TP5 - Surface Reconstruction

NPM3D - M2 MVA

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1 3D Reconstruction on Meshlab

Q1. We tried different parameters for both Poisson method and RIMLS method on *bunny.ply* and *dragon.ply*. The best reconstruction results are shown below:

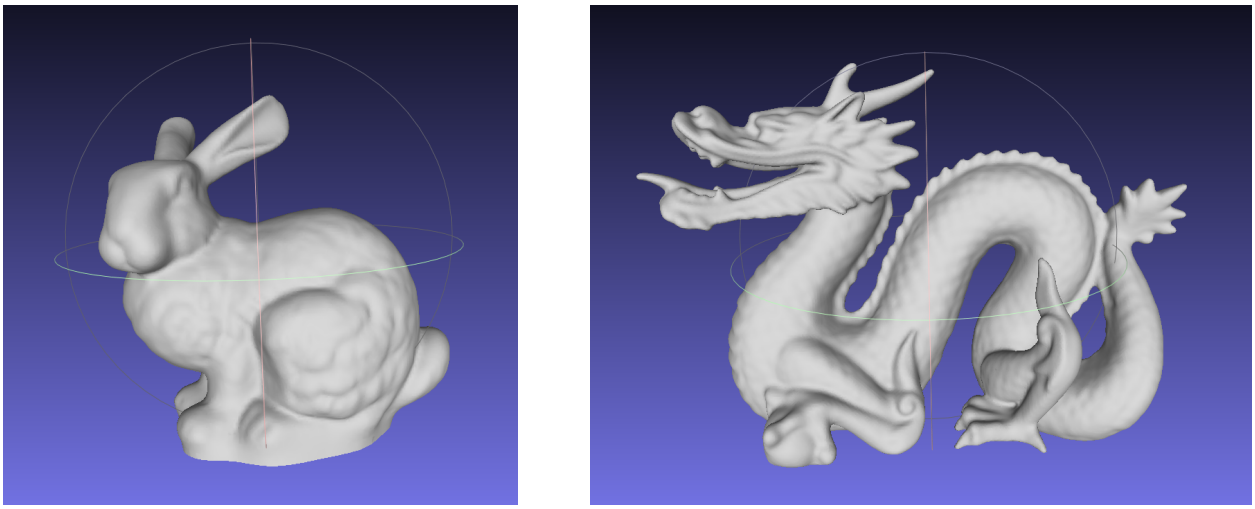

Figure 1: Poisson Method

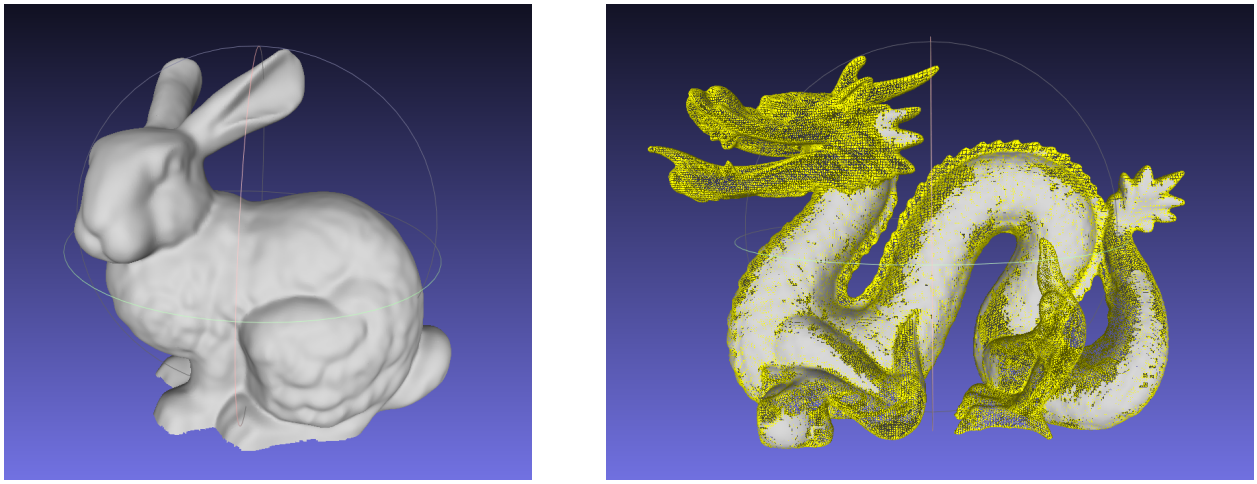

Figure 2: RIMLS Method

The used parameters are:
The quality of the mesh is defined by several criteria: we look for a mesh with more geometric details, less vertices and less unwanted holes. In general, Poisson method is less sensitive to parameters than RIMLS. For both point clouds, we find a good 3D mesh by using same parameters. However

Parameter	Bunny	Dragon
Reconstruction Depth	8	8
Minimum Number of Samples	2	2
Interpolation Weight	2	2
Vertex Number	41837	137185
Face number	83581	274370

Table 1: Poisson Method

Parameter	Bunny	Dragon
Filter Scale	4	5
Projection Accuracy	0.00001	0.1
Projection Max Iterations	15	15
MLS Sharpness	0.8	0.75
MLS Max Fitting Iterations	5	5
Grid Resolution	250	300
Vertex Number	135066	63567
Face Number	63567	100290

Table 2: RIMLS Method

we note that the one of Poisson is slightly better regarding to the border at the bottom of bunny. It is smoother than the one of RIMLS. For the dragon, we cannot find a good mesh at all since a part of the mesh is always missing.

Q2. For both point cloud, Poisson is the best reconstruction method.

2 Surface Reconstruction on Python

Q3. We show the extracted iso-zero surface of the sphere point cloud. The normal is estimated by Meshlab.

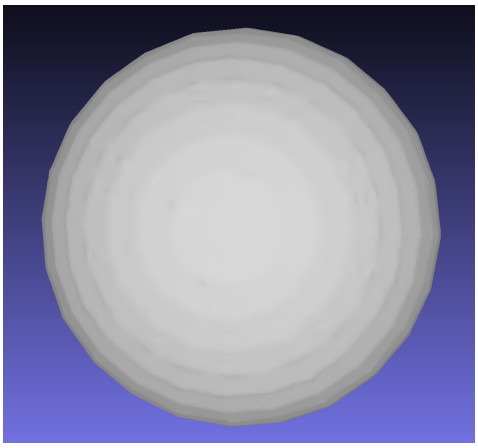

Figure 3: MLS Method on Sphere

Q4. We show the extracted iso-zero surface of the bunny point cloud.

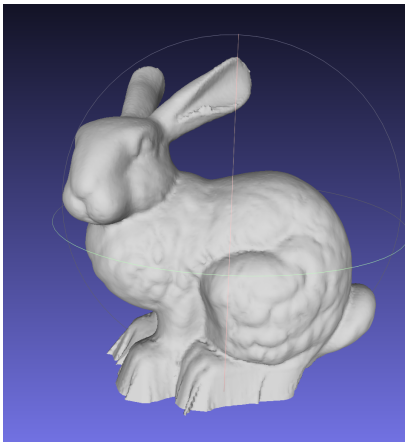

Figure 4: MLS Method on Bunny

3 Implement the EIMLS Function

Q5. We implement the EIMLS function and we compare its result with the one reconstructed by Hoppe function. The difference is obvious at the bottom of the bunny. While the one of Hoppe function contains many sharp edges, the one of EIMLS is much smoother, which is due to the non-linearity of the hoppe function. On the regions where the variances of the points are large, the one of Hoppe function has some artifacts as well.

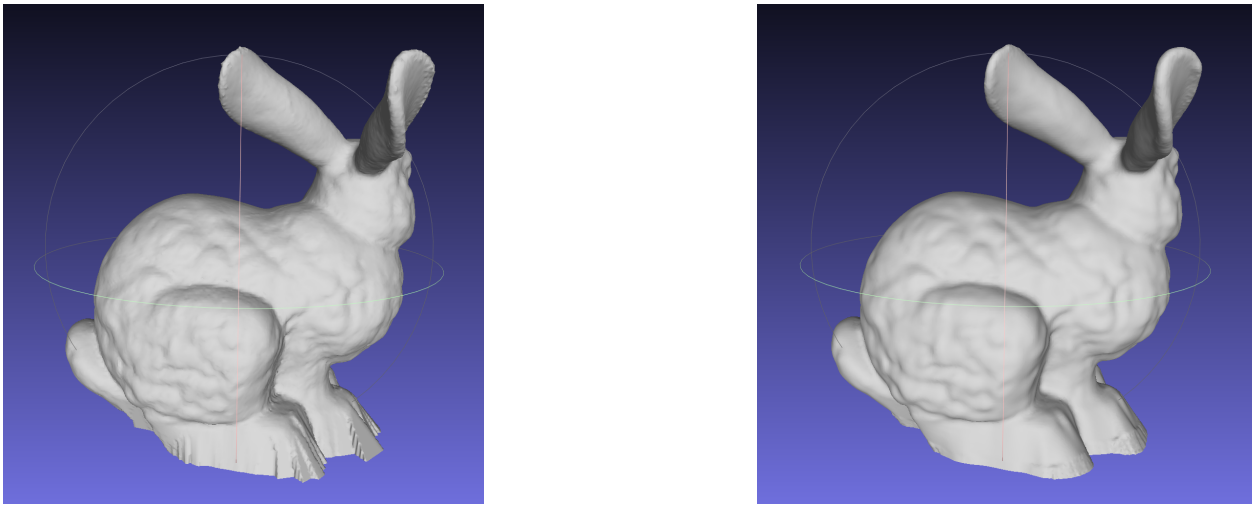

Figure 5: (a) Hoppe Function (b) EIMLS Function