Oregon State University

Project #3A: Displacement Mapping and Lighting

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1 Description

1.1 Set up

GLSL and glman are used to render a curtain with pleats in the project #3A.

1.2 Program Description

In this project, the program is designed to make a curtain with pleats, which is created in the vertex shader with a sine wave that goes up and down in the Z direction. In the .glib file, uA and uP affect the shape of the curtain, manipulating the magnitude and period of the sine wave:

$$uA\ < 0.01,\ 0.1\ 1.0 >$$

$$uP < 0.15\ 0.5\ 0.1 >$$

In the vertex shader, for the z coordinate of the current vertex, z is defined as:

$$float\ z = uA\ * (uY0 - gl\_Vertex.y)\ * sin(2.\ *\ \pi\ *\ gl\_Vertex.x\ /\ uP);$$

Then, new vertex is needed to be defined:

$$vec4\ vert =\ gl\_Vertex;$$

$$vert.z = z;$$

According to the description in project 3A, tangent vectors lie on the surface, and each tangent slope is determined by taking caculus derivatives:

$$float\ dzdx = uA * (uY0 - gl\_Vertex.y) * (2. * \pi/uP) * cos(2. * \pi * gl\_Vertex.x/uP);$$

$$float\ dzdy = -uA * sin(2. * \pi * gl\_Vertex.x/uP);$$

The full vec3 tangent vectors:

$$vec3\ Tx = vec3(1., 0., dzdx);$$

$$vec3\ Ty = vec3(0., 1., dzdy);$$

$$vN = normalize(cross(Tx, Ty))$$

1.3 URL

Video Link(bitly): `https://bit.ly/4aHDyVm`

Video Link(original):
`https://oregonstate.zoom.us/rec/share/3CRn-Cf8wYgygWRTZ-XiQak0ylb_kbXh860j_RVAc_gXZqeloVcnPcBYDKK-6Y4VaxgeAwF?startTime=1738380056000`

1.4 Test Result

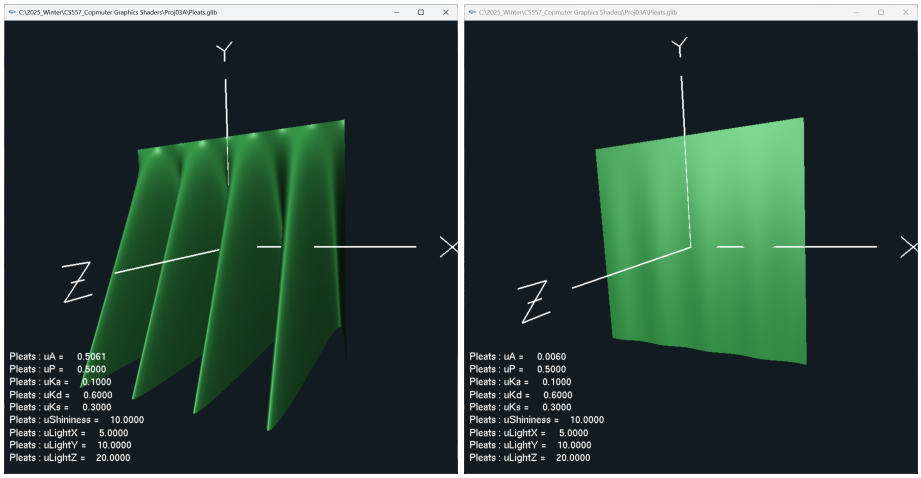

Figure 1: increase uA(left) and decrease uA(right)

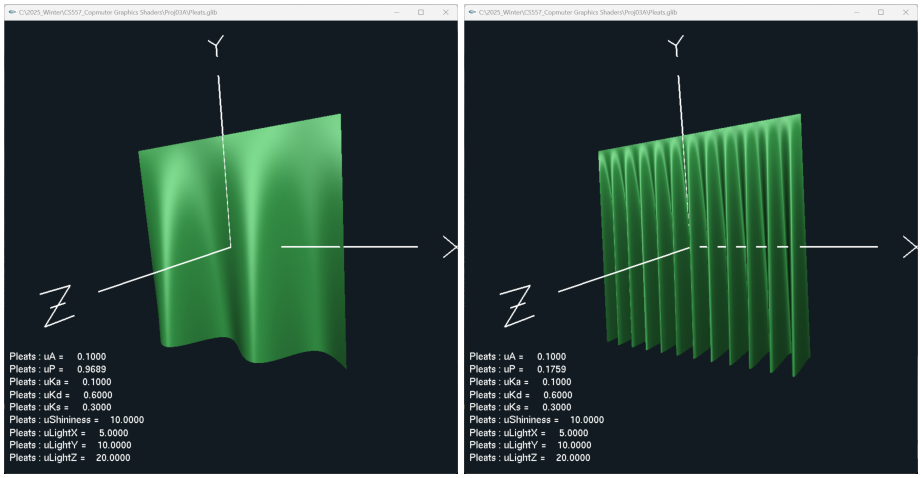

Figure 2: increase uP(left) and decrease uP(right)