Nanyang Technological University

Lab 3 Report: Parametric Surfaces and Solids

CZ2003 Computer Graphics and Visualization

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| **Object 1** | **Object 2** | **Note** |
| Above is the snapshot of “3D plane.wrl” which define a squared plane by parametric equations x=u, y=v, and z=0 with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “3D plane\_r.wrl” which define a squared plane by parametric equations x=u, y=v, and z=0 with parameter domain [0,1 0,1]. The sampling resolution is 10 | The sampling resolution does not affect the object, because this is a surface, and the graph is construct by straight lines. |
| Above is the snapshot of “3D plane.wrl” but this is viewed in wireframe mode. | Above is the snapshot of “3D plane\_r.wrl” but this is viewed in wireframe mode. | The sampling resolution affect the quantity of lines to form a surface. |

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| **Object 1** | **Object 2** | **Note** |
| Above is the snapshot of “3D triangle.wrl” which define a triangle by parametric equations x=u, y= v\*(1-u), and z=0 with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “3D triangle\_r.wrl” which define a triangle by parametric equations x=u, y= v\*(1-u), and z=0 with parameter domain [0,1 0,1]. The sampling resolution is 10 | The sampling resolution does not affect the object, because this is a surface, and the graph is construct by straight lines. |
| Above is the snapshot of “3D triangle.wrl” but this is viewed in wireframe mode. | Above is the snapshot of “3D triangle\_r.wrl” but this is viewed in wireframe mode. | The sampling resolution affect the quantity of lines to form a surface. |

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| **Object 1** | **Object 2** | **Note** |
| Above is the snapshot of “Bilinear Surface.wrl” which define a Bilinear Surface by parametric equations x= -1+2\*u, y= 1-u-v+u\*v\*2.5, and z= -1+2\*v with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “Bilinear Surface\_r.wrl” which define a Bilinear Surface by parametric equations x= -1+2\*u, y= 1-u-v+u\*v\*2.5, and z= -1+2\*v with parameter domain [0,1 0,1]. The sampling resolution is 10 | The sampling resolution does not affect the object, because this is a surface, and the graph is construct by straight lines. |
| Above is the snapshot of “Bilinear Surface.wrl” but this is viewed in wireframe mode. | Above is the snapshot of “Bilinear Surface\_r.wrl” but this is viewed in wireframe mode. | The sampling resolution affect the quantity of lines to form a surface. |

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| **Object 1** | **Object 2** | **Note** |
| Above is the snapshot of “Sphere.wrl” which define a triangle by parametric equations x= cos(2\*pi\*u)\*sin(pi\*v), y= sin(2\*pi\*u)\*sin(pi\*v), and z= cos(pi\*v) with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “Sphere\_r.wrl” which define a triangle by parametric equations x= cos(2\*pi\*u)\*sin(pi\*v), y= sin(2\*pi\*u)\*sin(pi\*v), and z= cos(pi\*v) with parameter domain [0,1 0,1]. The sampling resolution is 10 | The more the number of samples used, the more accurate and smooth the object will be. This is because the object is created by joining multiple straight line together between points defined in the formula.  Object is formed by rotational sweeping of a circle by PI degree. |
| Above is the snapshot of “Sphere.wrl” but this is viewed in wireframe mode. | Above is the snapshot of “Sphere\_r.wrl” but this is viewed in wireframe mode. | The sampling resolution affect the quantity of lines to form a surface. |

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| **Object 1** | **Object 2** | **Note** |
| Above is the snapshot of “Ellipsoid.wrl” which define a triangle by parametric equations x= cos(2\*pi\*u)\*sin(pi\*v), y= 0.5\*sin(2\*pi\*u)\*sin(pi\*v), and z= cos(pi\*v) with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “Ellipsoid\_r.wrl” which define a triangle by parametric equations x= cos(2\*pi\*u)\*sin(pi\*v), y= 0.5\*sin(2\*pi\*u)\*sin(pi\*v), and z= cos(pi\*v) with parameter domain [0,1 0,1]. The sampling resolution is 10 | The more the number of samples used, the more accurate and smooth the object will be. This is because the object is created by joining multiple straight line together between points defined in the formula.  Object is formed by rotational sweeping of a ellipse by PI degree. |
| Above is the snapshot of “Ellipsoid.wrl” but this is viewed in wireframe mode. | Above is the snapshot of “Ellipsoid\_r.wrl” but this is viewed in wireframe mode. | The sampling resolution affect the quantity of lines to form a surface. |

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| **Object 1** | **Object 2** | **Note** |
| Above is the snapshot of “Cone.wrl” which define a triangle by parametric equations x= v\*cos(2\*pi\*u), y= v\*sin(2\*pi\*u), and z= v with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “Cone\_r.wrl” which define a triangle by parametric equations x= v\*cos(2\*pi\*u), y= v\*sin(2\*pi\*u), and z= v with parameter domain [0,1 0,1]. The sampling resolution is 10 | The more the number of samples used, the more accurate and smooth the object will be. This is because the object is created by joining multiple straight line together between points defined in the formula.  Object is formed by rotational sweeping a straight line by 2\*PI degree. |
| Above is the snapshot of “Cone.wrl” but this is viewed in wireframe mode. | Above is the snapshot of “Cone\_r.wrl” but this is viewed in wireframe mode. | The sampling resolution affect the quantity of lines to form a surface. |

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| **Object 1** | **Object 2** | **Note** |
| Above is the snapshot of “3D plane.wrl” which define a 3D plane by parametric equations x= u, y= v, and z= 0 with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “solid box.wrl” which define a 3D solid box by parametric equations x= u, y= v, and z= w with parameter domain [0,1 0,1 0,1]. The sampling resolution is 75 | The object2 is converted by object1 by add one more parameter w. Which is means let object1 grows up as w along z-axis. |
| Above is the snapshot of “disk.wrl” which define a 3D disk by parametric equations x= v\*cos(2\*pi\*u), y= v\*sin(2\*pi\*u), and z= 0 with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “solid sphere.wrl” which define a solid sphere by parametric equations x= v\*cos(2\*pi\*u)\*sin(pi\*w), y= v\*sin(2\*pi\*u)\*sin(pi\*w), and z= cos(pi\*w) with parameter domain [0,1 0,1 0,1]. The sampling resolution is 75 | The object2 is converted by object1 by add one more parameter w. Which is let object1 rotational sweeping by sin(pi\*w). |

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| **Object 1** | **Object 2** | **Note** |
| Above is the snapshot of “disk.wrl” which define a 3D disk by parametric equations x= v\*cos(2\*pi\*u), y= v\*sin(2\*pi\*u), and z= 0 with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “solid Cone.wrl” which define a solid Cone by parametric equations x= w\*cos(2\*pi\*u)\*(1-v), y= w\*sin(2\*pi\*u)\*(1-v), and z= v with parameter domain [0,1 0,1 0,1]. The sampling resolution is 75 | The object2 is converted by object1 by add one more parameter w. Which is let object1 rotational sweeping by (1-v) along Z axis. |
| Above is the snapshot of “y=sinx\_d.wrl” which define a disk by parametric equations x= 0, y= 0.1\*v\*cos(2\*pi\*u)+0.5, and z= 0.1\*v\*sin(2\*pi\*u) with parameter domain [0,1 0,1]. The sampling resolution is 75 | Above is the snapshot of “y=sinx.wrl” which define a solid helix by parametric equations 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), and z= 0.1\*v\*sin(2\*pi\*u)+w with parameter domain [0,1 0,1 0,1]. The sampling resolution is 75 | The object2 is converted by object1 by add one more parameter w. Which is let object1 rotational sweeping by a helix orbit. The rotation center is Z axis. |