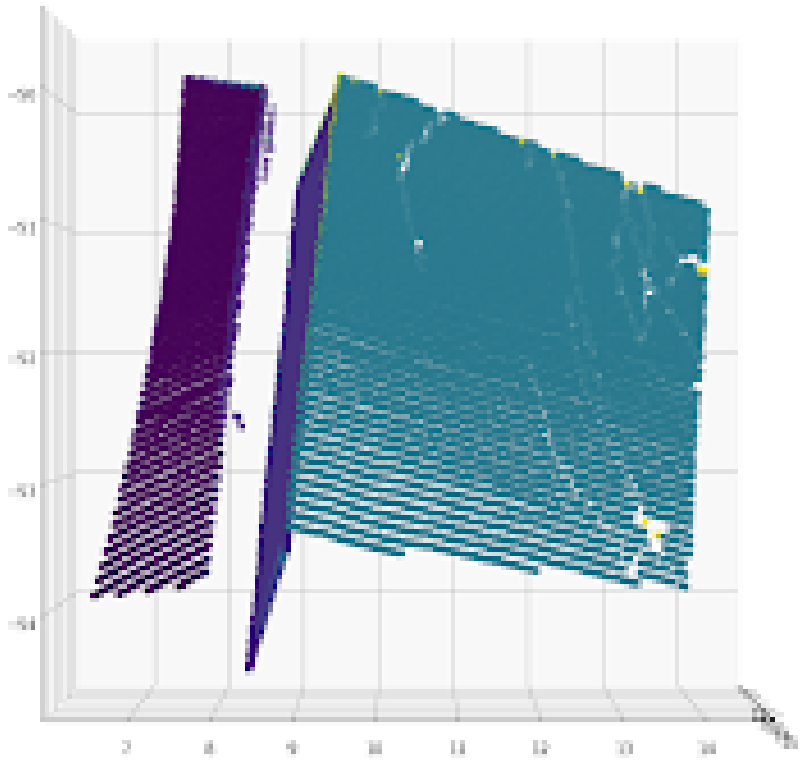
3D Photography - Project 1 Report

I. **Compute normals for all points and apply a region-growing algorithm using the grid structure of the range images.**

A. Small Sample

1. Results:



2. Parameters:

a) Normal kNN sampling: 5x5 neighborhood

b) Hough-based classification: none

c) Region Growing:

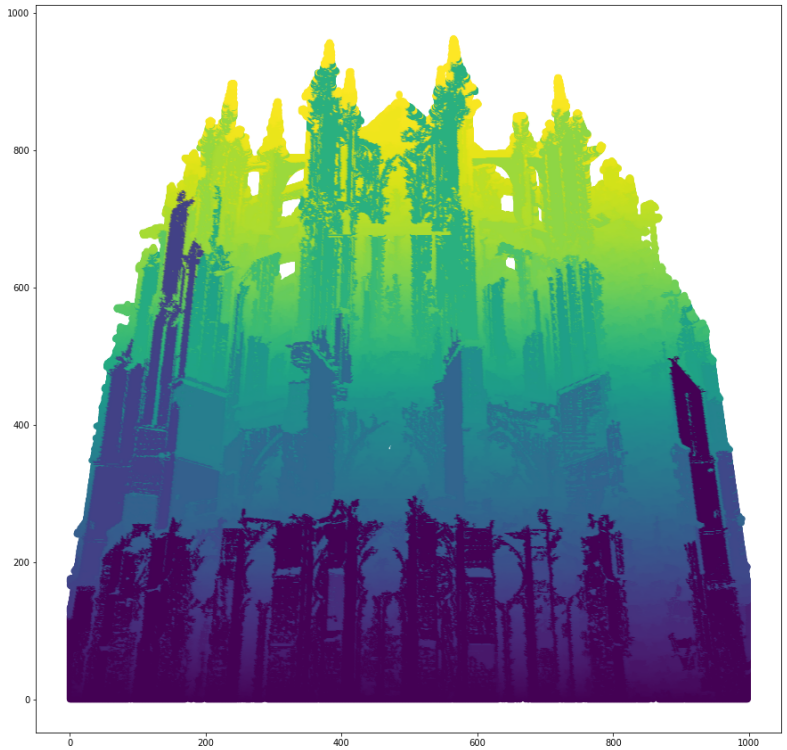
(1) Angle Threshold: 0.7 radian ~= 40 degrees

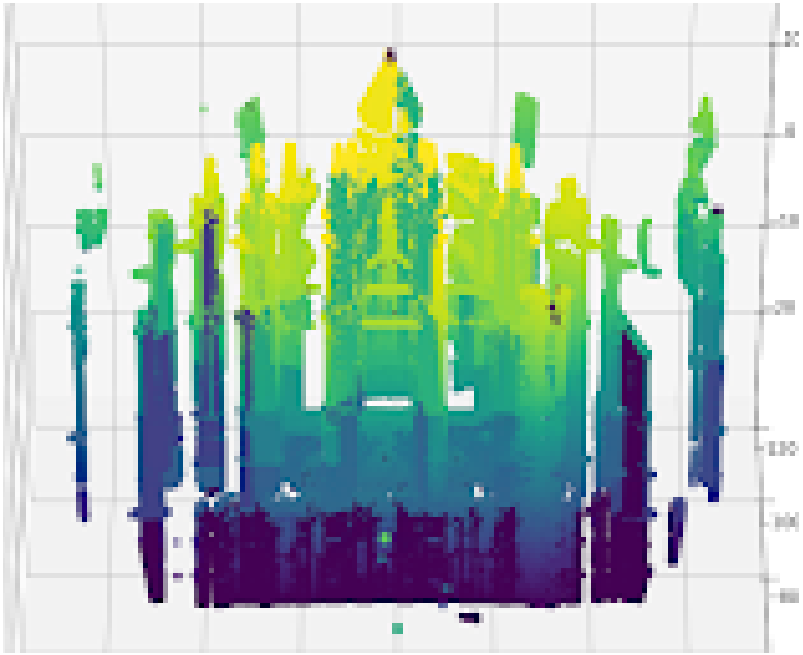
(2) Local Plane Fit Threshold: 3.0

(3) max(|R12 N1|, |R12 N2|) threshold: 1.0

B. Large Sample

1. Results:





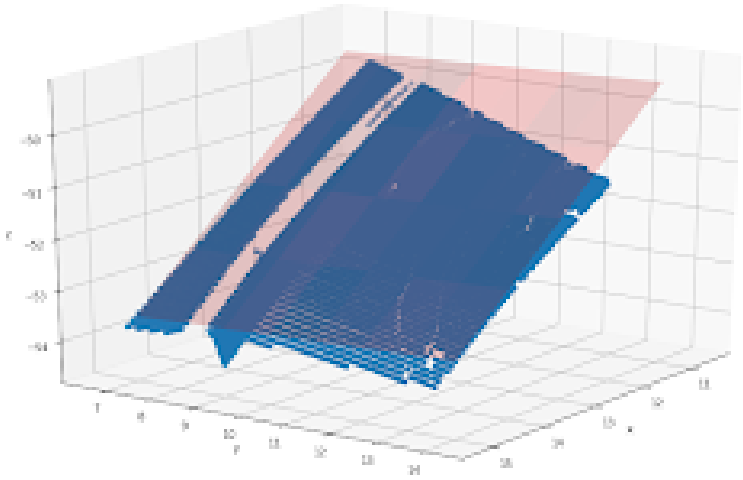
2. Parameters:
    a) Normal kNN sampling: 5x5 neighborhood
    b) Hough-based classification: Uniform 4x4x4 intervals on the xyz components of the normals.
    c) Region Growing:
        (1) Angle Threshold: 0.7 radian ~= 40 degrees
        (2) Local Plane Fit Threshold: 3.0

(3) max(|R12 N1|, |R12 N2|) threshold: 1.0

II. Apply a RANSAC algorithm by selecting 3 points to define a plane and then score it.

A. Small Sample

1. Result



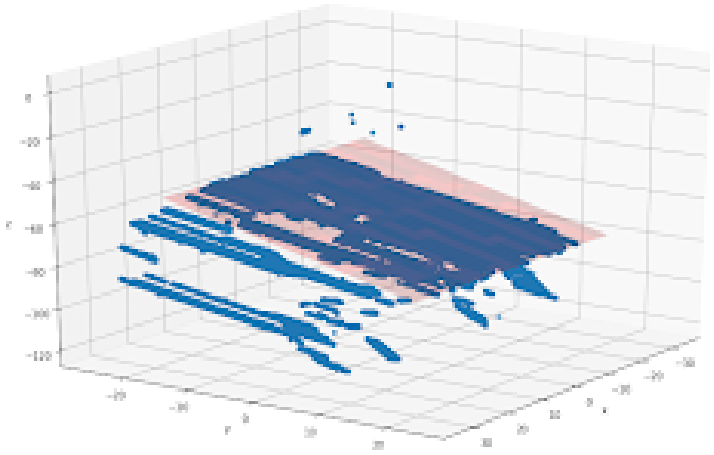
2. Stats

a) Fit error: 0.07485747040500663 (average mean squared error)

b) Iterations: 19

B. Large Sample

1. Result

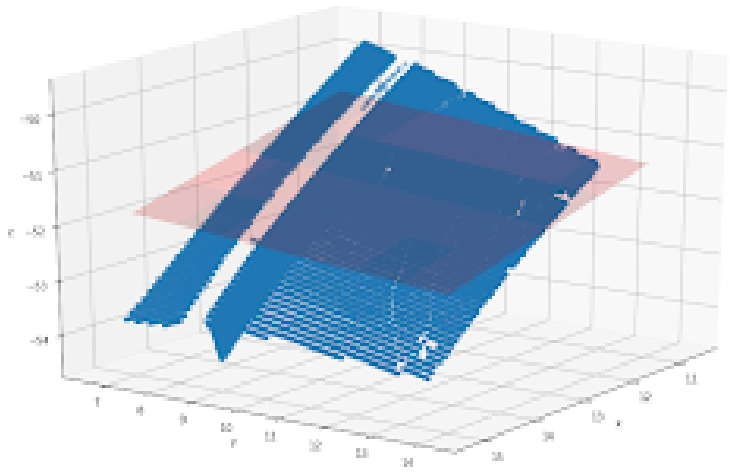


2. Stats
    a) Fit error: 56.79194263535259 (average mean squared error)
    b) Iterations: 3

III. Apply a RANSAC algorithm by selecting 1 point and its normal to define a plane.

A. Small Sample

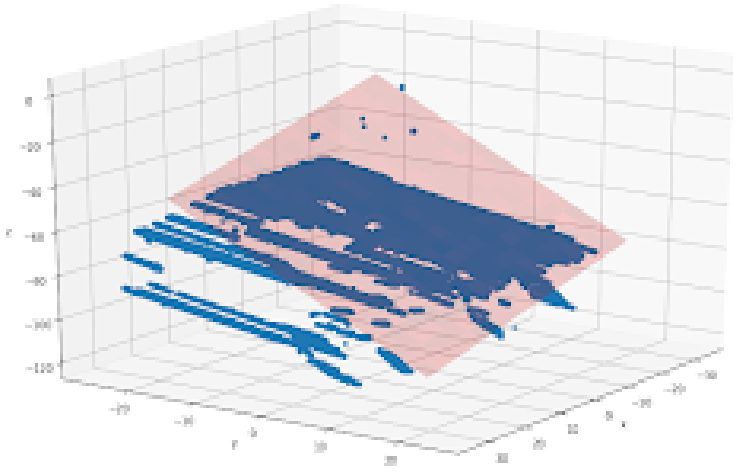
1. Result



2. Stats
    a) Fit error: 0.5944064623449847 (average mean squared error)
    b) Iterations: 220

B. Large Sample

1. Result



2. Stats
    a) Fit error: 59.33022402748604
    b) Iterations: 11