CZ2003 Lab3 Report

Experiment 3: Parametric Surfaces and Solids

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SS2

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| **Surface 1** | **Surface 2** | | **Notes** |
| Above is the image of “**3dplane1.wrl”** defining a 3d plane with parametric equations x=u, y=v and z=u with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | Above is the image of “**3dplane2.wrl”** defining a 3d plane with parametric equations x=u, y=v and z=u with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 200. | | **Note 1**: For the plane to look “3d”, we have to introduce a z component, z=u in this case, so that the plane will have x, y and z values. The sampling resolution does not affect the surface since the surface is constructed using straight lines. |
| Above is the image of “**3dplane1.wrl”** as seen in wireframe mode. | Above is the image of “**3dplane2.wrl”** as seen in wireframe mode. | | **Note 2**: In this case, given the sampling resolution affects the number of lines used, we can see that a higher sampling resolution in **surface 2** results in the surface looking more clearer than **surface 1** as more lines are present in **surface 2**. |
| Above is the image of “**3dtriangle1.wrl”** defining a 3d triangle with parametric equations x=u, y=u\*v and z=u with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | Above is the image of “**3dtriangle2.wrl”** defining a 3d triangle with parametric equations x=u, y=u\*v and z=u with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 10. | | **Note 3:** The sampling resolution does not affect the surface since the surface is constructed using straight lines. The surface is now the shape of a triangle instead of a rectangle. |
| Above is the image of “**3dtriangle1.wrl”** as seen in wireframe mode. | Above is the image of “**3dtriangle2.wrl”** as seen in wireframe mode. | | **Note 4**: For this case, we reduce the sampling resolution instead and we can see that lesser lines are used in **surface 2** to construct the triangle as the lower the sampling resolution the lesser the number of lines that is used to construct the object. |
| Above is the image of “**bilinearsurface1.wrl”** defining a bilinear surface with parametric equations  x=2\*u – 1,  y=1-u-v+2.5\*u\*v,  z=2\*v – 1  with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | Above is the image of “**bilinearsurface2.wrl”** defining a bilinear surface with parametric equations  x=2\*u – 1,  y=1-u-v+2.5\*u\*v  z=2\*v – 1  with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 5. | | **Note 5:** The sampling resolution does not affect the surface since the surface is constructed using straight lines. The shape of the surface is now a surface with 4 different coordinates. The surface is formed by vector addition. |
| Above is the image of “**bilinearsurface1.wrl”** as seen in wireframe mode. | Above is the image of “**bilinearsurface2.wrl”** as seen in wireframe mode. | | **Note 6**: Similar to **Note 4**, reducing the sampling resolution causes the number of lines used to construct the object to also decrease as seen in **Surface 2**. |
| Above is the image of “**sphere1.wrl”** defining a sphere surface with parametric equations x=0.7\*cos(u\*2\*pi)\*sin(v\*2\*pi);  y=0.7\*sin(u\*2\*pi);  z=0.7\*cos(u\*2\*pi)\*cos(v\*2\*pi) with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | Above is the image of “**sphere2.wrl”** defining a sphere surface with parametric equations x=0.7\*cos(u\*2\*pi)\*sin(v\*2\*pi);  y=0.7\*sin(u\*2\*pi);  z=0.7\*cos(u\*2\*pi)\*cos(v\*2\*pi) with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 4. | | **Note 7:** For this surface, the sampling resolution does in fact affects the surface as the surface is round, higher samples and more lines are required to be joined together to ensure the graph is smoother and more accurate as seen in **Surface 1**. The sphere has a radius of 0.7 units and does a rotational sweeping of 2PI degree. |
| Above is the image of “**ellipsoid1.wrl”** defining an ellipsoid surface with parametric equations x=0.7\*cos(u\*2\*pi)\*sin(v\*2\*pi);  y=0.4\*sin(u\*2\*pi);  z=0.6\*cos(u\*2\*pi)\*cos(v\*2\*pi) with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | Above is the image of “**ellipsoid2.wrl”** defining an ellipsoid surface with parametric equations x=0.7\*cos(u\*2\*pi)\*sin(v\*2\*pi);  y=0.4\*sin(u\*2\*pi);  z=0.6\*cos(u\*2\*pi)\*cos(v\*2\*pi) with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 5. | | **Note 8:** Similar to **Note 7** the sampling resolution affects the surface as the surface is also round, higher samples and more lines are required to be joined together to ensure the graph is smoother and more accurate as seen in **Surface 1**. The ellipsoid has a x-component of 0.7 units, a y-component of 0.4 units and a z-component of 0.6 units. The ellipsoid does a rotational sweeping of 2PI degree. The x, y and z component must have different values for it to look like an ellipsoid as if they were the same, the surface will just be a sphere. |
| Above is the image of “**cone1.wrl”** defining a cone surface with parametric equations  x=0.6\*u  y=0.6\*u\*cos(2\*pi\*v)  z=0.6\*u\*sin(2\*pi\*v)  with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | Above is the image of “**cone2.wrl”** defining a cone surface with parametric equations  x=0.6\*u  y=0.6\*u\*cos(2\*pi\*v)  z=0.6\*u\*sin(2\*pi\*v)  with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 3. | | **Note 9**: Similar to **Note 7** the sampling resolution affects the surface as the surface is also round, higher samples and more lines are required to be joined together to ensure the graph is smoother and more accurate as seen in **Surface 1**. The cone is formed by a sweeping of 2PI about the x-axis. |
| **Solid 1** | | **Solid 2** | **Notes** | |
| Above is the image of “**surface.wrl”** defining a square surface with parametric equations  x=u, y=v and z=0 with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | | Above is the image of “**solidbox.wrl”** defining a solid cube with parametric equations  x=u, y=v and z=w with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 75. | **Note 10:** From **Solid 1** to **Solid 2**, we have to add z=w so that the object can grow in the z axis/direction giving it the 3d cube effect, else it will just remain as a 2d surface as shown in **Solid 1**. | |
| Above is the image of “**circle.wrl”** defining a circle surface with parametric equations  x=0.5\*v\*cos(u\*2\*pi)  y=0.5\*v\*sin(u\*2\*pi)  z=0  with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | | Above is the image of “**solidsphere.wrl”** defining a solid sphere with parametric equations  x=0.5\*v\*cos(u\*2\*pi)  y=0.5\*v\*sin(u\*2\*pi)\*cos(w\*pi)  z=0.5\*v\*sin(u\*2\*pi)\*sin(w\*pi);with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 75. | **Note 11:** For both objects, we have a radius of 0.5 units. For **Solid 1**, we do not have a z component hence it is just a 2d circle. For **Solid 2**, we add a z component and sweep the circle rotationally by sin(w\*pi) and cos(w\*pi) to get the solid sphere as seen in **Solid 2.** | |
| Above is the image of “**circle.wrl”** defining a circle surface with parametric equations  x=0.5\*v\*cos(u\*2\*pi)  y=0.5\*v\*sin(u\*2\*pi)  z=0  with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | | Above is the image of “**solidcylinder.wrl”** defining a solid cylinder with parametric equations  x= 0.5\*v\*cos(u\*2\*pi);  y= 0.5\*v\*sin(u\*2\*pi);  z= w\*0.9 - 0.5  with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 75. | **Note 12**: To get the solid cylinder as shown in **Solid 2**, we need to add a z component to the graph, and we translate the circle in **Solid 1** in the z direction. For this case, we translate the circle back by 0.5 units, followed by a translational sweeping in the positive z direction by w\*0.9 times. The circle and cylinder both have a radius of 0.5 units. | |
| Above is the image of “**sin1.wrl”** defining a sine solid object with parametric equations  x=(0.2+0.5\*u)\*sin(pi/2+v\*pi);  y=0.2\*sin(2\*pi\*u);  z=(0.2+0.5\*u)\*cos(pi/2+v\*pi) with parameter domains all [0,1 0,1]. The sampling resolution used is 75. | | Above is the image of “**sin2.wrl”** defining a sine solid object with parametric equations  x=(0.2+0.5\*u)\*sin(pi/2+v\*pi);  y=0.2\*sin(2\*pi\*u)+0.5\*w;  z=(0.2+0.5\*u)\*cos(pi/2+v\*pi) with parameter domains all [0,1 0,1 0,1]. The sampling resolution used is 75. | **Note 13:** The original sine curve is first displaced by 0.2 units along the x-axis. It has a period of 2PI and an amplitude of 0.2 units. It undergoes a rotational sweep of v\*pi units about the y-axis and the result is **Solid 1**. We then do a translational sweeping of the curve by 0.5\*w units parallel to the y-axis as well which result in **Solid 2**. | |