IMA208 - Vision 3D et vidéo

TP6 - range scans to meshes 1/2

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Fixed Threshold Method

Purpose: The Fixed Threshold Method aims to filter out triangles from a 3D mesh based on a predetermined threshold. This threshold is a static value that does not change based on the data and is set prior to processing. The method is particularly useful when there's a clear distinction or a known value that separates desired triangles from undesired ones, such as filtering out triangles larger or smaller than a specific size.

Methodology: In this approach, each triangle's property of interest (e.g., circumradius, area) is calculated and compared against a fixed threshold. Triangles that do not meet the criterion (e.g., triangles with a circumradius larger than the threshold) are excluded from the final output.

Code Implementation:
- The code calculates a specific geometric property (like the circumradius) for each triangle in a 3D mesh generated through Delaunay triangulation.
- It then filters triangles by comparing each triangle's calculated property against a fixed threshold value.
- Triangles passing the filter are written into an STL file, forming the filtered 3D model.

Result:
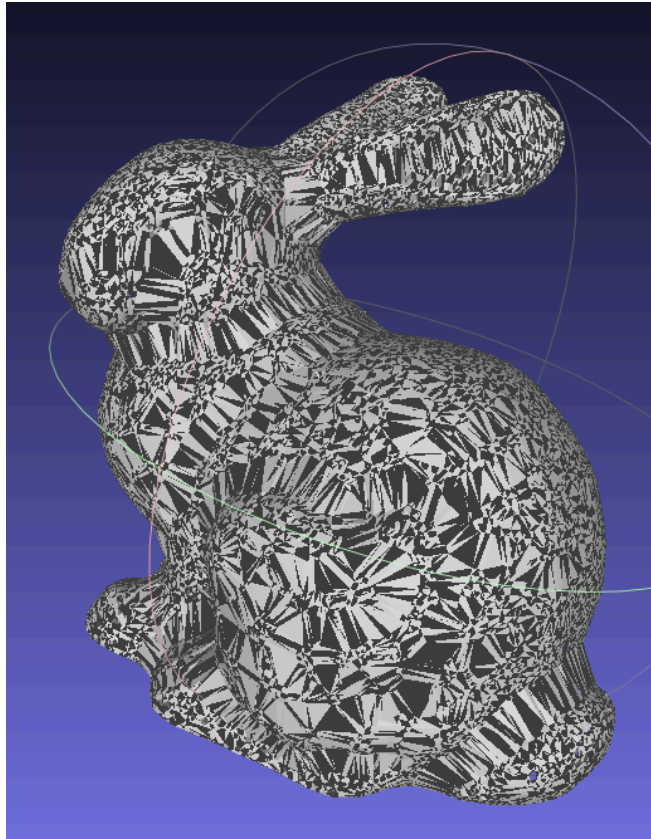
Adaptive Threshold Method

Purpose: The Adaptive Threshold Method dynamically adjusts the threshold based on the properties of the dataset itself, making it more flexible and data-dependent. This approach is useful in scenarios where the data's characteristics are not well-known in advance or where the properties of interest vary significantly across the dataset.

Methodology: This method involves calculating a property of interest for each triangle in the dataset and then using statistical measures of these values (such as the mean and standard deviation) to determine a threshold that adapts to the dataset's distribution. This way, the threshold is not fixed but is instead derived from the dataset's own characteristics.

Code Implementation:
- Similar to the fixed method, it calculates a geometric property (e.g., circumradius) for each triangle.

- Instead of using a predetermined threshold, it calculates the mean and standard deviation of all the calculated properties across the dataset.
- An adaptive threshold is set based on these statistical measures (e.g., one standard deviation above the mean).
- Triangles are filtered based on this adaptive threshold, and the ones meeting the criteria are written into an STL file.

Result: