Computer Graphics Assignment #3
OpenGL renderer

In the third assignment you will replace the software renderer you implemented in the first two assignment by an OpenGL renderer. There are several steps that are necessary in order to do that, and unfortunately you will not be able to see anything on screen before you accomplish all of them. Before you start, please study the example OpenGL project posted on the website and plan the necessary steps. The main goal of this assignment is to focus on the implementation of Phong shading only. There is no requirement to implement the wireframe rendering or flat and Gouraud shading.

For this part please create a markdown file 'Assignment3Report/Assignment3Report.md', and do the following:

1. The software renderer was built on top of OpenGL. The Renderer::SwapBuffer() function loads color_buffer into a texture on the GPU. Read the function Renderer::InitOpenGLRendering() and explain in the report how this texture is displayed. Remove all the now irrelevant code from the renderer.

2. Update the MeshModel class to load the mesh on the GPU. Use the example OpenGL project as a reference.

3. Write a vertex shader that applies all the transformations. Use the reference code, but pay attention to the differences between your code and the reference code. Copy the code the the report.

4. Write a fragment shader that only outputs a constant color and paste it in the report. The goal for now is to ensure that the pipeline works. Lights will be added later.

5. In the renderer, update all the relevant vertex attributes and uniforms, and paste the relevant piece of code to the report. If everything was done correctly, you should be able to view the mesh in your application.

6. Implement Phong shading in the fragment shader. To demonstrate that the performance has now improved a lot, load one of the meshes from https://github.com/alecjacobson/common-3d-test-models and display it from several viewpoint and different lighting.

7. Implement texture mapping. Use the example OpenGL project as reference. Enable at least one type of canonical project (for pairs: three): plane, cylinder or sphere. In addition, find a mesh with texture coordinates online and use them. Show your results in the report.

8. Implement one (for pairs: all) of the following

    (a) Normal mapping

    (b) Environment mapping

    (c) Toon shading (without the silhouette)

All of these can be done in many different ways and levels of complexity. Keep it simple! if in doubt, please ask. Explain what you did and show your results in the report.