**hw2: Simple 3D Model Viewer**

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| **Requirements** |

The viewer should be able to load the following 5 models:

1. Cube

2. Teapot

3. Jack (see text Figure 5.61)

4. A mesh from "WINEGLASS.3VN" file (see text Figure 6.15, 6.17, 6.69 - [Mesh.h](http://www.cs.umsl.edu/~kang/cs4410/hw2/Mesh.h))

5. Any arbitrary model of your own (the more complex, the better)

These models should be loaded by pressing the corresponding keys 1, 2, 3, 4, 5. (**At any time, only a single object is displayed and manipulated**).

The user should be able to change **the material color** of the current model by pressing key "m". At least 5 different colors should be provided (and toggled each time the key is pressed).

The viewer displays 3 axes as 3D objects (red for x-axis, green for y-axis, blue for z-axis).

The object is initially centered at the global origin O (when loaded).

Transformations on the object should be enabled as follows:

**Rotation**: The user first presses "r" to set the transformation mode to rotation. Then uses "x" for x-roll with positive angle, and "X" for x-roll with negative angle. If the user keeps the key pressed down, rotation should be done continuously (use **double buffer** for smooth animation). Similarly, "y" and "Y" are used for y-roll, and "z" and "Z" for z-roll.

**Translation**: The user first presses "t" to set the transformation mode to translation. Then "x" for positive x-translation, and "X" for negative x-translation. Similarly, "y", "Y", "z", "Z" are used for y- or z-translation.

**Scaling**: Only **uniform scaling** is allowed (Sx = Sy = Sz). The user first presses "s" to set the transformation mode to scaling. Then "x" for expanding (Sx > 1), and "X" for shrinking (0 < Sx < 1). No negative scaling factor is allowed.

**Note that the user may perform a series of transformations in a row (for example, first scale by factor 3.5, then translate by (3.0, 2.5, -1.9), then rotate by ..., then translate by ... ), in which case their accumulated effect must show on the transformed object.**

The user should be able to restore the initial configuration (object centered at O with no transformation) at anytime with pressing key "d".

The camera can be moved (rotated) around the origin to see the object from different viewpoint. Left-arrow and right-arrow keys control horizontal rotation angle (theta), and up-arrow and down-arrow keys control vertical rotation angle (phi).

The object can be displayed as **wireframe, flat-shaded**, or **smooth-shaded**. These 3 modes should be toggled by key "w".

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| **Sample code** |

[SimpleViewer.cpp](http://www.cs.umsl.edu/~kang/cs4410/hw2/SimpleViewer.CPP) (You can build on this program)

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| **Sample Mesh files (\*.3VN)** |

[BUCK.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/BUCK.3VN)

[BUCKY.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/BUCKY.3VN)

[CUBES3.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/CUBES3.3VN)

[DIAMOND.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/DIAMOND.3VN)

[GLASS.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/GLASS.3VN)

[ICOSA.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/ICOSA.3VN)

[PAWN.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/PAWN.3VN)

[SIMPBARN2.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/SIMPBARN2.3VN)

[WINEGLASS.3VN](http://www.cs.umsl.edu/~kang/cs4410/hw2/WINEGLASS.3VN)

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