Nuages de points et modélisation 3D
TP 2 : Recalage

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Question 1. ICP performs well for the bunny only when it is only perturbed, not returned (see Figure 1). For Notre-Dame the results are good too (see Figure 2). The aligned cloud and the reference cloud are not the same as they do not cover the same area. The order used here is important, if the small cloud is used as a reference the ICP will try to align points from the large cloud that don't match points in the small one (see Figure 3).
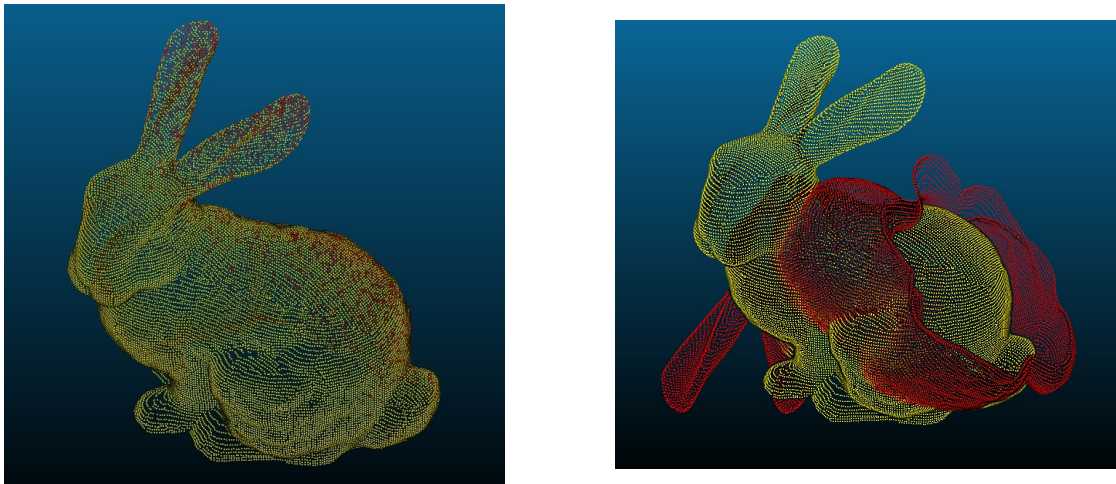

FIGURE 1 – Results obtained using CloudCompare implementation of ICP. On the left, the data to align was only slightly perturbed ; on the right it was returned.

Question 2. The RMS between the returned cloud and the reference one was 0.16. The RMS between the aligned cloud and the reference one was 1.32×10^{-8}. This method worked better than CloudCompare ICP because it uses the fact that the order of the points is the same in both model : this is a strong assumption. For instance it would not work for the Notre Dame clouds as they do not even have the same number of points.

Question 3. The graph for RMS convergence during ICP are shown in Figure 4 and 5.
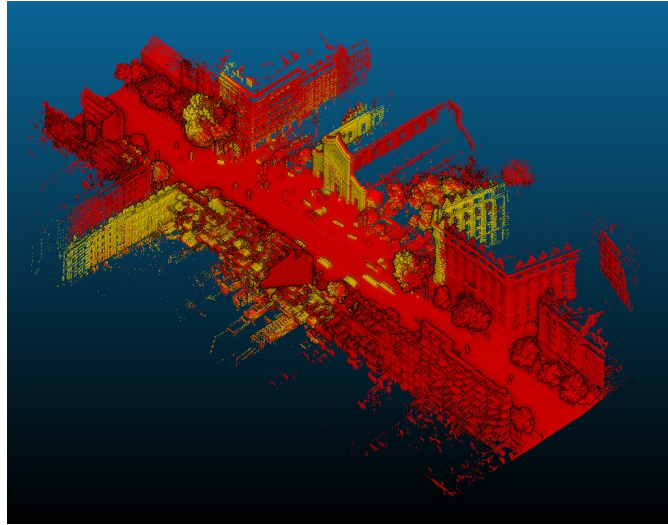
FIGURE 2 – Results obtained using CloudCompare implementation of ICP on the Notre-Dame point cloud. The larger cloud was used as reference.
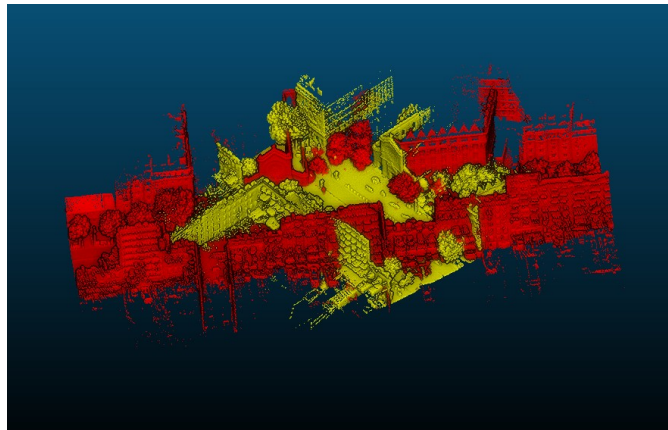

FIGURE 3 – Results obtained using CloudCompare implementation of ICP on the Notre-Dame point cloud. The smaller cloud was used as reference, as a result the algorithm performed poorly.
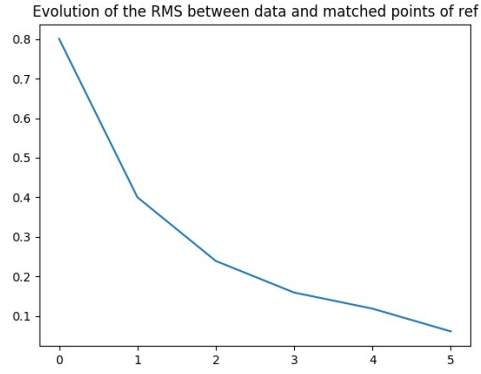
FIGURE 4 – Evolution of the RMS for every step of ICP when applied to the 2D example.
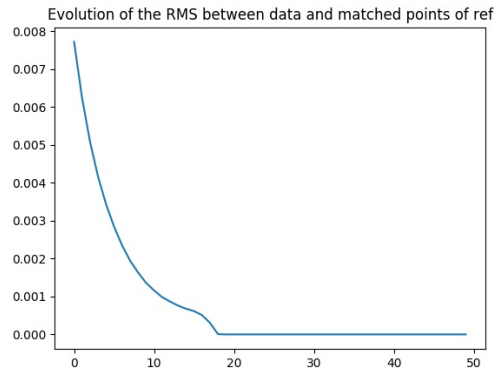

FIGURE 5 – Evolution of the RMS for every step of ICP when applied to the perturbed bunny cloud. The RMS goes down to around 1.4×10^{-7} and then stop decreasing, likely due to rounding errors.