

Practical Assignment 3

For this exercise you can continue using the code from Practical Assignment 1. This time it is helpful to use flat-shading when drawing the mesh, since it is important to identify noisy and smooth regions. To enable flat shading, you should make the following changes to MAIN.CPP:

- *Disable wireframe mode by setting `bool wireFrameMode = false;` in line 15.*
- *Disable smooth shading by using `glShadeModel(GL_FLAT);` in line 100, instead of `GL_SMOOTH`.*
- *Add the following lines at the end of the function `void init(...)`:*

```
glEnable(GL_LIGHTING);  
glEnable(GL_LIGHT0);  
GLfloat lightPos[] = { 0, 1.0, 1.0, 0 };  
glLightfv(GL_LIGHT0, GL_POSITION, lightPos);
```

There are also new meshes to test your implementation uploaded to brightspace.

Task 1 (Iterated Averaging).

Implement the iterated averaging algorithm to acquire smooth meshes:

- In each iteration, each vertex of the mesh moves into the direction of the average of its neighbours.
- How far it moves depends on a *user-defined* step-size.
- Each time the user presses a key, a *user-defined* number of iterations should be performed.
- You can use console in- and output or find a more elegant way to let the user define the step-size and iteration count.

Task 2 (Iterated Averaging - Visualization).

There will be regions in which the vertices are already in their 'average' position, and regions where they are far away.

- Give a color to each vertex depending on his distance to the average of his neighbours in a way that enables you to distinguish these regions.
- Test the iterated averaging on the new meshes.

Task 3 (Iterated Averaging - Clever smoothing).

As you can see, the mesh loses volume after each iteration. To counteract this, implement the following:

- Measure the change of volume enclosed by the mesh in each iteration.
- Find a strategy to keep this volume as constant as possible while still acquiring smoother meshes.

Task 4 (Report).

Write a short report that

- describes the algorithms you use, especially the enhancements that you made in Task 3
- describes the results and problems that you got using iterated averaging and your enhanced version of it (use screenshots to show what you write about)
- provides a manual on how to use the tool's user interface