Nanyang Technological University

Lab 3 Report:

Parametric Surfaces and Solids

CZ2003 Computer Graphics and Visualization

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**Parametric Surfaces (Experiment on Resolution)**

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| **Surface 1** | **Surface 2** | **Notes** |
|  |  | The sampling resolution does not affect the appearance of the surface. From wireframe, we will realise that the graph is constructed with straight lines. The higher the resolution, the more lines there is in the surface graph. |
| File: 3D plane 1.wrl  The parametric equation for 3D plane.  x: u  y: v  z: u  parameters [0 1 0 1]  resolution [75 75] | File: 3D plane 2.wrl  The parametric equation for 3D plane.  x: u  y: v  z: u  parameters [0 1 0 1]  resolution [2 2] |
|  |  |
| File: 3D plane 1.wrl  The parametric equation for 3D plane (wireframe).  x: u  y: v  z: u  parameters [0 1 0 1]  resolution [75 75] | File: 3D plane 2.wrl  The parametric equation for 3D plane (wireframe).  x: u  y: v  z: u  parameters [0 1 0 1]  resolution [2 2] |
|  |  | The sampling resolution does not affect the appearance of the surface. From wireframe, we will realise that the graph is constructed with straight lines. The higher the resolution, the more lines there is in the surface graph. |
| File: 3D triangle 1.wrl  The parametric equation for 3D triangle.  x: u  y: v\*(1 - u)  z: u  parameters [0 1 0 1]  resolution [75 75] | File: 3D triangle 2.wrl  The parametric equation for 3D triangle.  x: u  y: v\*(1 - u)  z: u  parameters [0 1 0 1]  resolution [2 2] |
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| File: 3D triangle 1.wrl  The parametric equation for 3D triangle (wireframe).  x: u  y: v\*(1 – u)  z: u  parameters [0 1 0 1]  resolution [75 75] | File: 3D triangle 2.wrl  The parametric equation for 3D triangle (wireframe).  x: u  y: v\*(1 - u)  z: u  parameters [0 1 0 1]  resolution [2 2] |
|  |  | The sampling resolution does not affect the appearance of the surface. From wireframe, we will realise that the graph is constructed with straight lines. The higher the resolution, the more lines there is in the surface graph. |
| File: bilinear surface 1.wrl  The parametric equation for bilinear surface.  x: u  y: v\*u  z: u  parameters [0 1 0 1]  resolution [75 75] | File: bilinear surface 2.wrl  The parametric equation for bilinear surface.  x: u  y: v\*u  z: u  parameters [0 1 0 1]  resolution [2 2] |
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| File: bilinear surface 1.wrl  The parametric equation for bilinear surface (wireframe).  x: u  y: v\*u  z: u  parameters [0 1 0 1]  resolution [75 75] | File: bilinear surface 2.wrl  The parametric equation for bilinear surface (wireframe).  x: u  y: v\*u  z: u  parameters [0 1 0 1]  resolution [2 2] |
|  |  | The sampling resolution does not affect the appearance of the surface. From wireframe, we will realise that the graph is constructed with straight lines. The higher the resolution, the more lines there is in the surface graph. |
| File: sphere 1.wrl  The parametric equation for sphere.  x: cos(2 \* pi \* u)\* cos(pi \* v)  y: cos(2 \* pi \* u) \* sin(pi \* v)  z: sin(2 \* pi \* u)  parameters [0 1 0 1]  resolution [75 75] | File: sphere 2.wrl  The parametric equation for sphere.  x=cos(2 \* pi \* u)\* cos(pi \* v);  y=cos(2 \* pi \* u) \* sin(pi \* v);  z=sin(2 \* pi \* u)  parameters [0 1 0 1]  resolution [2 2] |
|  |  |
| File: sphere 1.wrl  The parametric equation for sphere (wireframe).  x: cos(2 \* pi \* u)\* cos(pi \* v)  y: cos(2 \* pi \* u) \* sin(pi \* v)  z: sin(2 \* pi \* u)  parameters [0 1 0 1]  resolution [75 75] | File: sphere 2.wrl  The parametric equation for sphere (wireframe).  x=cos(2 \* pi \* u)\* cos(pi \* v);  y=cos(2 \* pi \* u) \* sin(pi \* v);  z=sin(2 \* pi \* u)  parameters [0 1 0 1]  resolution [2 2] |
|  |  | The more the number of samples used, the more accurate and smooth the ellipsoid will be. This is due to multiple straight lines joining together. |
| File: ellipsoid 1.wrl  The parametric equation for ellipsoid.  x: cos(2 \* pi \* u)\* sin(pi \* v)  y: 0.7 \* sin(2 \* pi \* v)  z: cos(2 \* pi \* u) \* cos(pi \* v)  parameters [0 1 0 1]  resolution [75 75] | File: ellipsoid 2.wrl  The parametric equation for ellipsoid.  x: cos(2 \* pi \* u)\* sin(pi \* v)  y: 0.7 \* sin(2 \* pi \* v)  z: cos(2 \* pi \* u) \* cos(pi \* v)  parameters [0 1 0 1]  resolution [10 10] |
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| File: ellipsoid 1.wrl  The parametric equation for ellipsoid (wireframe).  x: cos(2 \* pi \* u)\* sin(pi \* v)  y: 0.7 \* sin(2 \* pi \* v)  z: cos(2 \* pi \* u) \* cos(pi \* v)  parameters [0 1 0 1]  resolution [75 75] | File: ellipsoid 2.wrl  The parametric equation for ellipsoid (wireframe).  x: cos(2 \* pi \* u)\* sin(pi \* v)  y: 0.7 \* sin(2 \* pi \* v)  z: cos(2 \* pi \* u) \* cos(pi \* v)  parameters [0 1 0 1]  resolution [10 10] |
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| File: cone 1.wrl  The parametric equation for cone.  x: u  y: u \* cos(2 \* pi \* v)  z: u \* sin(2 \* pi \* v)  parameters [0 1 0 1]  resolution [75 75] | File: cone 2.wrl  The parametric equation for cone.  x: u  y: u \* cos(2 \* pi \* v)  z: u \* sin(2 \* pi \* v)  parameters [0 1 0 1]  resolution [10 10] |  |
|  |  |
| File: cone 1.wrl  The parametric equation for cone (wireframe).  x: u  y: u \* cos(2 \* pi \* v)  z: u \* sin(2 \* pi \* v)  parameters [0 1 0 1]  resolution [75 75] | File: cone 2.wrl  The parametric equation for cone (wireframe).  x: u  y: u \* cos(2 \* pi \* v)  z: u \* sin(2 \* pi \* v)  parameters [0 1 0 1]  resolution [10 10] |

**Parametric Solid on Parameters and Resolution**

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| **Solid 1** | **Solid 2** | **Notes** |
|  |  | The sampling resolution does not affect the appearance of the solid. From wireframe, we will realise that the graph is constructed with straight lines. The higher the resolution, the more lines there is in the surface graph. The differences in parameters will affect the length, breadth and even the height of the solid. |
| File: solid box 1.wrl  The parametric equation for solid box.  x: u  y: v  z: w  parameters [0 1 0 1 0 1]  resolution [75 75 75] | File: solid box 2.wrl  The parametric equation for solid box.  x: u  y: v  z: w  parameters [0 1 0 1 0 1]  resolution [2 2 2] |
|  |  |
| File: solid box 2 - 1.wrl  The parametric equation for solid box with different parameters.  x: u  y: v  z: w  parameters [0 2 0 1 0 3]  resolution [2 2 2] | File: solid box 2.wrl  The parametric equation for solid box (wireframe).  x: u  y: v  z: w  parameters [0 1 0 1 0 1]  resolution [2 2 2] |
|  |  | The sampling resolution will affect the appearance of the solid sphere. Lower resolution results in having lesser lines and the shape of the solid will change. The parameters also does the part of changing the shape of the solid. The minimum resolution the solid can go is 3 because the solid is made up of straight lines. |
| File: solid sphere 1.wrl  The parametric equation for solid sphere.  x: w \* cos( 2 \* pi \* u) \* sin(2 \* pi \* v)  y: w \* sin( 2 \* pi \* u)  z: w \* cos( 2 \* pi \* u) \* cos(2 \* pi \* v)  parameters [0 1 0 1 0 1]  resolution [75 75 75] | File: solid sphere 2.wrl  The parametric equation for solid sphere with lower resolution.  x: w \* cos( 2 \* pi \* u) \* sin(2 \* pi \* v)  y: w \* sin( 2 \* pi \* u)  z: w \* cos( 2 \* pi \* u) \* cos(2 \* pi \* v)  parameters [0 1 0 1 0 1]  resolution [5 5 5] |
|  |  |
| File: solid sphere 1 - 1.wrl  The parametric equation for solid sphere on lower parameters.  x: w \* cos( 2 \* pi \* u) \* sin(2 \* pi \* v)  y: w \* sin( 2 \* pi \* u)  z: w \* cos( 2 \* pi \* u) \* cos(2 \* pi \* v)  parameters [0 0.5 0 0.5 0 0.5]  resolution [75 75 75] | File: solid sphere 2 - 1.wrl  The parametric equation for solid sphere on lower parameters.  x: w \* cos( 2 \* pi \* u) \* sin(2 \* pi \* v)  y: w \* sin( 2 \* pi \* u)  z: w \* cos( 2 \* pi \* u) \* cos(2 \* pi \* v)  parameters [0 0.5 0 0.5 0 0.5]  resolution [5 5 5] |
|  |  | The sampling resolution affects the appearance of the solid cylinder. Lower resolution results in lesser lines form and thus changes the shape of the solid. Having more lines will have more points to form the equation of cylinder. The minimum resolution of this solid can goes is 3, else it cannot form a shape. |
| File: solid cylinder 1.wrl  The parametric equation for solid cylinder.  x: u \* 0.5 \* sin(2 \* pi \* v)  y: w \* 2 - 1  z: u \* 0.5 \* cos(2 \* pi \* v)  parameters [0 1 0 1 0 1]  resolution [75 75 75] | File: solid cylinder 2.wrl  The parametric equation for solid cylinder with lower resolution.  x: u \* 0.5 \* sin(2 \* pi \* v)  y: w \* 2 - 1  z: u \* 0.5 \* cos(2 \* pi \* v)  parameters [0 1 0 1 0 1]  resolution [3 3 3] |
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| File: solid cylinder 1 - 1.wrl  The parametric equation for solid cylinder with lower parameters.  x: u \* 0.5 \* sin(2 \* pi \* v)  y: w \* 2 - 1  z: u \* 0.5 \* cos(2 \* pi \* v)  parameters [0 0.5 0 0.5 0 0.5]  resolution [75 75 75] | File: solid cylinder 2 - 1.wrl  The parametric equation for solid cylinder with lower parameters.  x: u \* 0.5 \* sin(2 \* pi \* v)  y: w \* 2 - 1  z: u \* 0.5 \* cos(2 \* pi \* v)  parameters [0 0.5 0 0.5 0 0.5]  resolution [3 3 3] |
|  |  | The sampling resolution affects the appearance of the solid cone. Lower resolution results in lesser lines form and thus changes the shape of the solid. In this situation it changes the base into a triangle, Having more lines will have more points to form the equation of cone. The minimum resolution of this solid can goes is 3, else it cannot form a shape. |
| File: solid cone 1.wrl  The parametric equation for solid cone.  x: u \* 0.5 \* (1 - w ) \* sin(2 \* pi \* v)  y: w \* 2 - 1  z: u \* 0.5 \* (1 - w ) \* cos(2 \* pi \* v)  parameters [0 1 0 1 0 1]  resolution [75 75 75] | File: solid cone 2.wrl  The parametric equation for solid cone with lower resolution.  x: u \* 0.5 \* (1 - w ) \* sin(2 \* pi \* v)  y: w \* 2 - 1  z: u \* 0.5 \* (1 - w ) \* cos(2 \* pi \* v)  parameters [0 1 0 1 0 1]  resolution [3 3 3] |
|  |  |
| File: solid cone 1 - 1.wrl  The parametric equation for solid cone with lower parameters.  x: u \* 0.5 \* (1 - w ) \* sin(2 \* pi \* v)  y: w \* 2 - 1  z: u \* 0.5 \* (1 - w ) \* cos(2 \* pi \* v)  parameters [0 0.5 0 0.5 0 0.5]  resolution [75 75 75] | File: solid cone 2 - 1.wrl  The parametric equation for solid cone with lower parameters.  x: u \* 0.5 \* (1 - w ) \* sin(2 \* pi \* v)  y: w \* 2 - 1  z: u \* 0.5 \* (1 - w ) \* cos(2 \* pi \* v)  parameters [0 0.5 0 0.5 0 0.5]  resolution [3 3 3] |

## Question 7

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|  | File: y = sin x. wrl  x = 2 \* w  y = u \* sin( 2 \* w)  z = u \* cos(pi \* v)  parameters [ 0 1 0 1 0 1 ]  resolution [75 75]  This file uses y = sin(x) to make a solid object. However it only does the translational sweeping. |
|  | File: y = sin x - 0. wrl  x=2 \* w \* sin(2 \* pi \* u);  y=u \* sin(2 \* w) \* (cos(2\*pi\*u)+0.5);  z=u \* cos(pi \* v)\* (cos(2\*pi\*u)+0.5);  parameters [ 0 1 0 1 0 1 ]  resolution [75 75 75]  This file uses y = sin(x) to make a solid object. In addition to the precious, it include rotational sweeping. |
|  | File y = sin x – 1.wrl  x=0.1\*v\*sin(2\*pi\*u)+0.5;  y=0.1\*v\*cos(2\*pi\*u)+0.5;  z=0;  parameters [ 0 1 0 1 0 1]  resolution [ 75 75]  This file uses y = sin(x) to make a solid object. However it does not uses translational and rotational sweeping. |
|  | File y = sin x - 2.wrl  x=-sin(4\*pi\*w)\*(0.1\*v\*cos(2\*pi\*u)+0.5);  y=cos(4\*pi\*w)\*(0.1\*v\*cos(2\*pi\*u)+0.5);  z=0.1\*v\*sin(2\*pi\*u)+w;  parameters [ 0 1 0 1 0 1]  resolution [75 75]  This file uses y = sin(x) to make a solid object. In addition, it uses translational and rotational sweeping. |
|  | File y = sin x - 3.wrl  x=(0.5 + 1.25 \* u) \* sin ( 0.75 \* pi + 1.25 \* v \* pi);  y=0.2 \* sin(3 \* pi \* u) - 0.5 + 1.5 \* w;  z=(0.5 + 1.25 \* u) \* cos (0.75 \* pi + 1.25 \* v \* pi);  parameters [ 0 1 0 1 0 1 ]  resolution [75 75 75]  This file uses y = sin(x) to form a sine curve. Afterwards, it transform by using translational and rotational sweeping. |