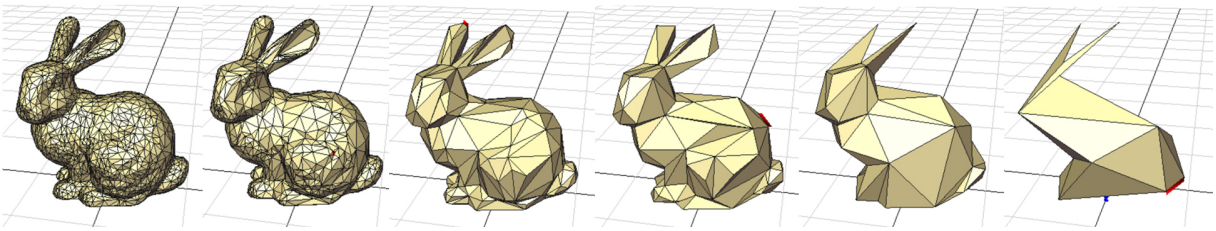
Project 3: Progressive Mesh Simplification



1. Due Date

Project 3 is due on **10/25 11:59pm**

2. Requirements

You are required to write a program to simplify a given triangular mesh (*bunny2k.obj*) using the half-edge collapsing method. Randomly selecting an edge to collapse is not acceptable. You are expected to implement the cost function presented in the "Polygon Reduction" paper to select an optimal edge at each collapsing operation. If you use a different cost function, you need to write a document that clearly explains what the cost function is.

A basic code template is provided by the instructor. It includes implementations of an OBJ file loader, OpenGL drawing functions, and camera controls. With the given code template, neighboring relationships among vertices and triangles are created and stored in appropriate data structures when loading the obj file. Feel free to use the given code template for your project. You are also allowed to create the project from scratch. An executable of this project (*.exe*) created by the instructor has been uploaded to *mycourses*. Please run it and get a feel of the work you are expected to deliver. You are required to write C++ program, and you are free to use either OpenGL, D3D, Vulkan for this project.

3. Assessment

Your program will be evaluated using the *bunny2k.obj* mesh file.

3.1.(40pts) Your program should allow a user to collapse edges one at a time by pressing the "p" key on the keyboard. The new mesh after each collapsing should be displayed in either shaded or wireframe modes at the user's choice. At each collapsing step, your program should highlight the selected edge that is going to be collapsed. The vertex and triangle counts should be updated and displayed after each collapsing step.

3.2. (20pts) Your program should simplify the mesh to a version with less than 10 vertices.

3.3.(40pts) Your program should have an appropriate implementation of the cost function for evaluating edges. After collapsing an edge, members of vertex, triangle, and mesh classes should be updated correctly, i.e., removing selected vertex and triangles from the lists, updating neighboring relationships, recalculating face normals, etc.

4. Submission

Upload the following things to *mycourses*:

(1) A document explaining how to set up your code in Visual Studio if not done with OpenGL.
(2) A document explaining how to use your program to collapse edges one-by-one.
(3) A document explaining the cost function if it is different from the one in the polygon reduction paper.
(4) A *.zip* file containing all source files (*.h* and *.cpp* files).