Assignment1:Transformation

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1. Environment：

a. OS: Mac OS
b. CPU :intel i7 4 core
c. GPU:Intel Iris Plus Graphics 655 1536 MB
d. RAM:8G

2. Implementation:

a. Translate, Scaling, Rotation, Perspective, Orthogonal Matrix: Implement it according to the lecture notes.
b. drawPlane: According the procedure of loadModel, Build VAO, VBO and draw the vertices.

```
glUniformMatrix4fv(iLocMVP, 1, GL_FALSE, mvp);

glGenVertexArrays(1, &quad.vao);
glBindVertexArray(quad.vao);
glGenBuffers(1, &quad.vbo);
glBindBuffer(GL_ARRAY_BUFFER, quad.vbo);
glBufferData(GL_ARRAY_BUFFER, sizeof(vertices), vertices, GL_STATIC_DRAW);
glVertexAttribPointer(0, 3, GL_FLOAT, GL_FALSE, 0, 0);
quad.vertex_count = 18 ;
glGenBuffers(1, &quad.p_color);
glBindBuffer(GL_ARRAY_BUFFER, quad.p_color);
glBufferData(GL_ARRAY_BUFFER, sizeof(colors), colors, GL_STATIC_DRAW);
glVertexAttribPointer(1, 3, GL_FLOAT, GL_FALSE, 0, 0);
glEnableVertexAttribArray(0);
glEnableVertexAttribArray(1);

glDrawArrays(GL_TRIANGLES, 0, 18);
```

c. renderScene: pass MVP matrix into shaders.
d. changeSize: Choose the largest boundary as the range of viewport

```
if (width > height) {
    glViewport((width - height) / 2, 0, min(width, height), min(width, height));
}
else {
    glViewport(0, (height - width) / 2, min(width, height), min(width, height));
}
```

e. mouse control: according to GLFW documents.
f. Keyboard control :according to GLFW documents.

3. Control:

a.

```
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Using manual :
    z : move to previous model
    x : move to next model
    o : switch to Orthogonal
    p : switch to Perspective
    s : GeoScaling
    t : GeoTranslation
    r : GeoRotation
    e : ViewEye
    c : ViewCenter
    u : ViewUp
------------------------------------------------------------
```
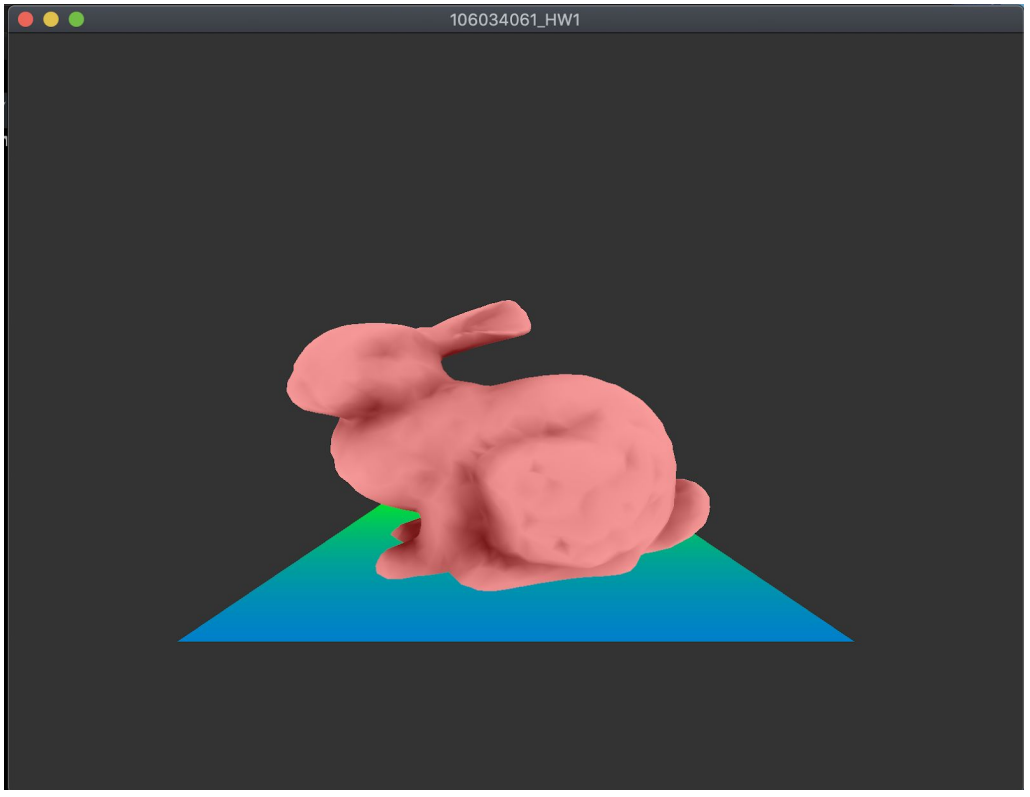
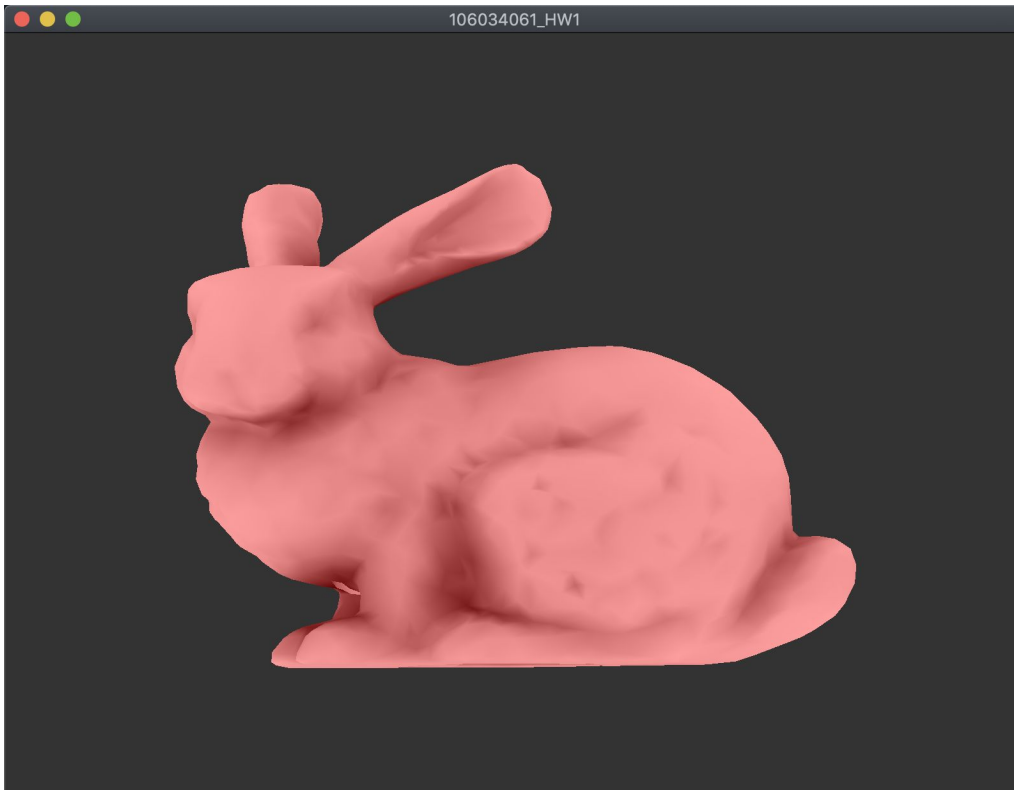

4. Demo :

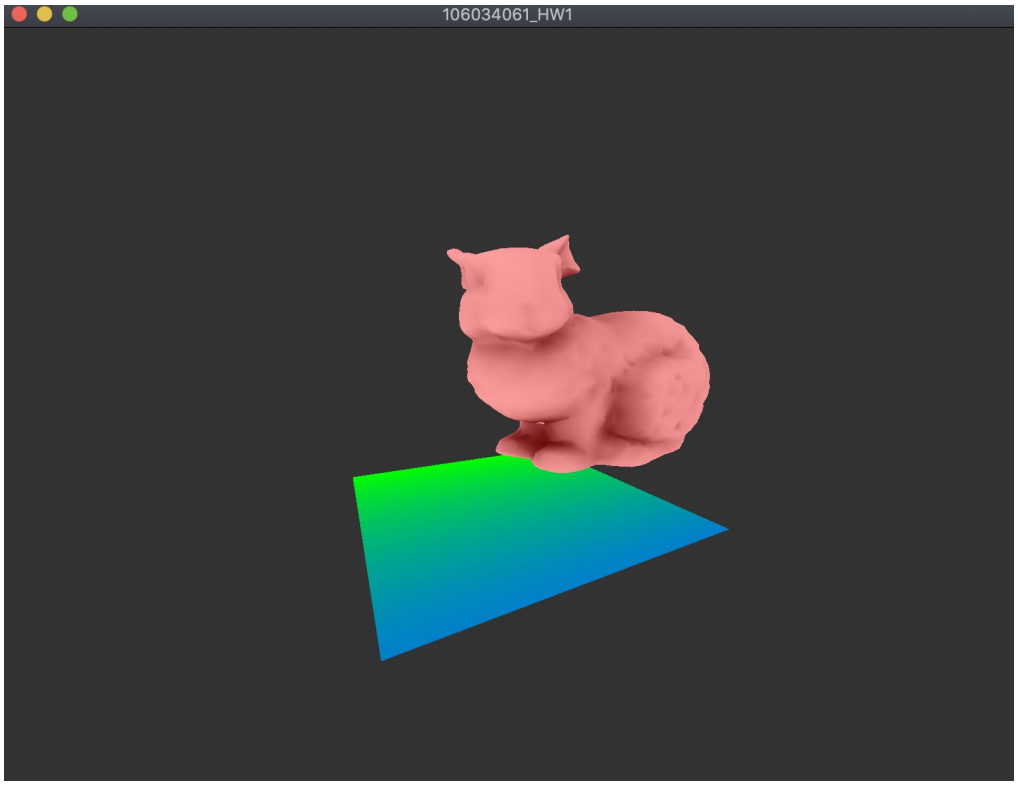
a. Perspective



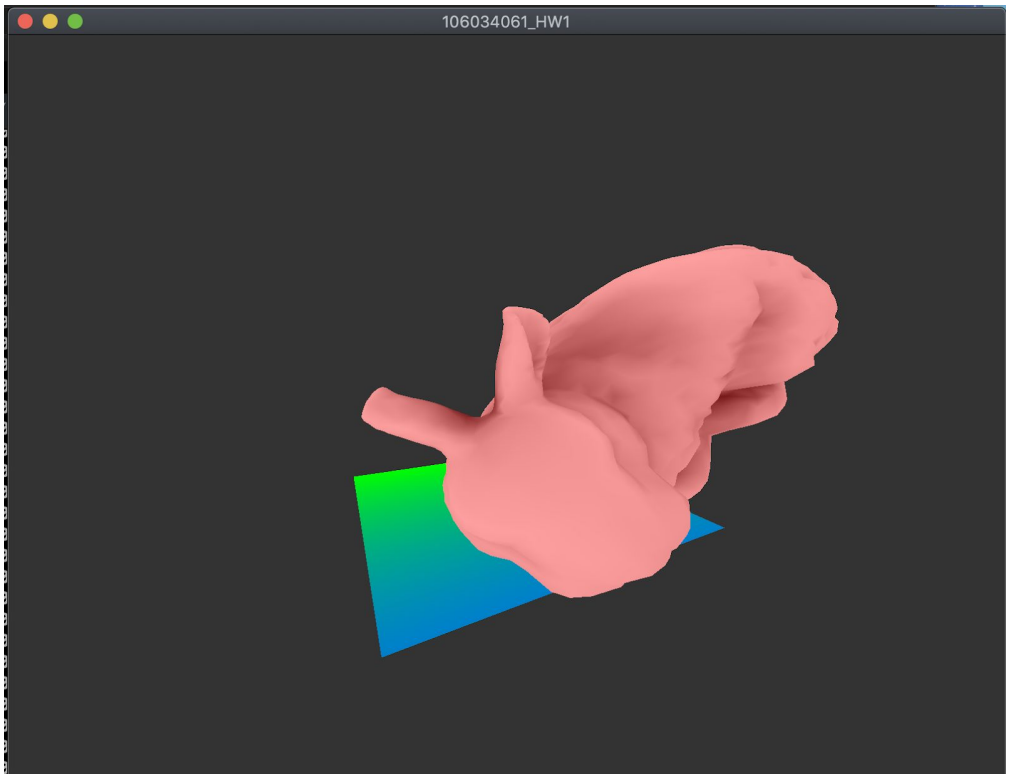
b. Orthogonal



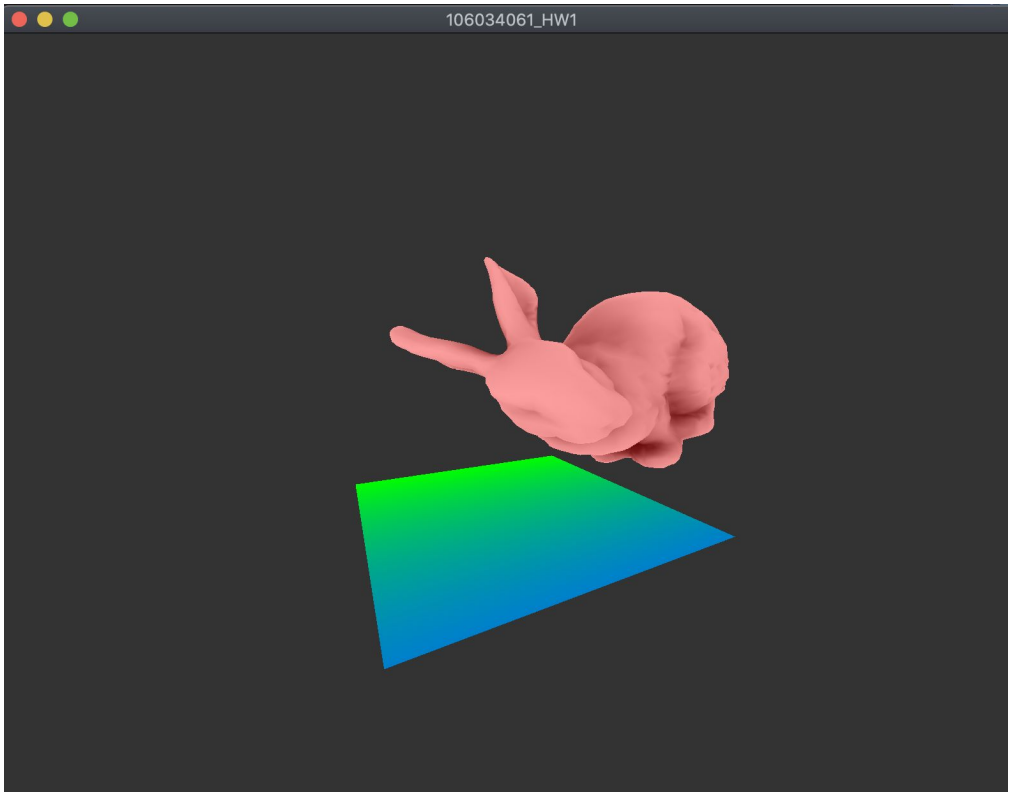
c. Translation



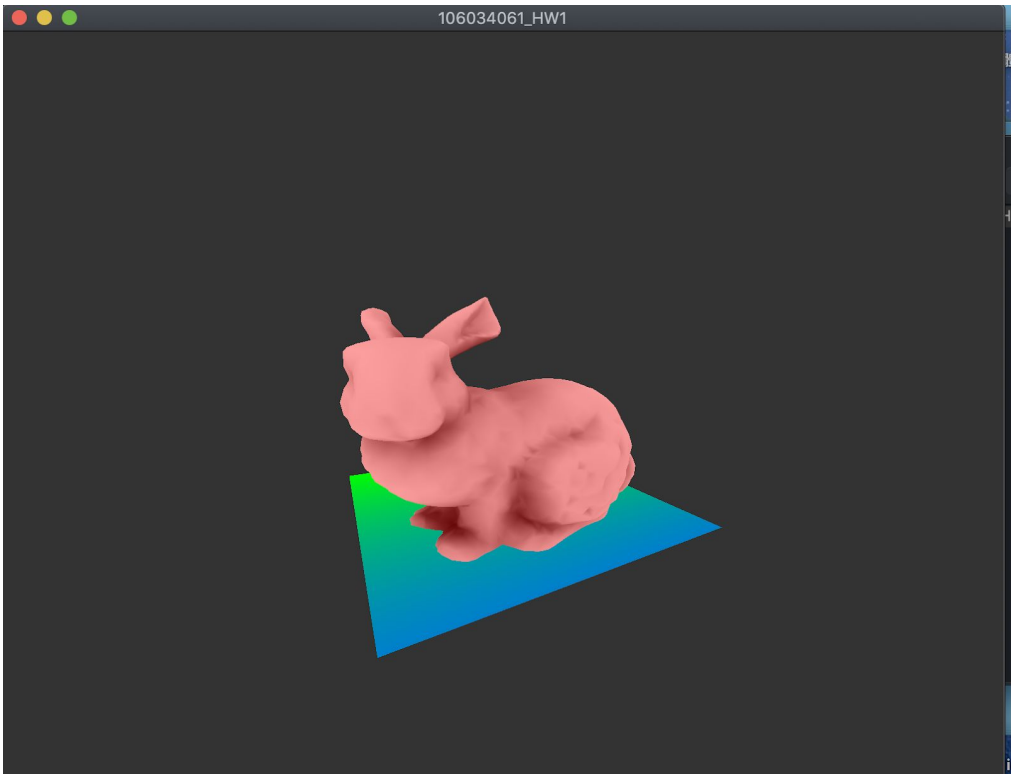
d. Scaling



e. Rotation



f. Viewing



g. Information

```
-----------------------------------
Viewing Matrrix
(0.892635,  0,  0.45078,    0)
(0.0963075, 0.976911,   -0.190708,  2.98023e-08)
(-0.440372, 0.213646,   0.872025,   -2.29351)
(0, 0,  0,  1)
-----------------------------------
Projecting Matrix
(0.666667,  0,  0,  0)
(0, 0.666667,   0,  0)
(0, 0,  -1.22222,   -2.22222)
(0, 0,  -1, 0)
-----------------------------------
Translate Matrix
(1, 0,  0,  0.6)
(0, 1,  0,  0.59)
(0, 0,  1,  0)
(0, 0,  0,  1)
-----------------------------------
Rotation Matrix
(0.67329,   -0.693246,  0.257081,   0)
(0.720795,  0.692879,   -0.0193265, 0)
(-0.164728, 0.198315,   0.966197,   0)
(0, 0,  0,  1)
-----------------------------------
Scaling Matrix
(1.8,   0,  0,  0)
(0, 0.45,   0,  0)
(0, 0,  1.7,    0)
(0, 0,  0,  1)
```