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CS 180

Assignment 2

1. *Construct the view transformation matrix and apply it to the vertices*
We have the camera **e** = {4, 2, 6}, look-direction **g** = {-4, 0, -6}, up-direction **t** = {0, 1, 0}
cross product **g x t** = {0.8320503, 0, -0.5547002}

plug these values into our T_{view} = {{1, 0, 0, -4},{0, 1, 0, -2},{0, 0, 1, -6},{0, 0, 0, 1}}
R_{view} ={{0.8320503, 0, -0.5547002, 0}, {0, 1, 0, 0}, {0.5547002, -0, 0.8320503, 0}, {0, 0, 0, 1}}
and then $M_{view} = R_{view}T_{view}$

- Note: these are *row-major* 4x4 matrices as given from spdlog

Finally apply the M_{view} matrix to our vertices from triangle world space to get the vertices in camera space
v0 = {1.1094005, -1.5, -5.269652}
v1 = {-0.8320503, -1.7, -4.1602516}
v2 = {-0.5269652, -1, -5.1587114}

2. *Construct the orthographic projection matrix and apply it to the vertices in camera space to get them in the canonical cube*

We have the values **l** = -4.0, **r** = 4.0, **b** = -2.0, **t** = 2.0, **n** = -1.0, **f** = -10.0
Translate the center to the **origin** and then scale the cube to get the *orthographic projection matrix* = {{0.25, 0, 0, 0}, {0, 0.5, 0, 0}, {0, 0, 0.22222222, 1.2222222}, {0, 0, 0, 1}}

Then apply our projection matrix to our camera space vertices
v0 = {0.27735013, -0.75, 0.05118847}
v1 = {-0.20801258, -0.85, 0.29772186}
v2 = {-0.1317413, -0.5, 0.0758419}

3. *Construct the perspective projection matrix and apply it to the to the vertices in camera space to get them in the canonical cube*

We have our formula for $M_{persp \rightarrow ortho}$ {{n, 0, 0, 0}, {0, n, 0, 0}, {0, 0, (n + f), 1}, {0, 0, -(n * f), 0}}

- note this is a *column-major* matrix as written in the program

which we multiply with our previous *orthographic projection matrix*, so our *perspective projection matrix* = $M_{ortho}M_{persp \rightarrow ortho}$

Then we apply this *perspective projection matrix* to our camera space vertices
v0 = {-0.27735013, 0.75, 4.2184634}
v1 = {0.20801258, 0.85, 2.8625298}
v2 = {0.1317413, 0.5, 4.0828695}