

3D Point Cloud and Modeling (NPM3D)

TP 4: Surface Reconstruction

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Question 1

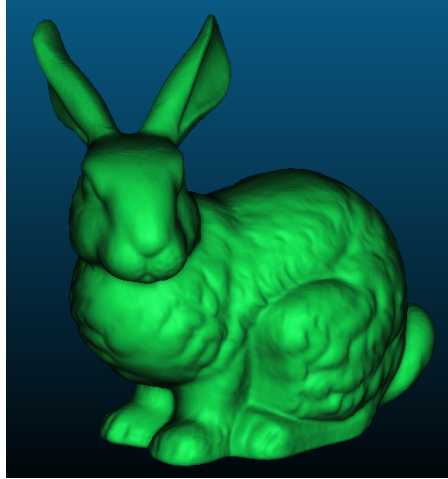


Figure 1: Bunny surface reconstruction with PoissonRecon of CloudCompare

Figure 1 shows a reconstruction of the surface of `bunny_normals.ply` with PoissonRecon in CloudCompare. The mesh contains a total of 373800 triangles and it is obtained with the following parameters: octree depth = 8, boundary = Neumann, samples per node = 1.5, point weight = 2.

A “better” reconstruction should have as much detail as possible and least holes possible.

Question 2

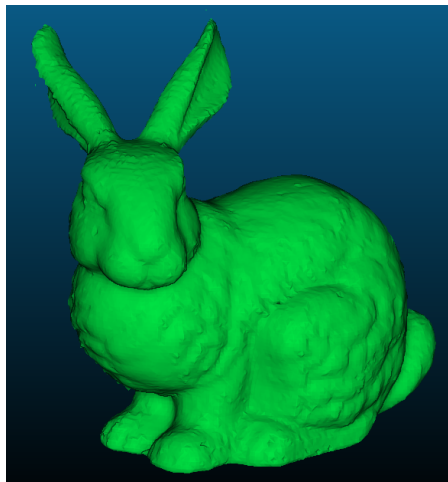


Figure 2: Bunny surface reconstruction with Hoppe function

Figure 2 illustrates the result of the surface reconstruction of the bunny with the Hoppe function on a $128 \times 128 \times 128$ voxel grid.

Question 3

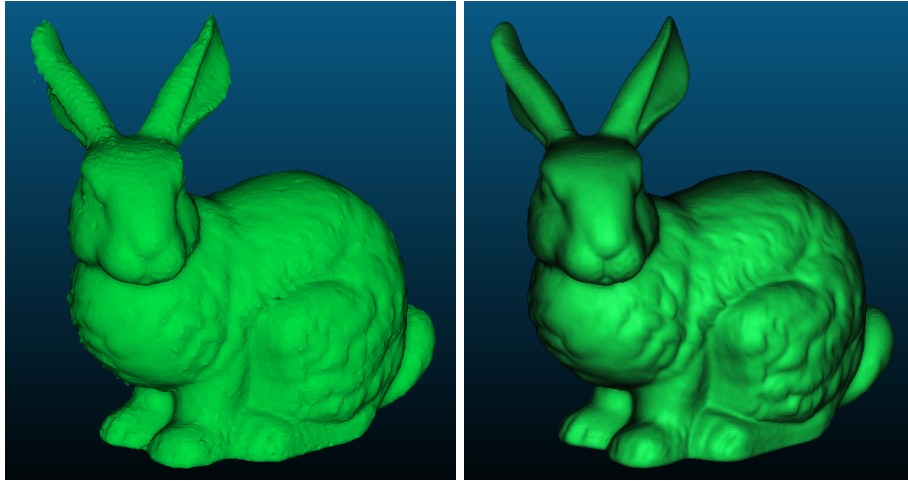


Figure 3: Bunny surface reconstruction with Hoppe function (left) and PoissonRecon (right)

Figure 3 shows a visual comparison between surface reconstruction with the Hoppe function and PoissonRecon. The computation time for the mesh with the Hoppe function is much longer than with PoissonRecon: 48 seconds with the Hoppe function compared to 7 seconds with PoissonRecon. Furthermore, the mesh computed with the Hoppe function and PoissonRecon contain 82168 and 373800 triangles respectively. In terms of the quality of the reconstruction, the surface computed with the Hoppe function appears to be rough and not smooth or continuous as the one obtained from PoissonRecon. There are also small visible bumps all over the surface of the mesh of Hoppe.

Question 4

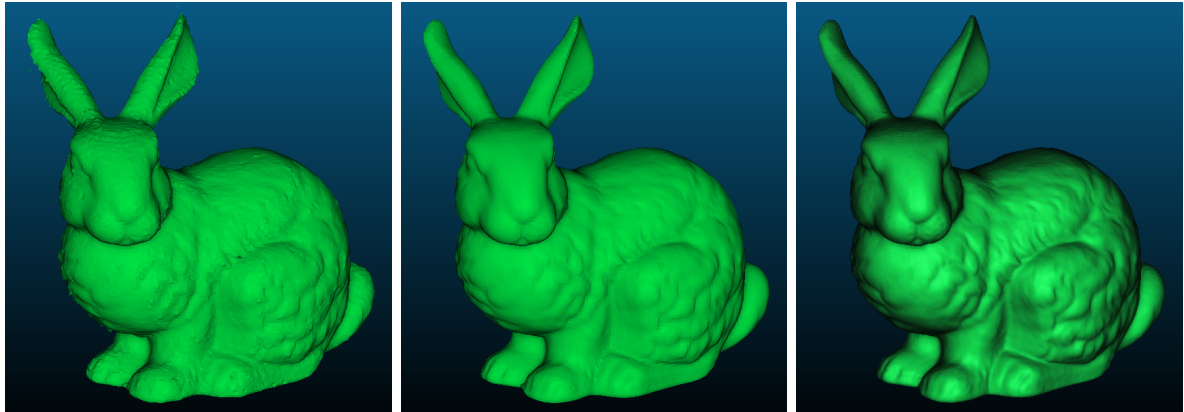


Figure 4: Bunny surface reconstruction with Hoppe function (left), IMLS function (middle) and PoissonRecon (right)

Figure 4 shows a visual comparison between surface reconstruction with the Hoppe function, IMLS function and PoissonRecon. The computation time for the mesh with the IMLS function is longer than with the Hoppe function, making it even longer compared to PoissonRecon: 152, 48 and 7 seconds for IMLS function, Hoppe function and PoissonRecon respectively. In contrast, the mesh computed with the IMLS function contains the least triangles: 77164, 82168 and 373800 triangles for IMLS function, Hoppe function and PoissonRecon respectively. Regarding the quality of the reconstruction, the IMLS function manages to do a better job than the Hoppe function as the surface appears to be a lot smoother. In terms of the detail, IMLS still lacks behind PoissonRecon, which can be seen with the dots on the mouth of the bunny on the mesh computed by PoissonRecon.