



**Oregon State**  
University

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**Project #1: Step- and Blended-edged Elliptical Dots**

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# 1 Description

## 1.1 Set up

GLSL and glman are used to render geometry covered with elliptical dots in the project #1.

## 1.2 Program Description

In this project, the program is designed to make ellipse dots on the given 3-D sphere. The 3-D sphere has a white color, defined as "const vec3 OBJECTCOLOR = vec3 ( 0.95, 0.95, 0.95 )", and the ellipse dots have a red color, defined as "const vec3 ELLIPSECOLOR = ( 1., 0.5, 0.4 )."

For shaping elliptical dots, we need to use the equation to compute :

$$(s - s_c)^2/Ar^2 + (t - t_c)^2/Br^2 = 1$$

, where  $s_c$  and  $t_c$  are the center of the ellipse dot, and  $Ar$  and  $Br$  are of the x-axis and y-axis radius of each ellipse dot.

To do the rest of the ellipse equation to compute  $d (= rst)$ , we define  $ra(= Ar)$ ,  $rb(= Br)$ ,  $s_c$ , and  $t_c$ :

$$\begin{aligned} \text{float } ra &= uAd/2.; \\ \text{float } rb &= uBd/2.; \\ \text{float } s_c &= numins * uAd + ra \\ \text{float } t_c &= numint * uBd + rb \end{aligned}$$

Then, we can compute  $d(= rst)$  with these variables:

$$\text{float } rst = \text{pow}((st.s - s_c)/ra, 2) + \text{pow}((st.t - t_c)/rb, 2)$$

, where  $\text{pow}()$  is the square root function.

The result of equation  $(= rst)$  can be applied to the smooth step function:

$$\text{float } t = \text{smoothstep}(1. - uTol, 1. + uTol, rst)$$

By doing so, we get the sphere with elliptical dots. The results of the program are on the Test Result section.

## 1.3 URL

Video Link(bitly): <https://bit.ly/42iXiN4>

Video Link(original):

[https://oregonstate.zoom.us/rec/share/YmXEd7zUb7-yWQzY\\_VdVbtFbvB-6uDEdii8cxRyP11N6aI4yq2YY\\_JAuCJSNQX5V.mBbOFQALob1VAbWJ](https://oregonstate.zoom.us/rec/share/YmXEd7zUb7-yWQzY_VdVbtFbvB-6uDEdii8cxRyP11N6aI4yq2YY_JAuCJSNQX5V.mBbOFQALob1VAbWJ)

## 1.4 Test Result

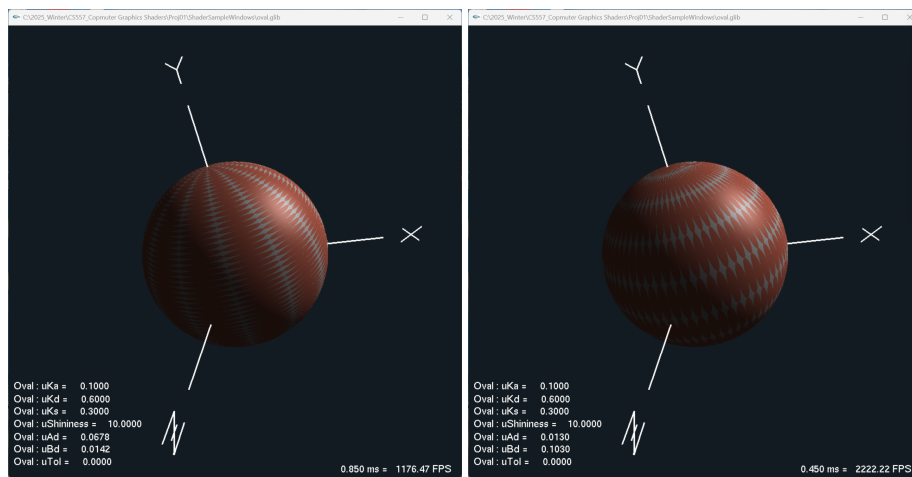


Figure 1: Higher uAd(left) and higher uBd(right)

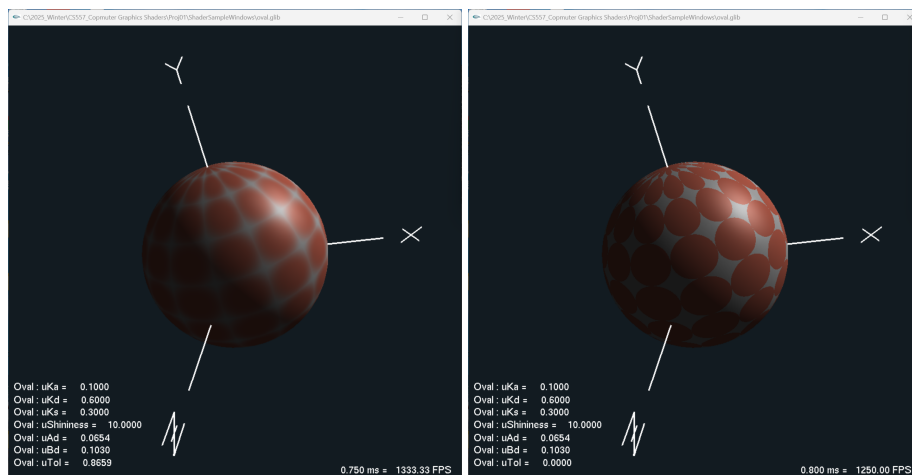


Figure 2: High uTol(left) and Low uTol(right)