

Assig1_Documentation

February 2, 2023

1 Documentation for Assignment (1)

This assignment consists of 3 main codes to evaluate the naive approach and the dynamic programming approach for displaying the disparity map as well as the third one is for computing the surface normal and 3D triangulation.

- In order to run the naive program, the terminal should be written in it:

```
./OpenCV_naive_stereo (image_1 path) (image_2 path) (name of the output file) window_size
```

- Although to run the dynamic programming program, the terminal should be written in it:

```
./OpenCV_dp_stereo (image_1 path) (image_2 path) (name of the output file) window_size lambada
```

- To run the code of computing the normals and 3D triangulation:

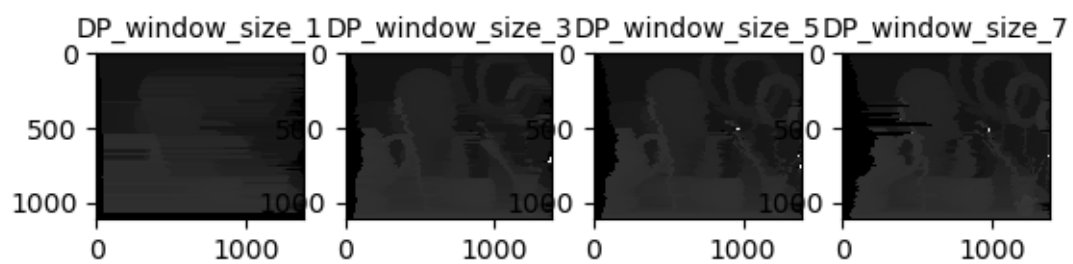
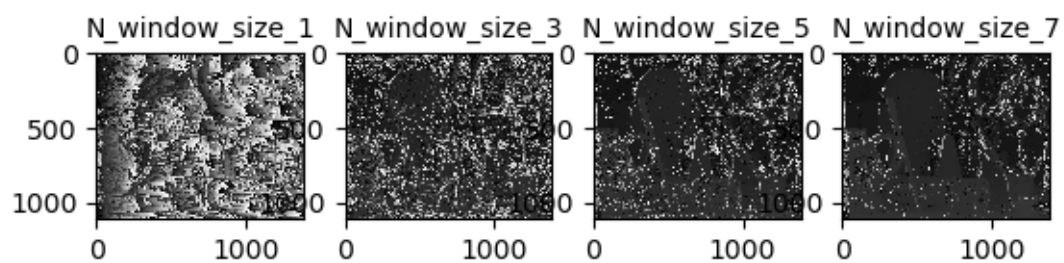
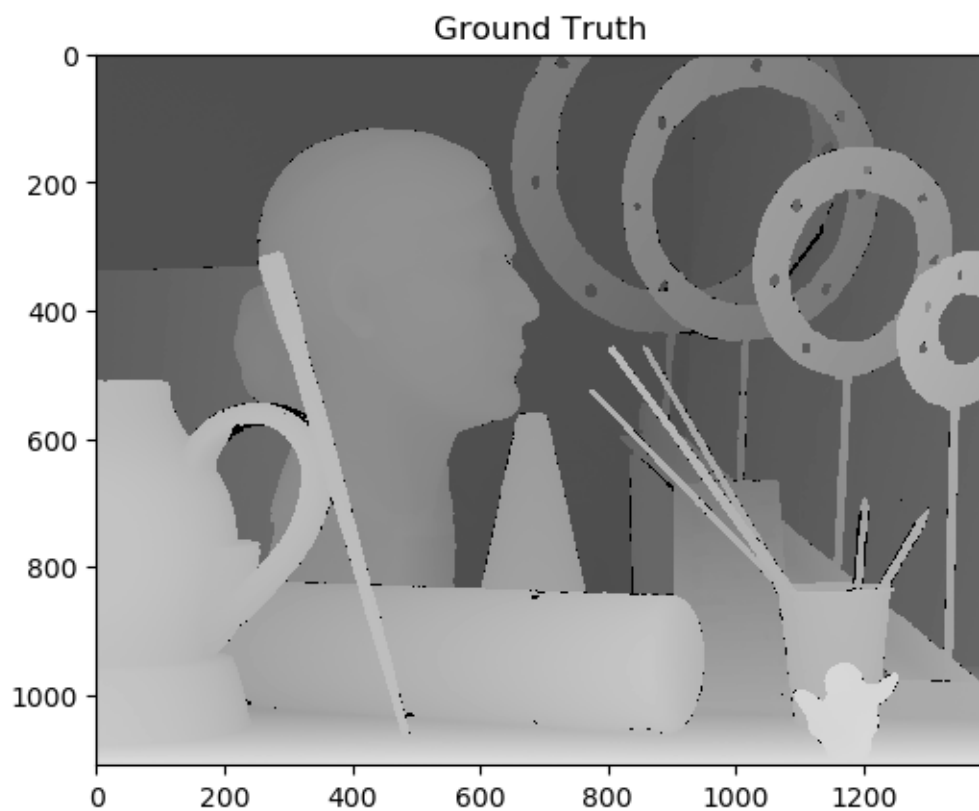
```
./surface_normal.py (radius of KDTreeSearch to compute normals) (number of neighbors)
(downsampling voxel size) (radius of ball pivoting) (path of the point cloud generated from DP)
(name of the output file with extension xyzn)
```

This documentation includes evaluation of six different pairs of images of some metrics as Sum of squared difference, Normalized cross correlation, and Structural similarity index. Also, a comparison between the time taken in the naive “dotted line” and the DP “line” in each pair is included.

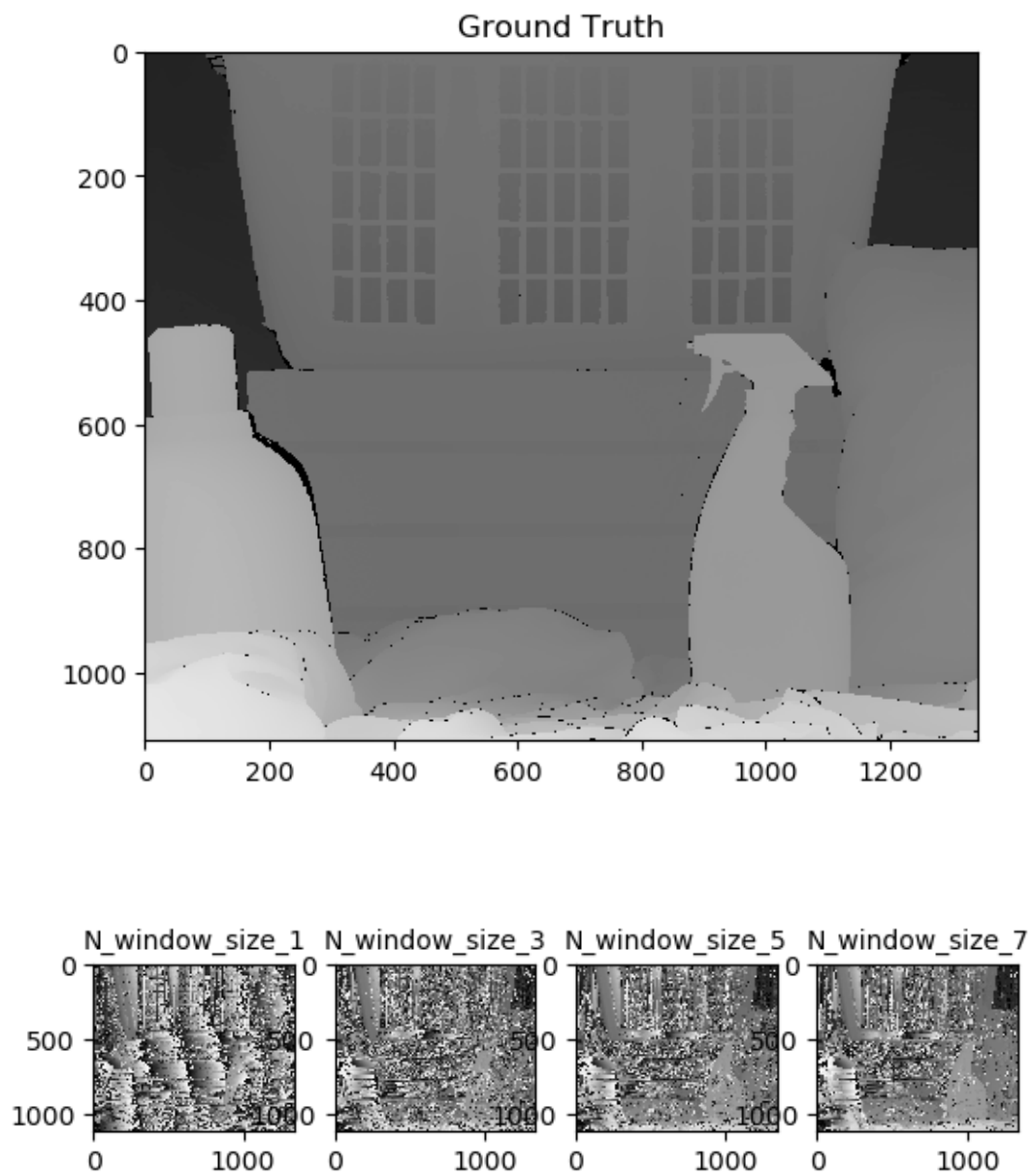
- Most of the pairs in the dynamic programming approach are having the optimal lambada is *100* and window size *3* which give more smooth and less noisy disparity maps. But, with pairs that having more details, the lambada is increased to *250* to have more details shown in the disparity.
- When the window size increase, the lambada also increased to have more fine details shown as with window size *5* and *7*; the lambada is raised to *500* to reduce the noise in the disparity map.

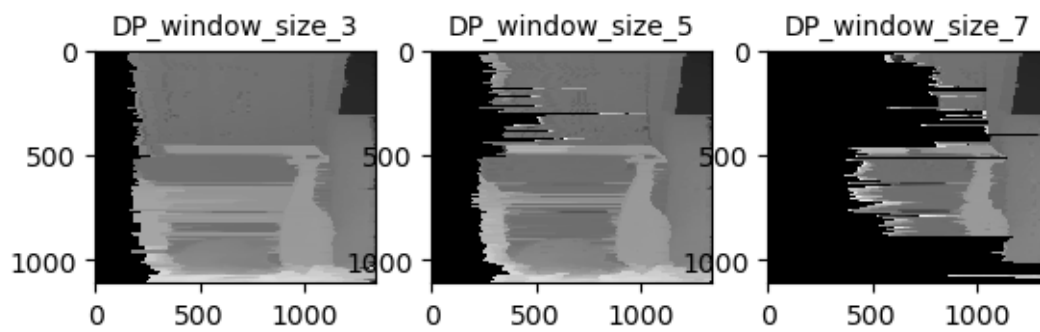
Consequently, there are two files includes the point cloud and normals for pair 1 and 4 which can be shown in meshlab.

First Pair

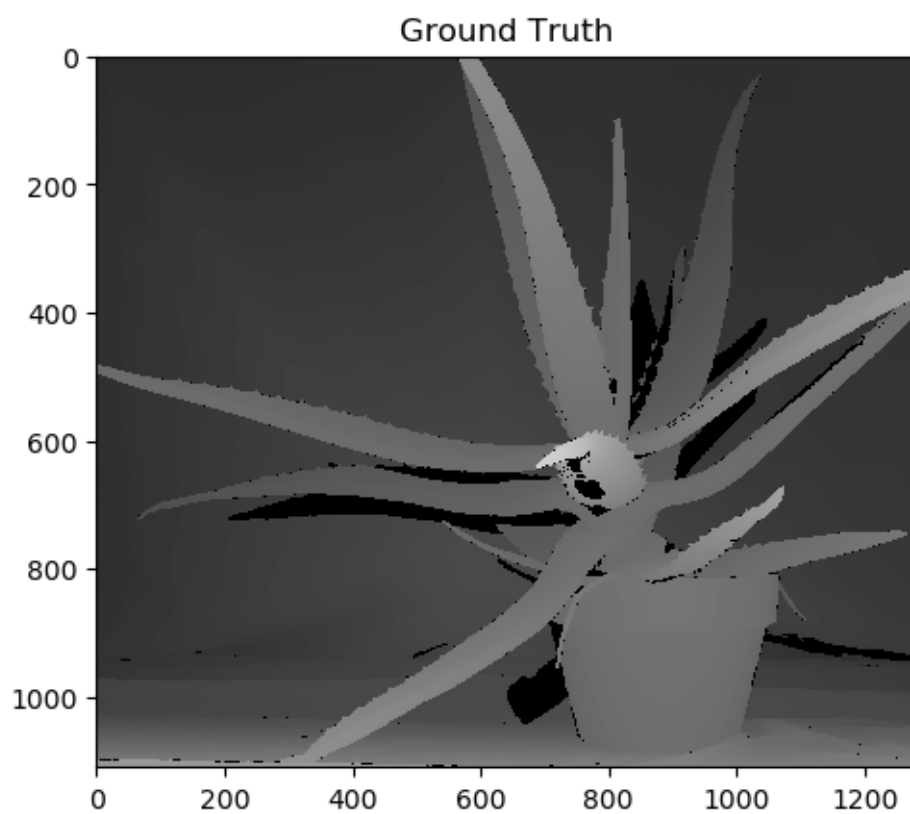


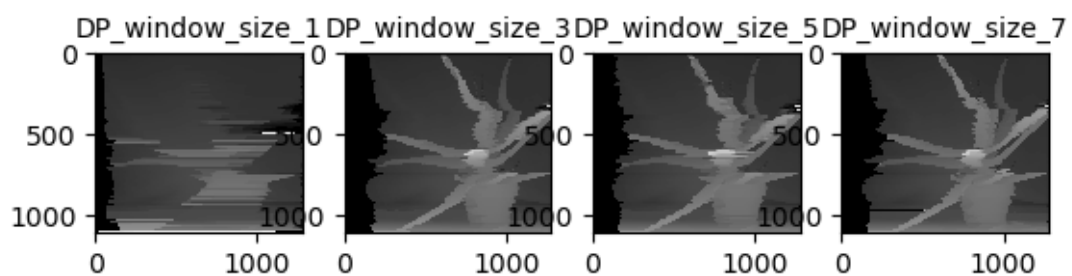
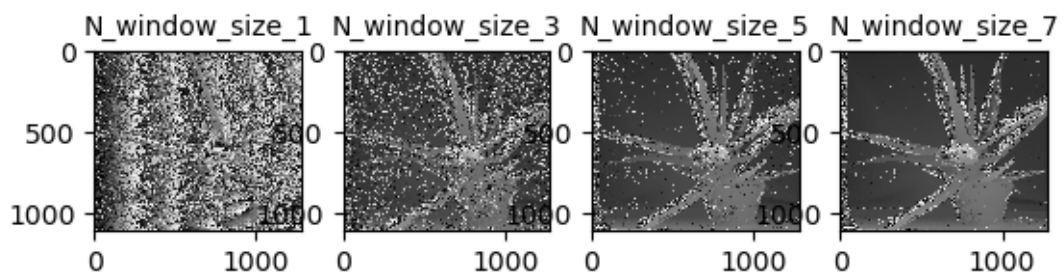
Second Pair



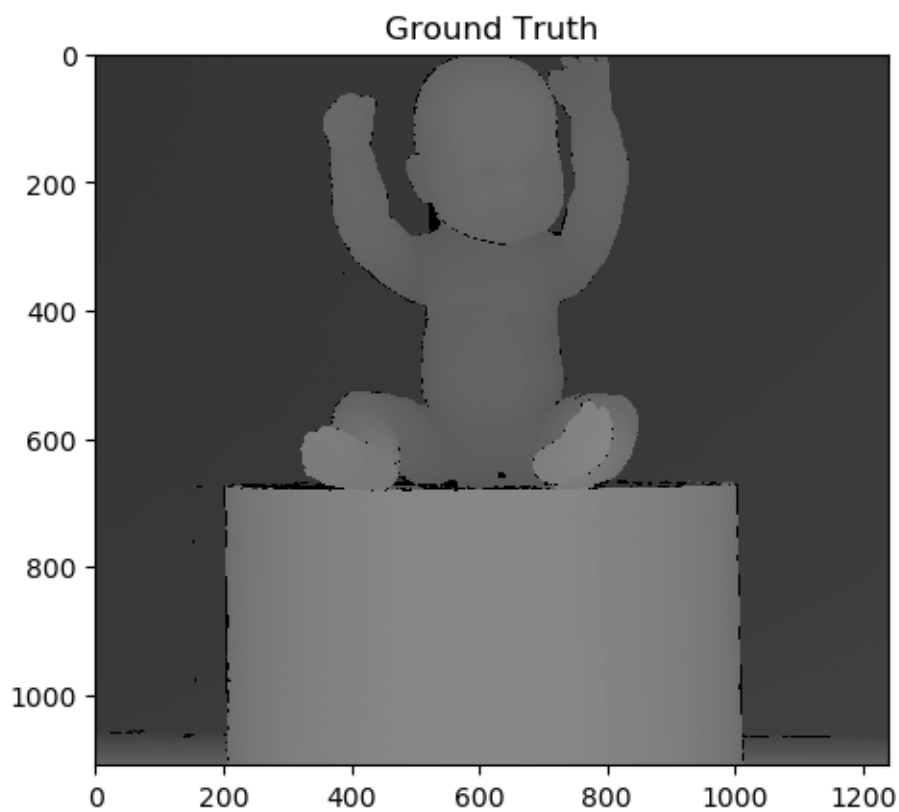


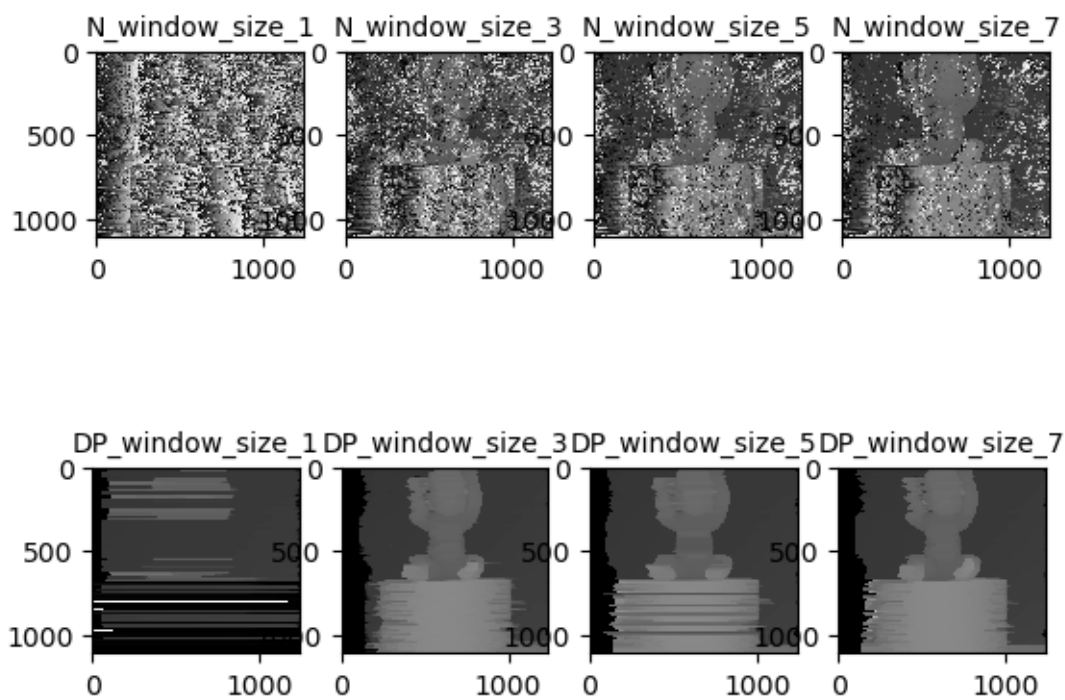
Third Pair:



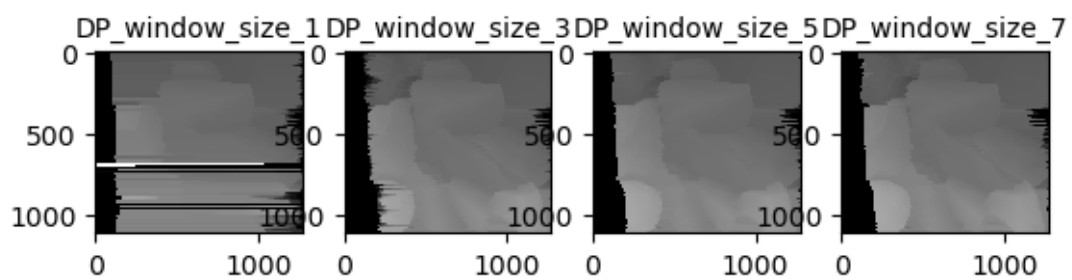
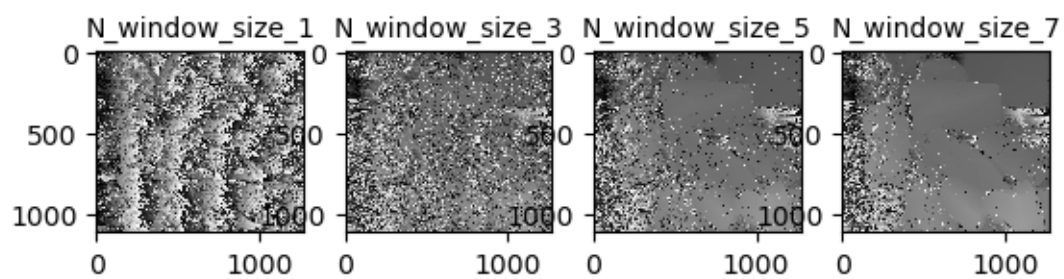
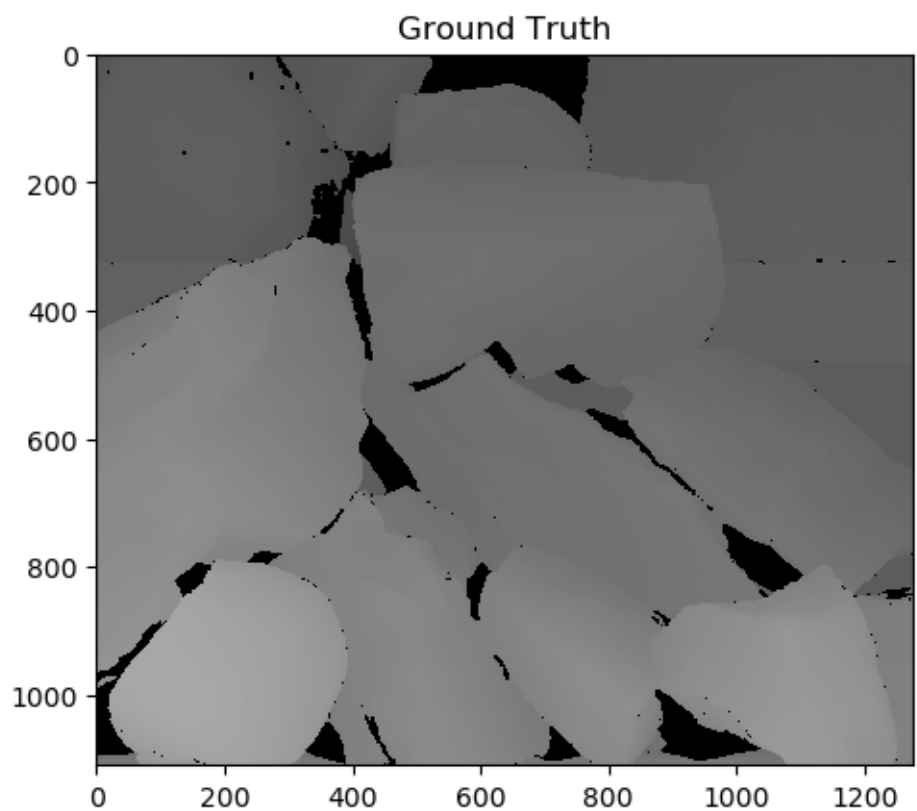


Forth Pair:

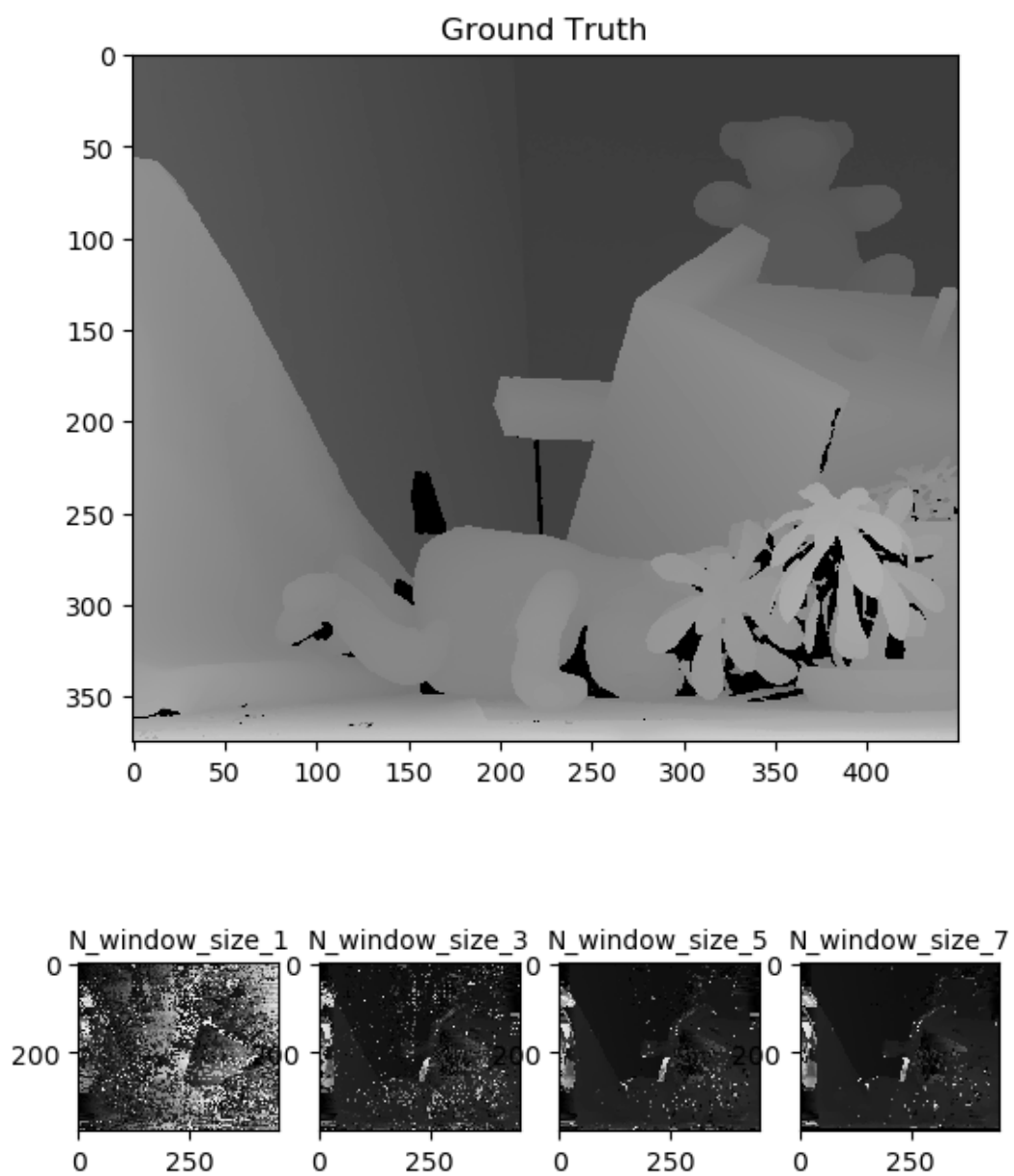


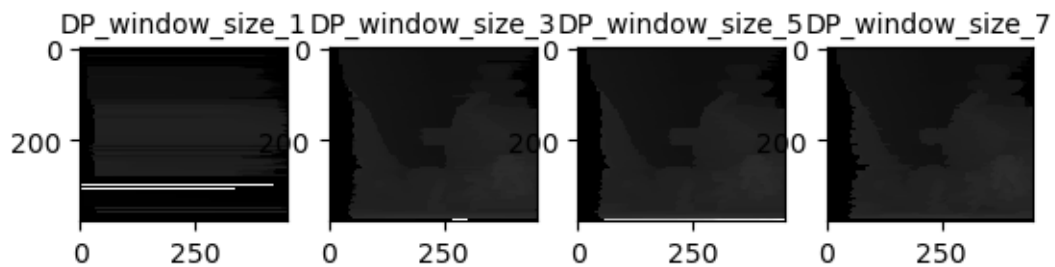


Fifth Pair:

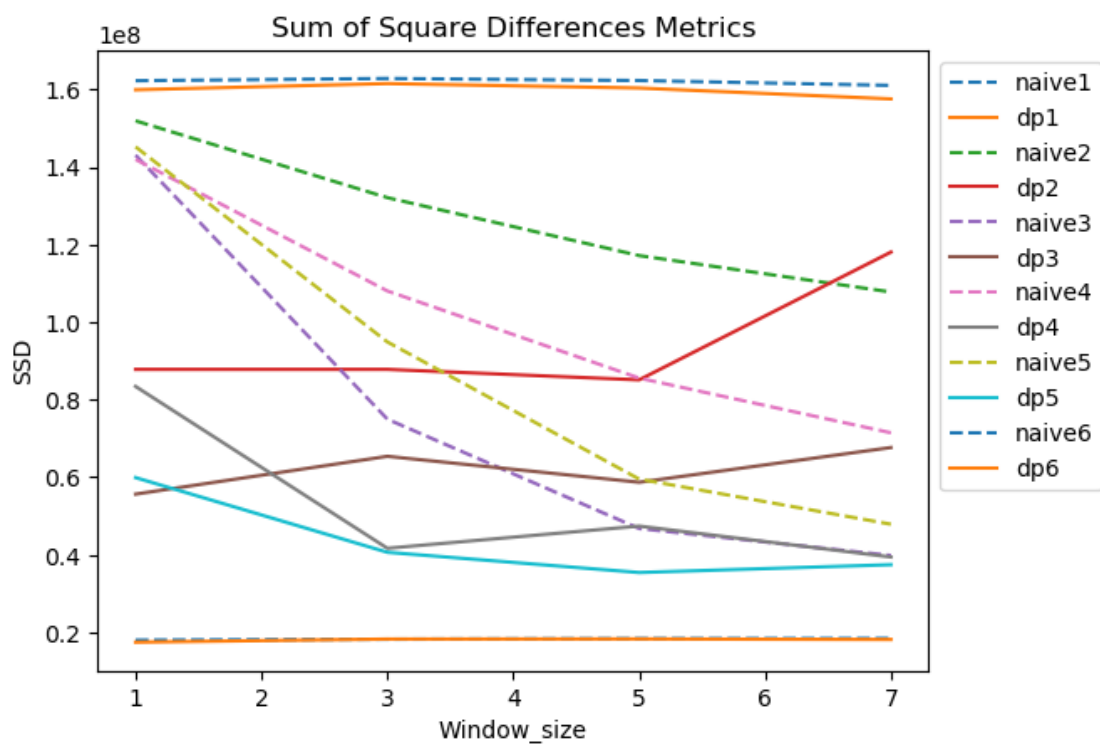


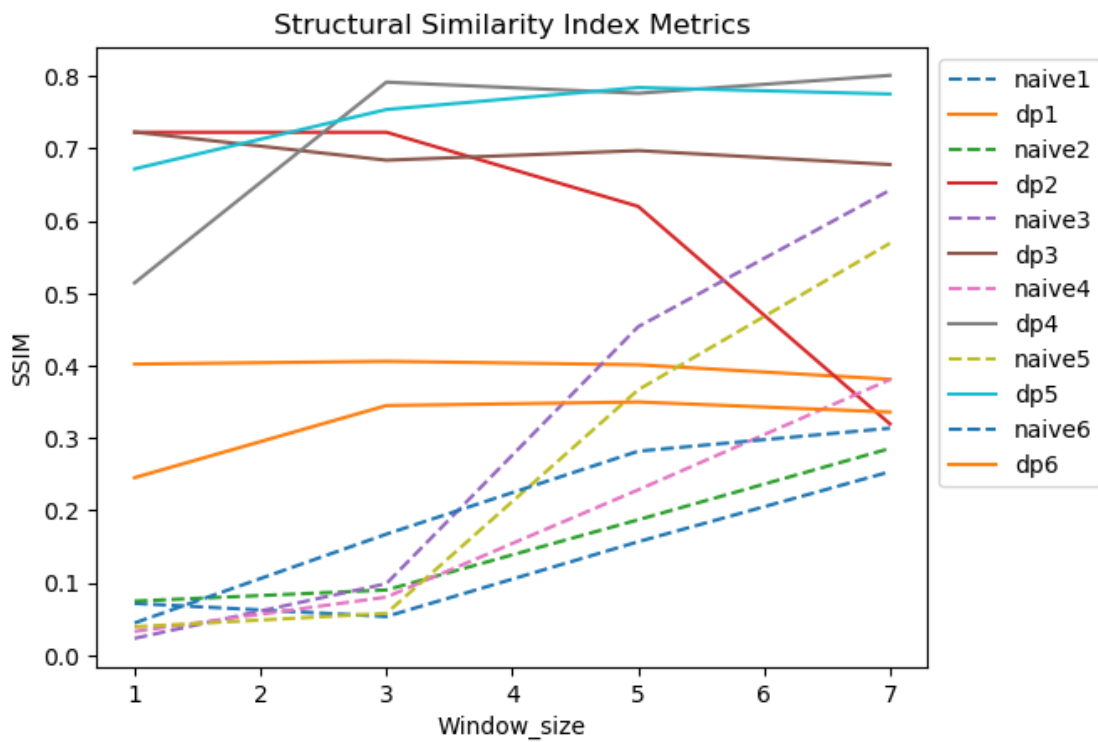
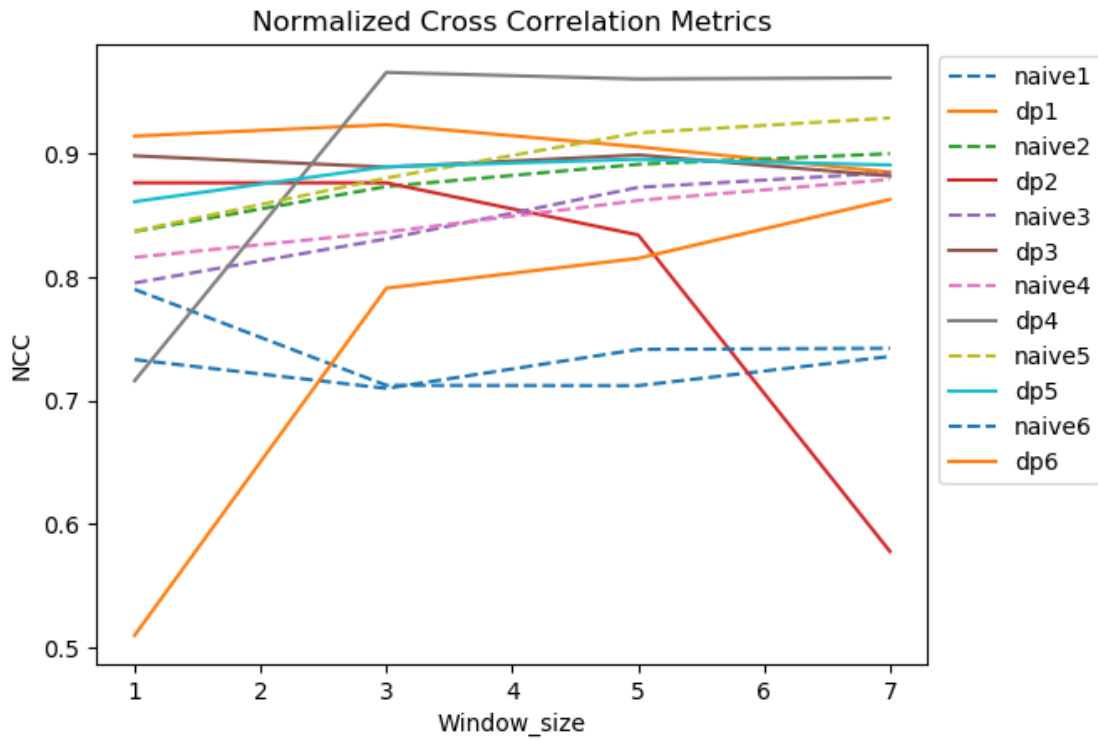
Sixth Pair:



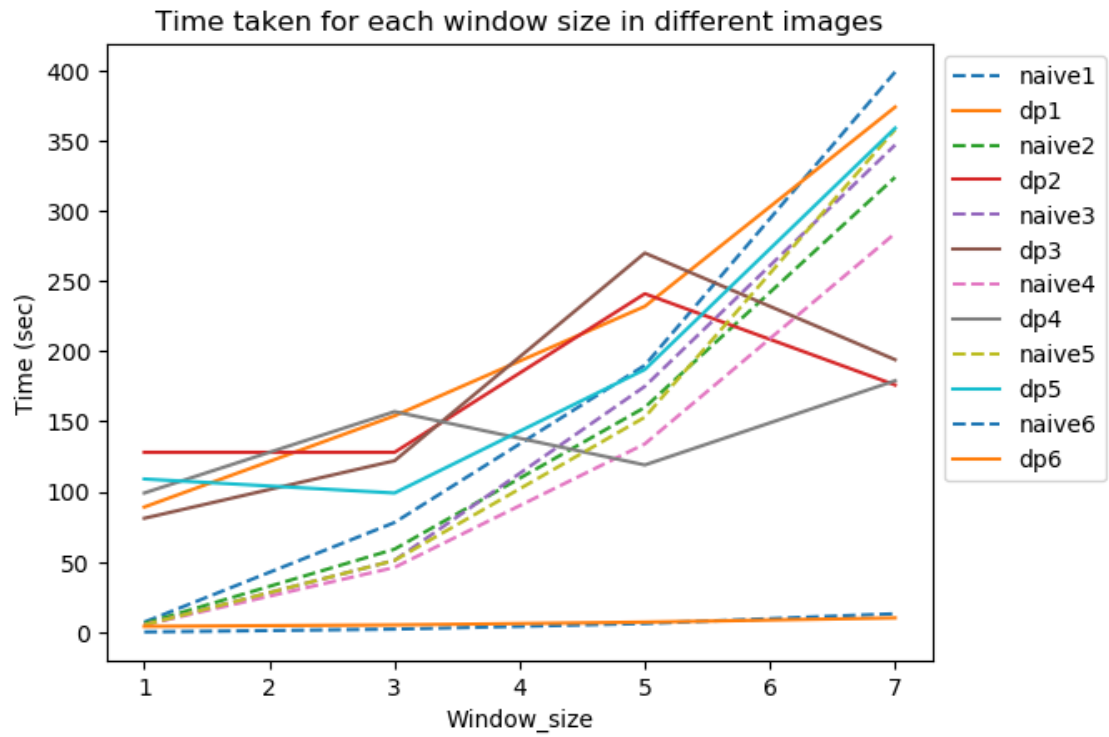


Metrics Comparison



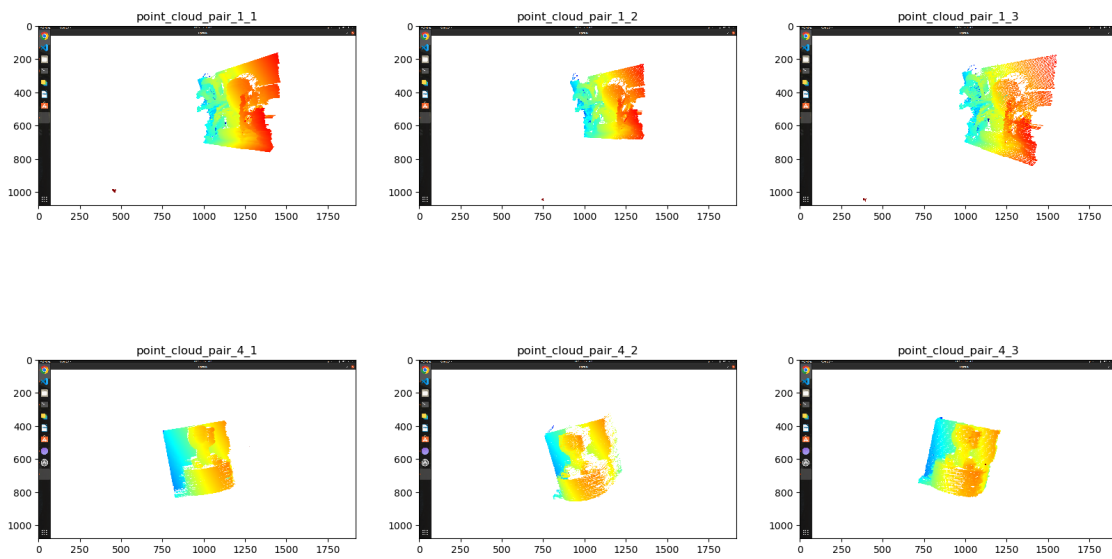


Time Processing



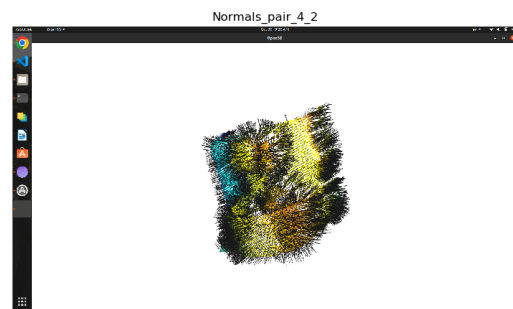
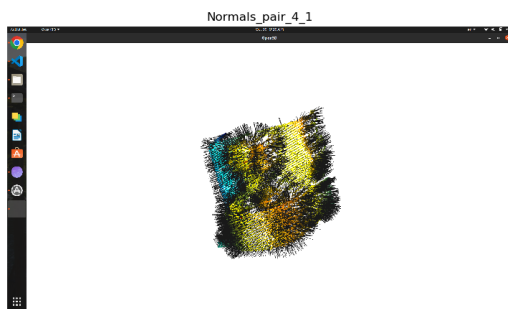
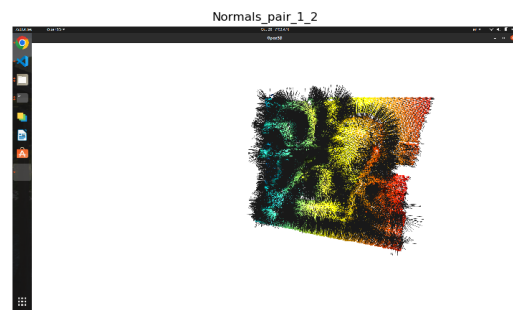
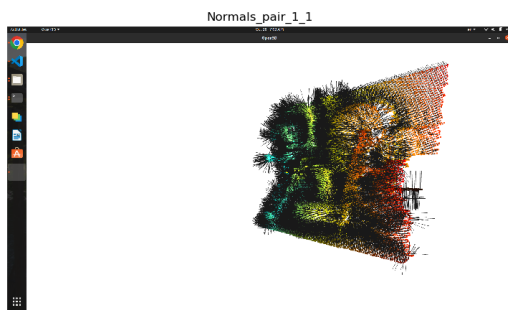
3D_Point Cloud Visualization

Text(0.5, 1.0, 'point_cloud_pair_4_3')



Surface Normal Visualization

```
Text(0.5, 1.0, 'Normals_pair_4_2')
```



Triangulation Visualization

```
Text(0.5, 1.0, '3D_Triangulation_pair_4_2')
```

