# 3D Point Cloud and Modeling
# TP 1 : Basic operations and structures on point clouds

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## 1 Question 1 and 2

After the required transformations, the point cloud looks like this:

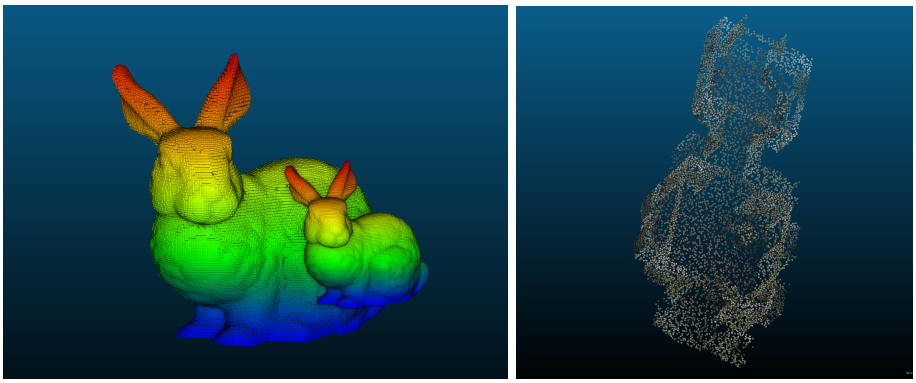

Figure 1: Transformed rabbit next to the original one, Decimated point cloud

## 2 Question 3

We obtained this result:

- 10 spherical neighborhoods computed in 0.286 seconds
- 10 KNN computed in 0.650 seconds
- Computing spherical neighborhoods on whole cloud : 24 hours
- Computing KNN on whole cloud : 55 hours

# 3 Question 4a

We found an optimal leaf size of 50 (in terms of magnitude) with a running time of 0.047 seconds for 10 queries. It can't be one since the tree built with that leaf size parameter is too big to be optimal.

# 4 Question 4b

The evolution of the timing with the radius is displayed below:

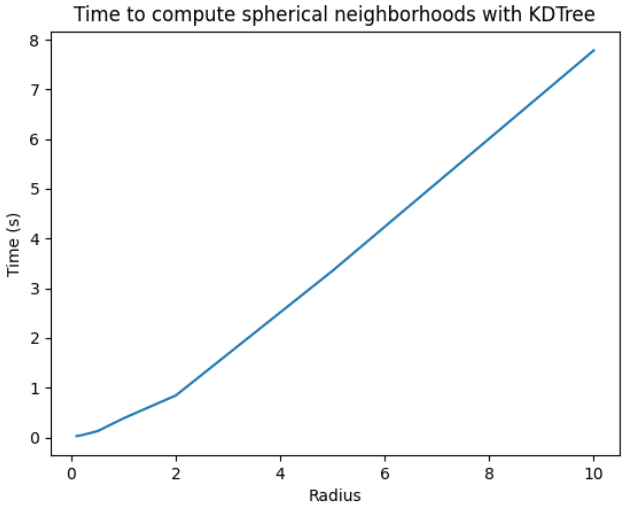


Figure 2: Evolution of the timinig with the radius

With the optimal leaf size chosen as parameters, it would take 1h to search for the 20cm neighborhoods over the whole set.

# 5 Question Bonus

The implementation can be found here: `https://github.com/constantbourdrez/NPM_3D`

Using this approach, we better preserve the overall structure compared to the previously implemented method. The *dl* parameter in grid subsampling determines the proportion of points retained versus those removed.

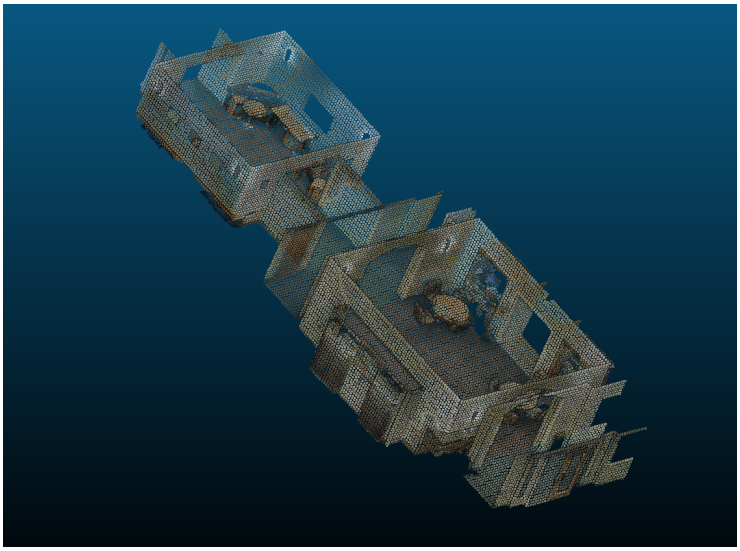

Figure 3: Subsampled image via the grid subsampling