

Summer Semester 2025

Assignment on Advanced Computer Graphics - Sheet 5

Due Date 03.07.2025

Exercise 1 (Mesh Processing)

In this assignment you should implement Laplacian smoothing of 3D meshes.

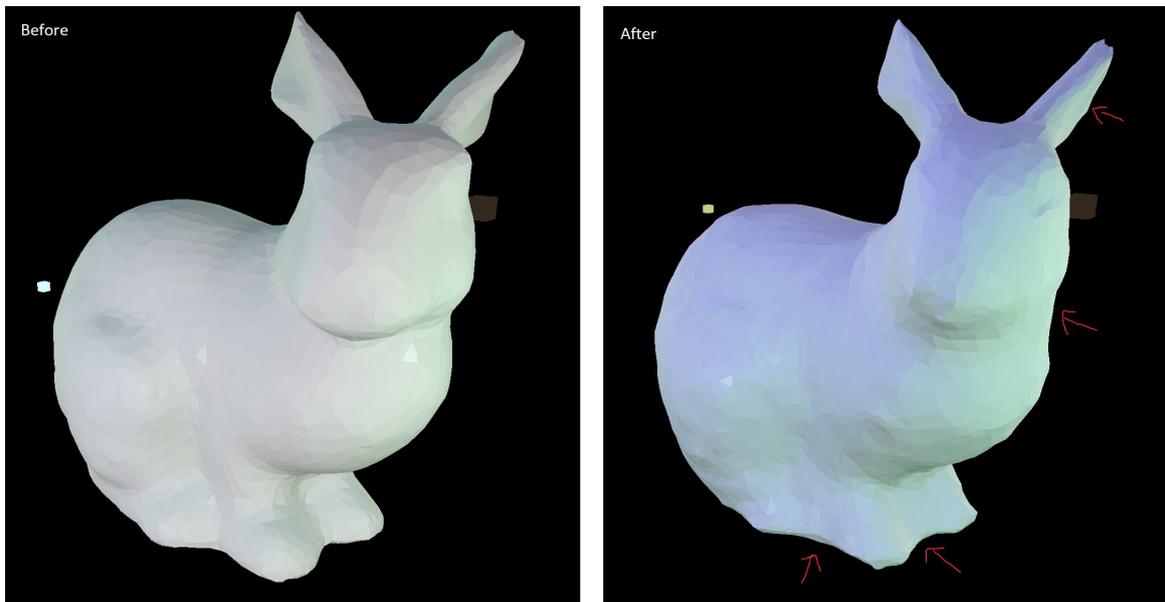


Figure 1: Results of the smoothing (simple variant).

On our homepage, you will find the *MeshFramework*. As you will see, it is based on the PBR Framework from assignment sheet 5. When started, you will see the standard Stanford bunny model in the center of the scene. Your task is to implement the Laplacian smoothing algorithm (see the slides "Laplacian Smoothing" and following from the lecture on *Mesh Processing*).

Specifically, you have to put your code into the `smoothI()` function in the `mesh.cpp` file. Of course, you are free to create additional helper functions. Using the checkbox *SmoothI* in the UI you can apply your implemented smoothing algorithm. Remember, an important step for Laplacian smoothing is to calculate the 1-ring (all adjacent vertices) for each vertex. Also, you can play around with the *weight* and *iterations* parameters in the function to get better results.

- Implement the aforementioned Laplacian smoothing algorithm. The standard, iterative variant with the simplest form of the weights will suffice.
- Now change the weights in your implementation to the better ones (look in the slides) and see if it makes a difference.

- c) You heard about the shrinking issue with Laplacian smoothing. Implement the extension mentioned in the slides ("A Simple Extension to Prevent Shrinking") to prevent the shrinking.
- d) (BONUS) Implement the global Laplacian smoothing. You would need to put your code into the *smoothG* function and use the *smoothG* UI checkbox to apply it. For global Laplacian smoothing, you probably should use the math and matrix functions and the solver provided by the Eigen library that is included.