14475 Computer Graphics for Digital Games Lab. 1-2 - 10/03/2021

Loading and Rendering 2D Meshes in 3D

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In these two lab sessions, students will learn to create their own custom meshes from the loading OBJ, OFF or PLY models. Also, students will learn how to parse a file to read custom mesh vertices, normals, and texture coordinates. In a word, students will learn to build their own mesh loader using a specific format. Students will also learn how to design a standard and complete data structure for handling 2D meshes. All this is the basis of the first project of course.

1 Specific Learning Goals

After completing this worksheet, students should know and be able to:

1. Create a custom mesh given a set of vertices and indexes.
2. Set the color, normals and texture coordinates per vertex of custom created mesh.
3. Parse from a file the vertices, normals, texture coordinates, and indices of custom mesh.
4. Activate/deactivate front and back face culling.
5. Load a mesh file (OBJ, OFF oe PLY) into an edge-based data structure.
6. Basics of materials/color setup.

2 Programming Exercises

Exercise 1

Design and implement in C++ an edge-based data structure (e.g., winged-based data structure). You must use the data structure assigned to your Project #1.

Exercise 2

Design and implement in C++ a mesh loader from an OBJ, OFF, or PLY format file.

Exercise 3

Design and implement a C++ graphics application in OpenGL to render your mesh.

Exercise 4

Add materials and textures (from OBJ, OFF, or PLY format file) to your mesh.

References

[1] OBJ file format: https://en.wikipedia.org/wiki/Wavefront_.obj_file.
OBJ file format: http://paulbourke.net/dataformats/obj/.

[2] OFF file format: https://en.wikipedia.org/wiki/OFF_(file_format).
OFF file format: http://paulbourke.net/dataformats/ply/.

[3] PLY file format: https://en.wikipedia.org/wiki/PLY_(file_format).
PLY file format: http://paulbourke.net/dataformats/ply/.