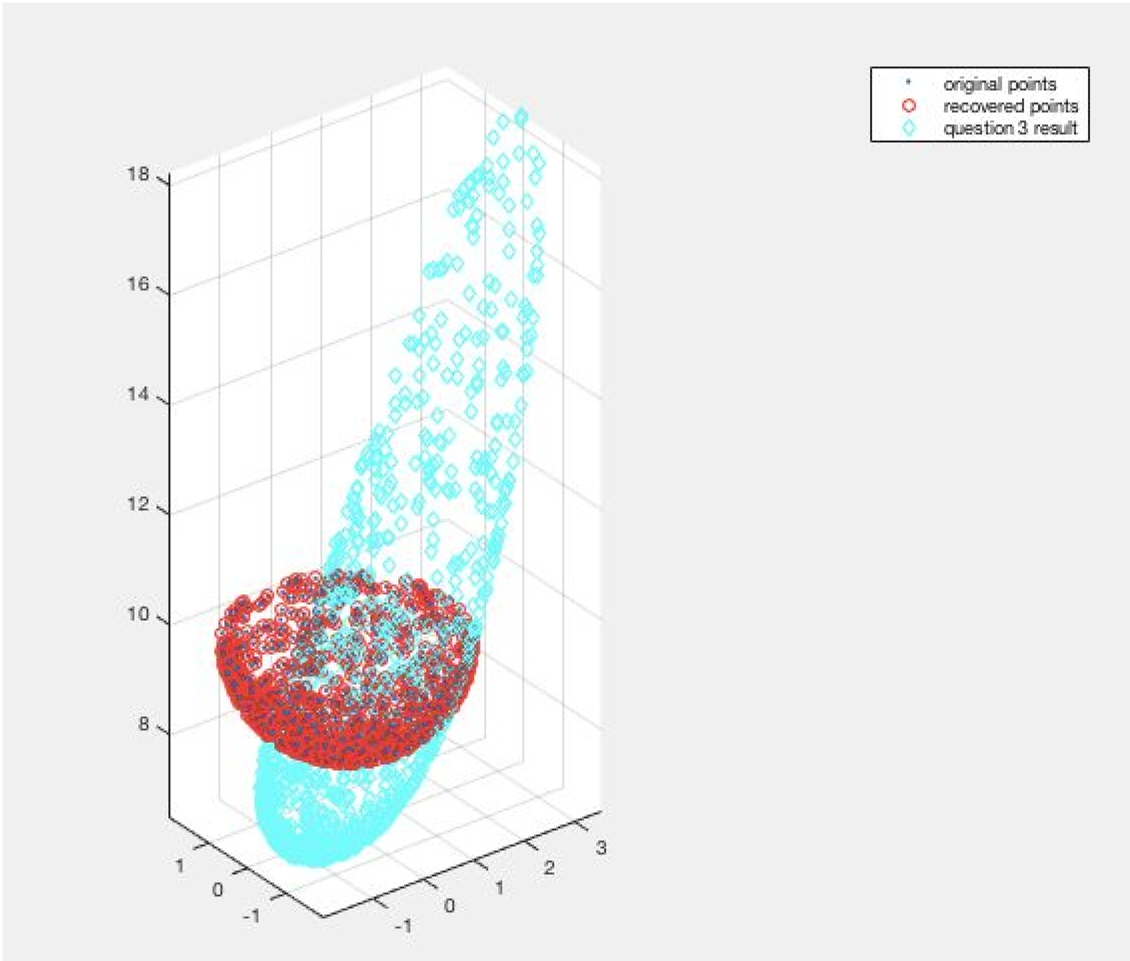
HW #2 Write up

**ANGLE OF VIEW (IN DEGREES) = 2 ARCTAN( SENSOR WIDTH / (2 X FOCAL LENGTH)) * (180/Π)**

1. Using the above equation, I calculated the horizontal angle of view and the vertical angle of view. Long focal length delivers small field of view and short focal length delivers wide field of view. With the focal length of 50mm,
   a. horizontal field of view = 2 * ARCTAN((1280/15) / (2 * 50)) * (180/pi)
      = 2 * ARCTAN(1280/1500) * (180/pi)
      = 2 * 0.706 * (180/pi)
      = 80.95 degrees
   b. vertical field of view = 2 * ARCTAN((1024/15) / (2 * 50)) * (180/pi)
      = 2 * ARCTAN(1024/1500) * (180/pi)
      = 2 * 0.5990 * (180/pi)
      = 68.64 degrees

   With the focal length of 100 mm, the new horizontal field of view will be:
   horizontal field of view = 2 * ARCTAN((1280/15) / (2 * 100)) * (180/pi)
   = 2 * ARCTAN(1280/3000) * (180/pi)
   = 2 * 0.40328 * (180/pi)
   = 46.21 degrees
2. Rotation matrix = [ cos(90) 0 sin(90); 0 1 0; -sin(90) 0 cos(90)]
   Translation vector = [ 0; 0; 2]
   (2, 2, 2) in world coordinate system would be (2, 2, 0) in the camera coordinate system after the camera has been moved. The formula for transformation is rotation matrix * world coordinate + translation vector. So in this case, it would be rotation matrix * [2; 2; 2] + translation vector.
   Camera coordinate system = [cos(90) 0 sin(90); 0 1 0; -sin(90) 0 cos(90)] * [2; 2; 2] + [0; 0; 2]
   = [0 0 1; 0 1 0; -1 0 0] * [2; 2; 2] + [0; 0; 2]
   = [2; 2; -2] + [0; 0; 2]
   = [2; 2; 0]

3.




Focal length and field of view are closely related. When focal length gets longers, the field of view gets shorter, and when the focal length gets shorter, the field of view gets wider. So when the left camera's focal length was extended by 10%, the image will appear skewed toward where the camera is pointing at. So basically, when the field of view of right camera is wider, the field of view of the left camera is shorter, so the two images projected by two cameras are at different points. Thus an acceptable amount of error in the focal length has to be from 0 to 1% in order for someone's face shot to match up.