

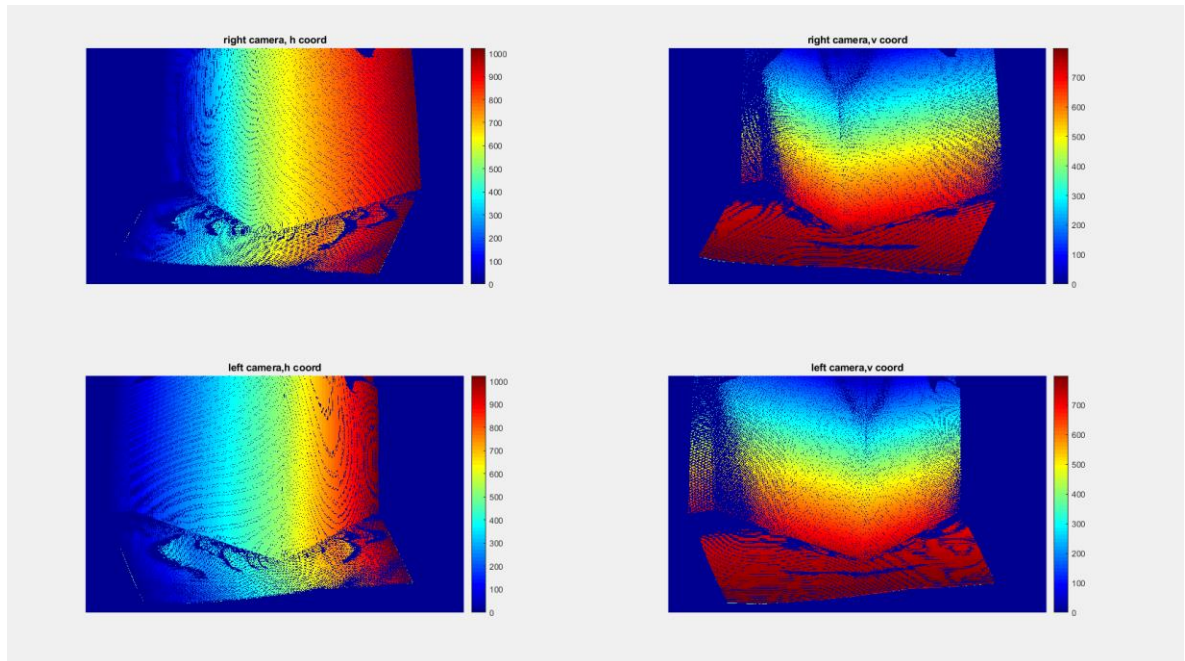
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CS 117 SP18

## Assignment 4 Write-up

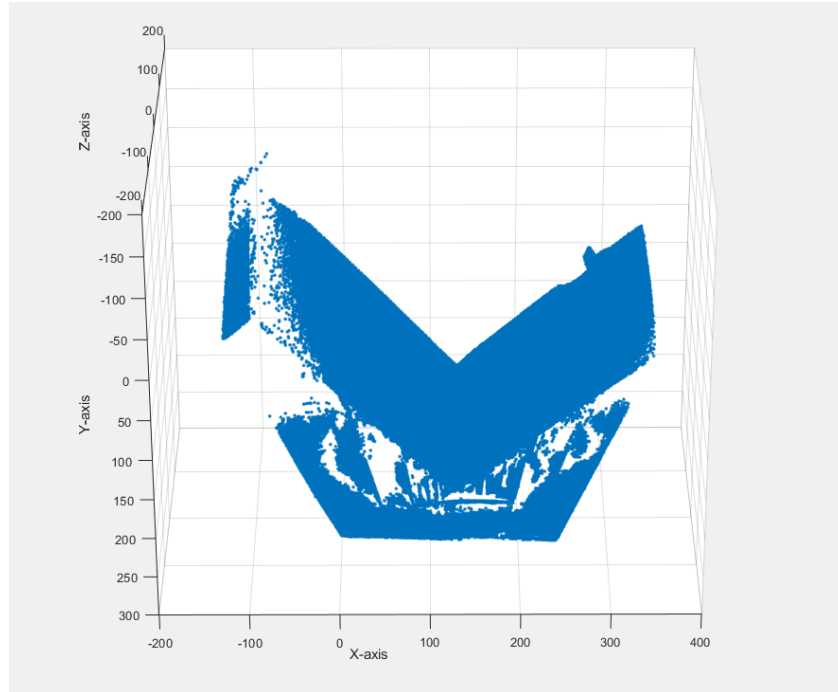
Question 1:

a)



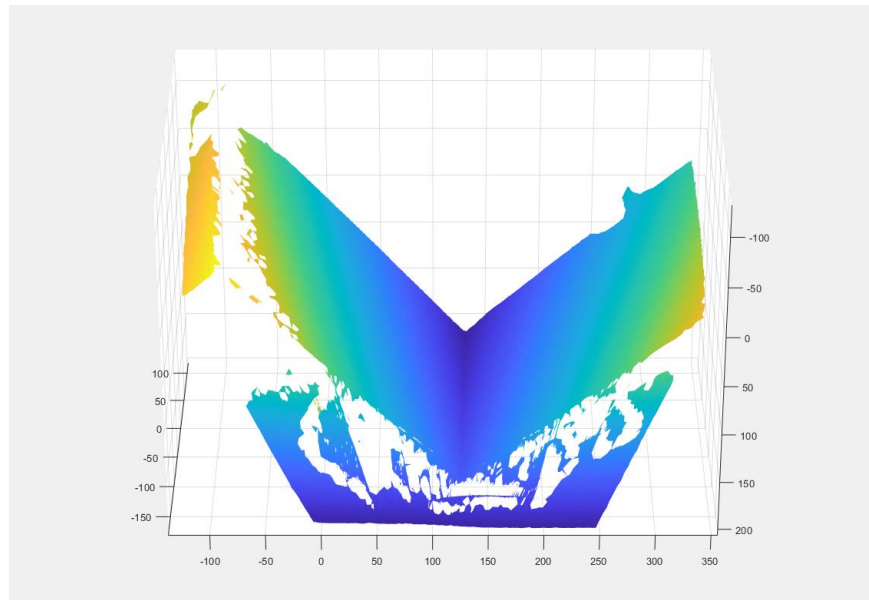
Decoded result images

b)

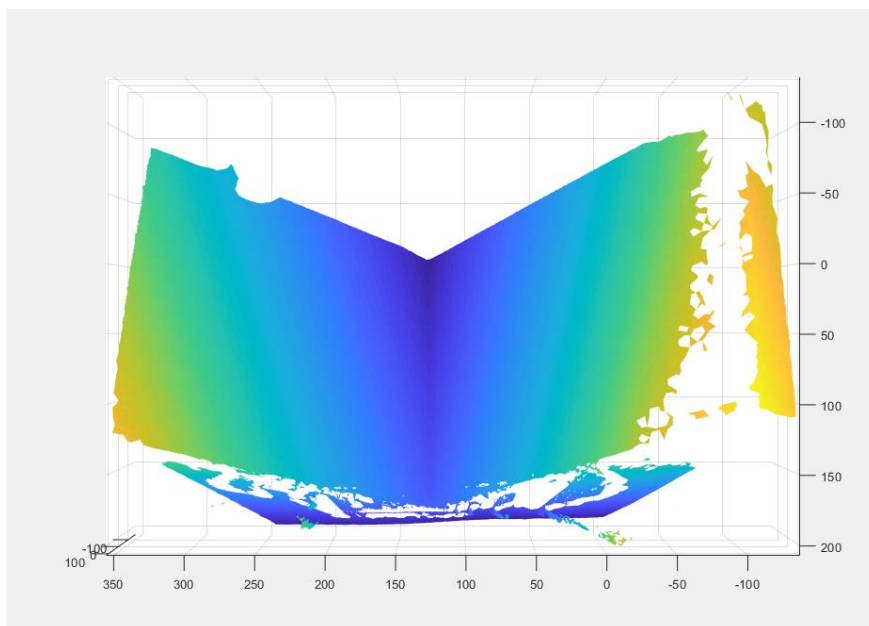


Plot of triangulated points recovered by reconstruct

c)



Final mesh produced, front view



Final mesh produced, back view

## Question 2:

To clean up noisy points, I first removed points outside the bounding box containing the object. I did this by first specifying threshold values in the positive and negative directions along each axis. Then, I found and removed all recovered points that had coordinates outside of the specified ranges. I used the `delaunay` function afterwards to obtain a triangulation of the resulting points. I then calculated the length of each side (`side1`, `side2`, `side3`) of all the triangles and kept the longest side per triangle in a new matrix. From this matrix (`maxSides`) I found triangles with sides that were outside the threshold and removed them from the triangulation (`tri`). I used the new range of indices (`unique(tri)`) to remove unreferenced points from the mesh. To remap the range of indices in `tri` to the range of indices in `X`, I used the `intersect` function to map between the old `X` indices and new, valid `X` indices. I used this mapping along with the `ismember` function to replace occurrences of old indices in `tri` with the valid indices.

## Question 3:

a)

Some parts of the surface have more scanned points than others because reflected light from the surface underneath the box caused some areas of the box to be marked as unrecoverable. The reflected light caused the difference in brightness between the pairs of scans to be less than the threshold (they were lit but were too similar).

b)

There is some noise and missing data around the edges of the box because the patterns were not projected parallel with the box's local coordinates. This causes some pixels near the edges of the box to be interpreted as the same value due to occlusion with the surface around the

box. Shadows are being interpreted as part of the gray code, leading to undecodable pixels around edges with dark shadows. Points far from the camera at higher bit levels are also interpreted as similar brightness levels because the codes begin to blur together. Placing the camera closer could fix this.

There also seems to be aliasing in the scan images at higher bit levels that may have to be filtered before using the decoder.