CSci 5607, Spring 2022 Name ________________________

Assignment 2b: Learning About Viewing, Projection and Viewport Transformations via a First-Person 3D Walkthrough

Due: Friday April 22nd Score (out of 100) _________________

____ The student has submitted a program that compiles and runs. The program contains at least one meaningful change beyond what is done in the template. (5 pts)

____ When the program launches, the user sees a nice view from the inside of the provided cathedral model. The initial viewing position and the initial direction of view are appropriate for a first-person virtual "walk through" of the provided 3D model (e.g. the user is facing towards an open area; the camera height is approximately matched to the eye height of a person standing on the floor, etc.). This appropriate initial eye/camera position and initial viewing direction can be hard-coded. The camera parameters are used to define an appropriate viewing transformation matrix that has the potential to later be interactively modified by the user (the updating of this matrix is credited elsewhere). (10 pts)

____ Appropriate parameters have been used to define a perspective projection matrix that is applied to each vertex in the vertex shader. The view that the user sees is free from excessive perspective distortion. There is no excessive clipping of the scene by the near clipping plane. The view feels reasonably "lifelike", such that the building model seems large with respect to the viewer. (15 pts)

____ The program allows the user to translate the camera location (eye) forward and backwards by an appropriate amount within the scene by pressing the 'w' and 's' keys. Specifically, pressing the 'w' key causes the eye position to move forward by about one step (~0.75m) in the direction of view, and pressing the 's' key causes the camera to move backwards (in the opposite direction to the direction of view) at a similar rate. (15 pts)

____ The program allows the user to translate the camera location (eye) left and right by an appropriate amount, relative to the direction of view, by pressing the 'a' and 'd' keys. Specifically, pressing the 'a' key causes the eye position to sidestep to the left by about one step (~0.75m) in a direction that is orthogonal to the current direction of view, and pressing the 'd' key causes the camera to move to the right in a similar way. (10 pts)

____ The program allows the user to spin the direction of view to the left and right around the current viewpoint, within a plane that is parallel to the groundplane of the building model, by pressing the left and right arrow keys. Pressing the left arrow key causes the viewing direction to rotate by a small amount to the left, and pressing the right arrow key causes similar changes to the right. The camera position does not move as the view direction changes – i.e. the user is able to rotate a full 360° via continuous key presses and end up with the exact same view they started with. (20 pts)

____ The view does not become distorted when the user re-sizes or re-shapes the window. This outcome is achieved by adjusting the dimensions of the viewport and the aspect ratio of the viewing frustum appropriately in response to a window resizing event . When the aspect ratio of the window is changed: the graphics don't stretch, but rather the user is enabled to see more of the scene in the larger dimension. If the window simply becomes larger or smaller, without a change in the window's aspect ratio, then the same scene contents can remain visible within the larger or smaller window. (20 pts)

____ The student has turned in all of their source code, along with a video (preferred) or multiples of images showing the results of running their program. The code that the student has provided has been written in a platform-independent manner and is reasonably straightforward to compile and run. (5 pts)

For extra credit:

____ The program allows the user to rotate the viewing direction upwards and downwards by pressing the left and right arrow keys. Pressing the up arrow key causes the viewing direction to rotate by a small amount directly upwards without any tilting to the left or right (e.g. within the plane defined by the viewing and 'up' directions) regardless of the direction of view, and pressing the down arrow key causes the viewing direction to rotate downward in a similar manner. There is no shift in the camera position as the user rotates, and the rotation is accomplished in such a way that could allow the user to rotate a full 360˚ (e.g. a somersault) via continuous key presses if they wanted to, so as to end up with the exact same view of the scene that they started from. In particular, nothing prevents the user from looking straight up or straight down. (10 pts)

____ The program allows the user to translate the camera location (eye) by an appropriate amount upwards or downwards in the vertical direction with respect to the model (i.e. parallel to the world coordinate *y* axis), by pressing the left and right bracket keys, ('[' and ']') respectively. Specifically, pressing the '[' key causes the camera position to move a small amount towards the floor of the cathedral, and pressing the ']' key causes the camera position to move a small amount towards the ceiling of the cathedral. (2 pts)