Point Clouds and 3D Modelling

TP5: Surface reconstruction

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Question 1 Figure 1 compares the differences between two surface reconstruction methods: RIMLS and Poisson surface reconstruction.

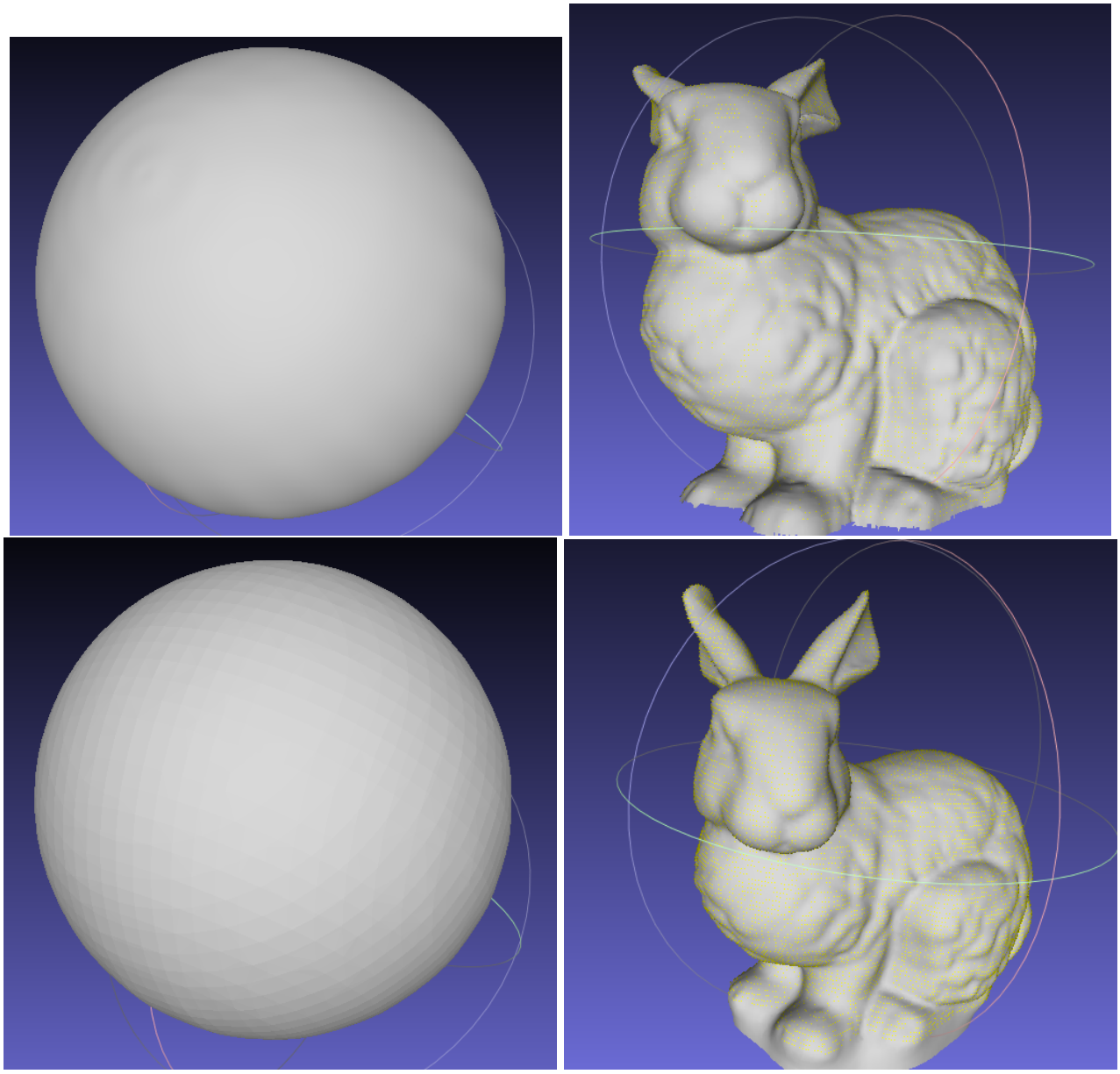

Figure 1: Comparison of the two reconstruction methods on two point clouds. Top: RIMLS. Bottom: Poisson

Question 2 According to the renderings on figure 1, it seems that RIMLS is more sensitive to noise than Poisson reconstruction, and thus that Poisson is a better method to render textured surfaces like bunny's fur.

In the other hand, by zooming in a lot on the reconstructed spheres, one can see that the sphere reconstructed by RIMLS is more "spheric" than the one reconstructed with Poisson method. Therefore, RIMLS seems to be a more relevant method in that case. Table 1 indicates the parameters used for reconstruction. Table 2 indicates the number of faces and vertices per reconstruction.

MLS - Filter scale	2		
Projection - Accuracy	0.0001		
Projection - Max iterations	15	Reconstruction depth	12
MLS - Sharpness	0.75	Minimum number of samples	1.5
MLS - Max fitting iterations	3	Interpolation weight	4
Grid resolution	200		

Table 1: Parameters used for reconstruction. Left: RIMLS. Right: Poisson.

	RIMLS	Poisson
Number of vertices/faces (sphere)	133644/267284	4013/8022
Number of vertices/faces (bunny)	85372/170150	43054/86009

Table 2: Number of vertices and faces per reconstruction.

Question 3 Figure 2 shows the reconstructed shape of the sphere.

Figure 2: Two view points of the sphere's iso-zero surface, with 100 cells along each dimension.

Question 4 Figure 3 shows two the reconstructed shape of the bunny point cloud.

Figure 3: Two view points of the bunny's iso-zero surface, with 100 cells along each axis

Question 5 Figure 4 compares the rendering obtained with both methods (Hoppe implicit function and EIMLS). One can see that EIMLS generates a smoother surface than Hoppe, and seems also more robust to outliers. This difference can be explained by the fact that the function used in EIMLS is continuous whereas Hoppe implicit function is not (because of the min function). Thus one produces a continuous surface whereas the other does not.

Figure 4: Rendering of bunny's shape with Hoppe implicit function (left) and EIMLS (right), with 100 voxels along each dimension.