

Lab 3 Report

Parametric Surfaces and Solids

SSR3

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Parametric Surfaces and Solids: 3D

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| **Plane 1a** | **Plane 1b** |
| Above illustrates a 3D plane defined by parametric equations:  x=v;  y=u;  z=v;  The parameters for u and v are [0 1 0 1].  The resolution is set to [75 75]  The corresponding file is named ‘3Dplane\_75.wrl’. | Above illustrates a 3D plane with defined by the same parametric equations as Plane 1a. The parameters for u and v are still  [0 1 0 1], but the resolution is changed from [75 75] to [15 15]. The corresponding file is named ‘3DPlane\_15.wrl’. |
| **Notes** | |
| A change in resolution of Plane 1 does not affect the appearance of the plane. This is because all the samples already lie on the plane, thus the result will be the same regardless of how many samples are taken. | |
| **Triangle 1a** | **Triangle 1b** |
| Above illustrates a 3D triangle defined by parametric equations:  x=u-0.6;  y=v\*u\*0.5;  z=v\*u\*0.5;  The parameters for u and v are [0 1 0 1].  The resolution is set to [75 75]  The corresponding file is named ‘3Dplane\_75.wrl’. | Above illustrates a 3D triangle with defined by the same parametric equations as Triangle 1a. The parameters for u and v are still [0 1 0 1], but the resolution is changed from [75 75] to [15 15]. The corresponding file is named ‘3DTriangle\_15.wrl’. |
| **Notes** | |
| Please refer to notes for Plane 1. Similarly, all sampled points lie on the same plane of the triangle, thus resolution will not change the triangle’s appearance. | |
| **Surface 1a** | **Surface 1b** |
| Above illustrates a bilinear surface defined by parametric equations:  x=-1+2\*u;  y=1-u-v+2\*u\*v;  z=-1+2\*v;  The parameters for u and v are [0 1 0 1].  The resolution is set to [75 75]  The corresponding file is named ‘bilinearSurface\_75.wrl’. | Above illustrates a bilinear surface defined by the same parametric equations as Surface 1a. The parameters for u and v are still [0 1 0 1], but the resolution is changed from [75 75] to [2 2]. The corresponding file is named ‘bilinearSurface\_2.wrl’. |
| **Notes** | |
| Since a bilinear surface is not completely flat, the resolution will have an affect on the appearance of the surface. When the resolution is low, the edges curvature of the bilinear surface would appear more jagged. This can be observed from the difference between Surface 1a and Surface 1b. | |
| **Sphere 1a** | **Sphere 1b** |
| Above illustrates a sphere defined by parametric equations:  x=0.5\*sin(2\*pi\*u)\*cos(2\*pi\*v);  y=0.5\*sin(2\*pi\*u)\*sin(2\*pi\*v);  z=0.5\*cos(2\*pi\*u)\*w;  Parameters for u and v are [0 1 0 1].  The resolution is set to [75 75]  The corresponding file is named ‘sphere\_75.wrl’. | Above illustrates a sphere defined by the same parametric equations as Sphere 1a. Parameters for u and v are still [0 1 0 1], but the resolution is changed from [75 75] to [10 10]. The corresponding file is named ‘sphere\_10.wrl’. |
| **Notes** | |
| Please refer to notes for Surface 1. Similar to bilinear surface, the surface of a sphere is not flat, therefore the resolution greatly affects the appearance of the sphere. This can be observed by comparing Sphere 1a and Sphere 1b. Sphere 1b appears considerably more jagged than Sphere 1a. It is evident that the higher the resolution, the more the object resembles a sphere. | |
| **Ellipsoid 1a** | **Ellipsoid 1b** |
| Above illustrates an ellipsoid defined by parametric equations:  x=0.5\*sin(2\*pi\*u)\*cos(2\*pi\*v);  y=0.5\*sin(2\*pi\*u)\*sin(2\*pi\*v);  z=1.2\*cos(2\*pi\*u);  Parameters for u and v are [0 1 0 1 ].  The resolution is set to [75 75]  The corresponding file is named ‘Ellipsoid\_75.wrl’. | Above illustrates an ellipsoid defined by the same parametric equations as Ellipsoid 1a. Parameters for u and v are still [0 1 0 1 0 1], but the resolution is changed from [75 75] to [10 10]. The corresponding file is named ‘Ellipsoid\_10.wrl’. |
| **Notes** | |
| Please refer to notes for Sphere 1. | |
| **Cone 1a** | **Cone 1b** |
| Above illustrates a cone defined by parametric equations:  x=u\*cos(2\*pi\*v);  y=u\*sin(2\*pi\*v);  z=u;  Parameters for u and v are [0 1 0 1 ].  The resolution is set to [75 75]  The corresponding file is named ‘cone\_75.wrl’. | Above illustrates a cone defined by the same parametric equations as Cone 1a. Parameters for u and v are still [0 1 0 1], but the resolution is changed from [75 75] to  [5 5]. The corresponding file is named ‘Ellipsoid\_10.wrl’. |
| **Notes** | |
| Please refer to notes for Sphere 1. | |

Parametric Surfaces and Solids: Solids

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| **Solid 1** | **Solid 2** |
| Above illustrates a solid sphere defined by parametric equations:  x=sin(2\*pi\*u)\*cos(2\*pi\*v);  y=sin(2\*pi\*u)\*sin(2\*pi\*v);  z=cos(2\*pi\*u)\*w;  Parameters for u, v and w are [0 1 0 1 0 1 ].  The resolution is set to [75 75 75]  The corresponding file is named ‘Ssphere.wrl’. | Above illustrates a solid cube defined by parametric equations:  x=u-0.5;  y=v-0.5;  z=w-0.5;  Parameters for u, v and w are [0 1 0 1 0 1 ].  The resolution is set to [75 75 75]  The corresponding file is named ‘Scube.wrl’. |
| **Solid 3** | **Solid 4** |
| Above illustrates a solid cylinder defined by parametric equations:  x=sin(2\*pi\*u)\*w;  y=cos(2\*pi\*u)\*w;  z=v;  Parameters for u, v and w are [0 1 0 1 0 1 ].  The resolution is set to [75 75 75]  The corresponding file is named ‘Scylinder.wrl’. | Above illustrates a solid cone defined by parametric equations:  x=u\*cos(2\*pi\*v)\*w;  y=u\*sin(2\*pi\*v)\*w;  z=u-0.6;  Parameters for u, v and w are [0 1 0 1 0 1 ].  The resolution is set to [75 75 75]  The corresponding file is named ‘Scone.wrl’. |
| **Notes** | |
| The introduction of a new parameter ‘w’ allows shapes to be 3 dimensional. Examples are shown below | |
| **Hollow Cylinder** | **Solid Cylinder** |
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| **Cone** | **Solid Cone** |
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| **Plane** | **Solid Cube** |
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Parametric Surfaces and Solid: Sweeping

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| **Curve 1** | **TSweeping 1** |
| Above illustrates a sin(x) curve defined by parametric equations:  x=u;  y=sin(2\*pi\*u);  z=0;  Parameters for u are [0 1].  The resolution is set to [100]  The corresponding file is named ‘sin(x)\_curve.wrl’. | Above illustrates a translational sweeping of the sin(x) curve along the y axis defined by parametric equations:  x=u;  y=sin(2\*pi\*u)+v;  z=0;  Parameters for u and v are [0 1 0 1].  The resolution is set to [100 100]  The corresponding file is named ‘sin(x)\_ts1.wrl’. |
| **TSweeping 2** | **TSweeping 3** |
| Above illustrates a translational sweeping of the sin(x) curve along the z axis defined by parametric equations:  x=u;  y=sin(2\*pi\*u);  z=v;  Parameters for u and v are [0 1 0 1].  The resolution is set to [100 100]  The corresponding file is named ‘sin(x)\_ts2.wrl’. | Above illustrates a translational sweeping of the sin(x) curve along the z axis defined by parametric equations:  x=u+v;  y=sin(2\*pi\*u);  z=0;  Parameters for u and v are [0 1 0 1].  The resolution is set to [100 100]  The corresponding file is named ‘sin(x)\_ts3.wrl’. |
| **Rotational Sweeping** | |
| Illustrates on the left shows a rotational sweeping of the sin(x) curve around the y axis after translational sweeping shown in TSweeping 1. The function is defined by parametric equations:  x=u\*cos(2\*pi\*v);  y=sin(2\*pi\*u)\*w;  z=u\*sin(2\*pi\*v);  Parameters for u and v are [0 1 0 1 0 1].  The resolution is set to [100 100 100]  The corresponding file is named ‘sin(x)\_rs.wrl’. | |
| **Notes** | |
| Both translational and rotation sweeping were used in generating the solid above. | |