3DViewer-v2.0

Implementation a program to view 3D wireframe models.

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Table of Contents

1 Subject

In this project you will implement a program to view 3D wireframe models (3D Viewer) in the C programming language. The models themselves must be loaded from .obj files and be viewable on the screen with the ability to rotate, scale and translate. A wireframe model is a model of an object in 3D graphics, which is a set of vertices and edges that defines the shape of the displayed polyhedral object in three-dimensional space.

* The program must be developed in C++ language of C++17 standard;
* When writing code it is necessary to follow the Google style;
* The program must be built with Makefile which contains standard set of targets for GNU-programs: all, install, uninstall, clean, dvi, dist, tests, gcov. Installation directory could be arbitrary, except the building one
* The program should be developed according to the principles of object-oriented programming; the structured programming approach is not allowed;
* Prepare full coverage of modules related to model loading and affine transformations with unit-tests
* There should be only one model on the screen at a time
* The program must provide the ability to:
    1. Load a wireframe model from an obj file (vertices and surfaces list support only).
    2. Translate the model by a given distance in relation to the X, Y, Z axes.
    3. Rotate the model by a given angle relative to its X, Y, Z axes.
    4. Scale the model by a given value.
* The graphical user interface must contain:
    1. A button to select the model file and a field to output its name.
    2. A visualisation area for the wireframe model.
    3. Button/buttons and input fields for translating the model.
    4. Button/buttons and input fields for rotating the model.
    5. Button/buttons and input fields for scaling the model.
    6. Information about the uploaded model - file name, number of vertices and edges.
* The program must correctly processes and allows user to view models with details up to 100, 1000, 10,000, 100,000, 1,000,000 vertices without freezing (a freeze is an interface inactivity of more than 0.5 seconds)
* The program must be implemented using the MVC pattern, and also: there should be no business code in the view code; there should be no interface code in the controller and the model; controllers must be thin;

2 Usage

* The libviewer.a library is written in C++, a graphical user interface by means of Qt6, graphics for displaying models using OpenGL API 2.1.
* The program supports model descriptions in Wavefront obj format.
* To load the model, click on the menu bar File->open. The program works with one model at a time.
* The upper-left corner displays information about the name of the selected file, the number of vertices and edges in the model.
* The panel on the right shows buttons for shifting and rotating the model along three coordinate axes, and buttons for changing the scale.
* The panel on the right contains buttons to customize the display of the model, such as changing the background colors, vertices and faces, the type and size of lines and vertices. You can also choose the type of projection: central or parallel.
* The program settings are saved in a file .3DViewer.conf in the user's home directory between program restarts.
* In the File->save menu, you can save the current model as an obj file, jpeg file, or bmp file. By default, it is saved in obj format, for jpeg and bmp formats, you need to explicitly specify the file extension.
* A gif file recording function is also available.