

NANYANG
TECHNOLOGICAL
UNIVERSITY

CZ2003 Computer Graphic

Lab 3

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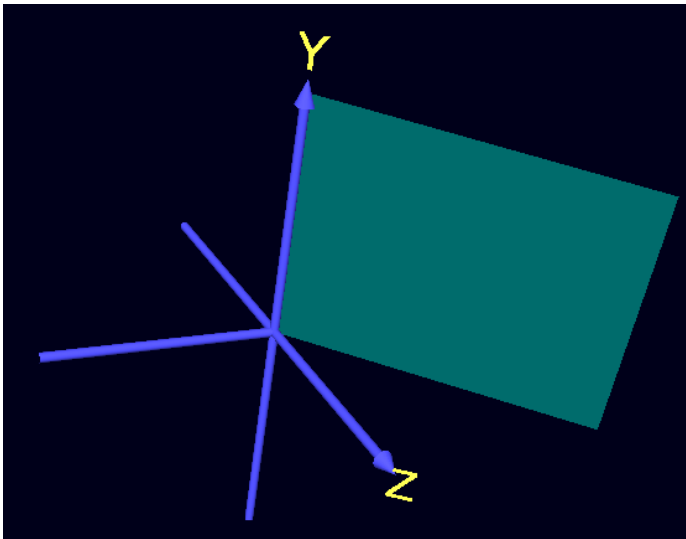
Matriculation Number: U1521567A

File	Description
3DPlane.wrl	3D Plane defined Parametrically
3DTriangle.wrl	3D Triangle defined Parametrically
BilinearSurface.wrl	Bilinear surface defined Parametrically
Sphere.wrl	Sphere object defined Parametrically
Ellipsoid.wrl	Ellipsoid object defined Parametrically
Cone.wrl	Cone object defined Parametrically
Sphere_lowRes.wrl	Sphere Object with Resolution changed to 5
Ellipsoid_lowRes.wrl	Ellipse Object with Resolution changed to 5
Cone_lowRes.wrl	Cone Object with Resolution changed to 5
SolidBox.wrl	Transform a box surface into a solid box object by introducing a new parameter
SolidSphere.wrl	Transform a sphere surface into a solid sphere object by introducing a new parameter
SolidCylinder.wrl	Transform a cylinder surface into a solid cylinder object by introducing a new parameter
SolidCone.wrl	Transform a cone surface into a solid cone object by introducing a new parameter

1.0) Define parametrically in separate files

- 3D plane
- 3D triangle
- bilinear surface
- sphere
- ellipsoid
- cone

3D Plane



Formula:

$$x=u;$$

$$y=v;$$

$$z=1-u-v;$$

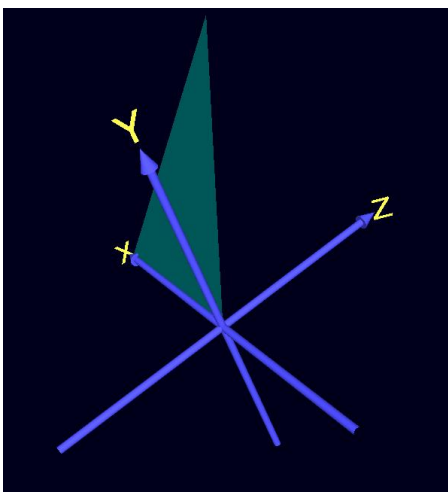
Parameters:

$$[0 \ 1 \ 0 \ 1]$$

Resolution:

$$[75 \ 75]$$

3D Triangle



Formula:

$$x=u;$$

$$y=u*v;$$

$$z=u*v*v;$$

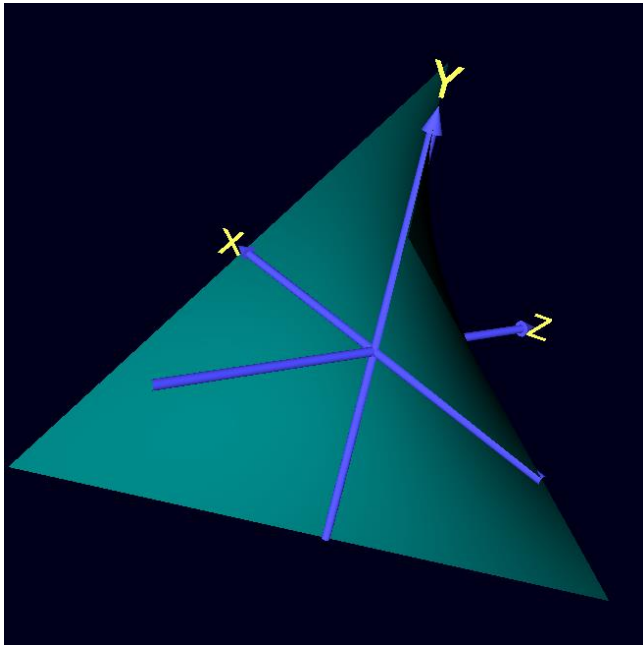
Parameters:

$$[0 \ 1 \ 0 \ 1]$$

Resolution:

$$[75 \ 75]$$

Bilinear surface



Formula:

$$x=1-2*u;$$

$$y=1-2*v;$$

$$z=(1-2*u) * (1-2*v);$$

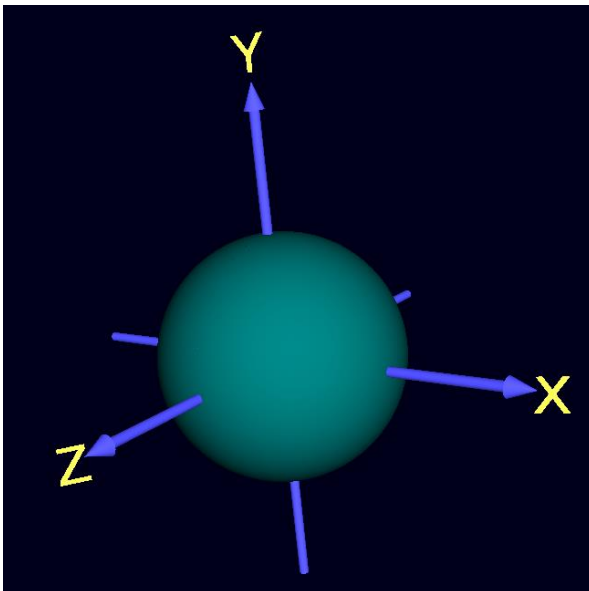
Parameters:

$$[0 \ 1 \ 0 \ 1]$$

Resolution:

$$[75 \ 75]$$

Sphere



Formula:

$$x=0.5*\cos(u*2*pi) * \sin(v*2*pi)$$

$$y=0.5*\sin(u*2*pi);$$

$$z= 0.5*\cos(u*2*pi) * \cos(v*2*pi);"$$

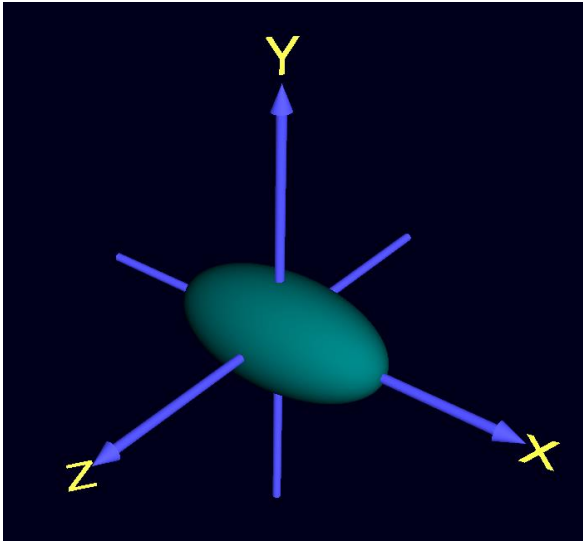
Parameters:

$$[0 \ 1 \ 0 \ 1]$$

Resolution:

$$[75 \ 75]$$

Ellipsoid



Formula:

$$X = 0.5 * \cos(u * 2 * \pi) * \sin(v * 2 * \pi)$$

$$Y = 0.25 * \sin(u * 2 * \pi);$$

$$Z = 0.25 * \cos(u * 2 * \pi) * \cos(v * 2 * \pi)$$

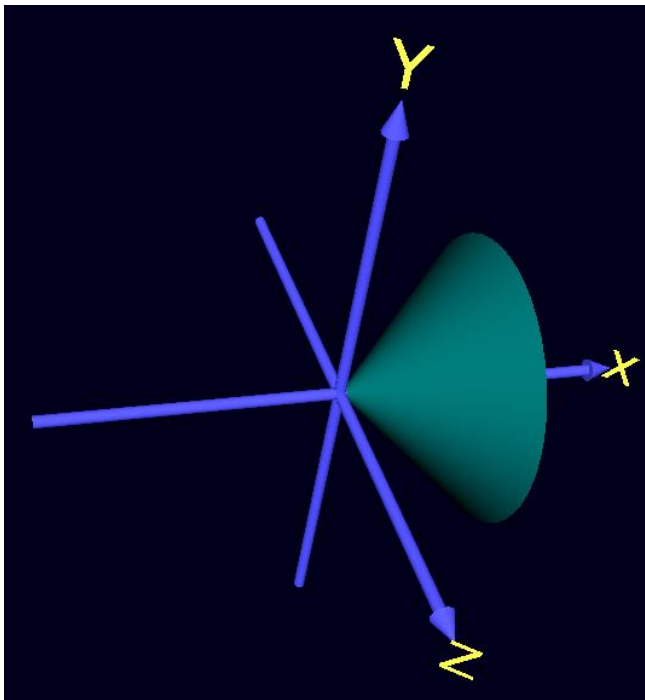
Parameters:

[0 1 0 1]

Resolution:

[75 75]

Cone



Formula:

$$x = 0.5 * u$$

$$y = 0.5 * u * \cos(7 * v)$$

$$z = 0.5 * u * \sin(7 * v)$$

Parameters:

[0 1 0 1]

Resolution:

[75 75]

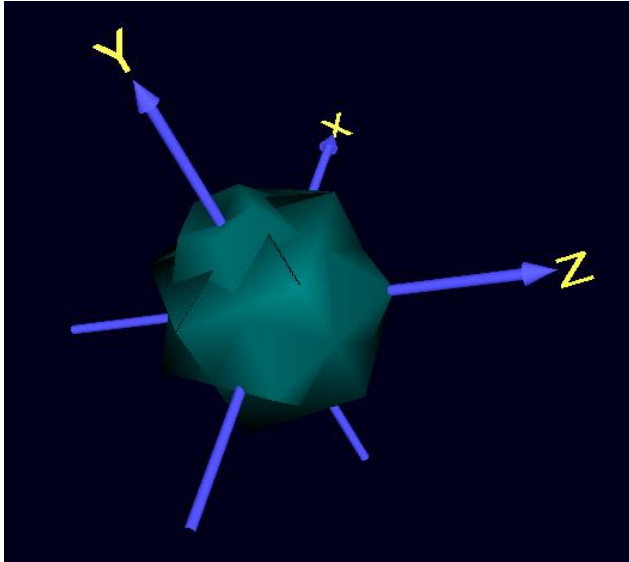
Similar to Lab 2, to create the shapes, we can either have a basic formula and then use the parameters to define the shape or modify multiplying coefficient to u or v inside the formula.

3.0) Explore how the shapes change when their sampling resolution is changed

Changing the resolution does not affect the shape for the following objects:

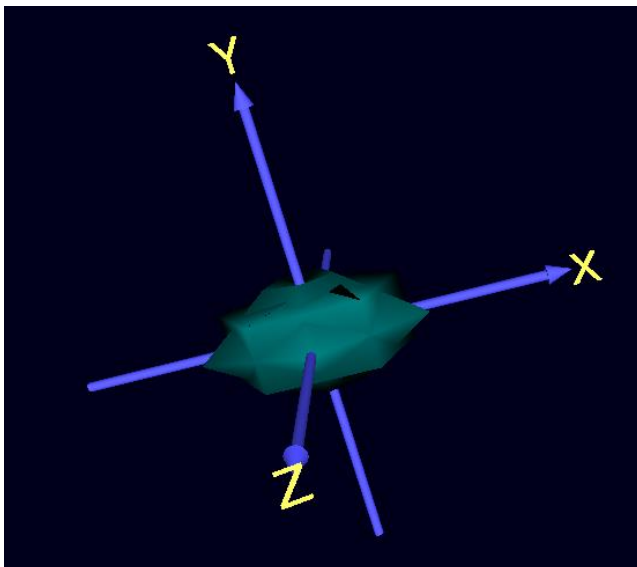
- 3D Plane
- 3D Triangle
- Bilinear Surface

Sphere Low Res



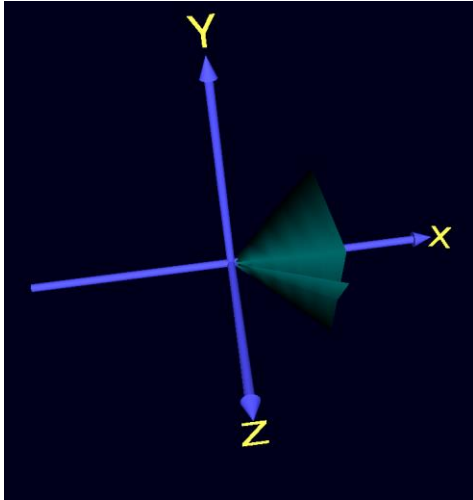
Resolution [5 5]

Ellipsoid Low Res



Resolution [5 5]

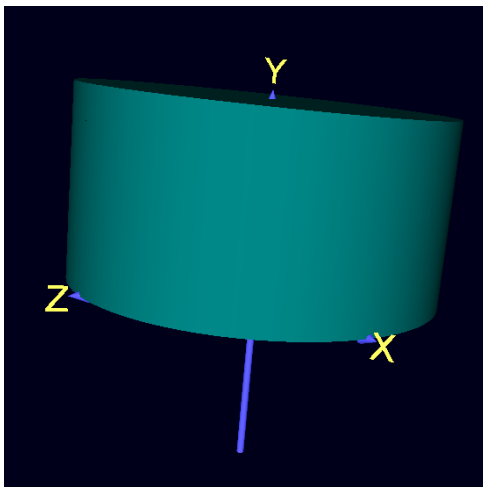
Cone Low Res



Resolution [5 5]

3.) Define parametrically in separate files: solid box, solid sphere, solid cylinder, solid cone.

Solid Object using Translational Sweeping(Cylinder)



$$x = \sin(v*2*pi) * u$$

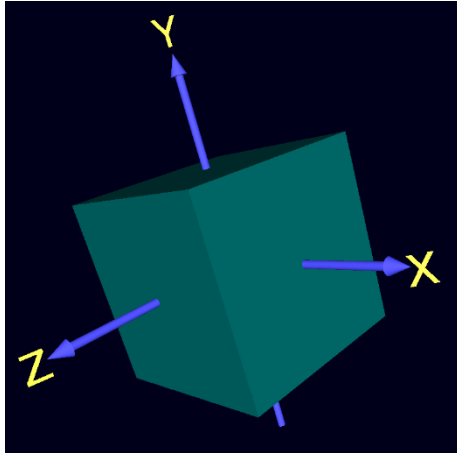
$$y = w$$

$$z = u * \cos(v*2*pi)$$

parameters [0 1 0 1 0 1]

Resolution [75 75]

Solid Box



Introducing parameter “w”

Formula:

$$X=u;$$

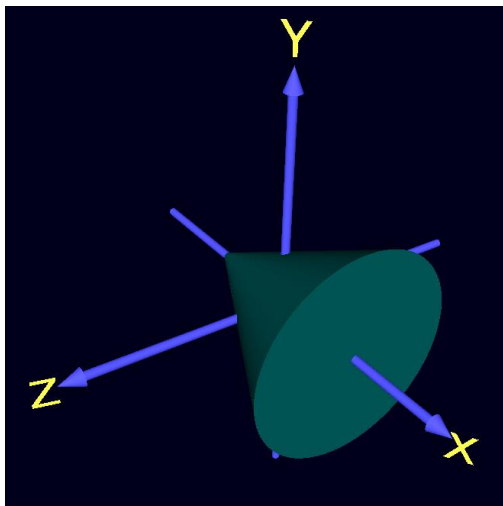
$$Y=v;$$

$$Z=w;$$

Parameters [-0.5 0.5 -0.5 0.5 -0.5 0.5]

Resolution [75 75 75]

Solid Cone



Introducing parameter “w”

Formula:

$$X= u*0.5*(1-w) *\sin(v*2*\pi);$$

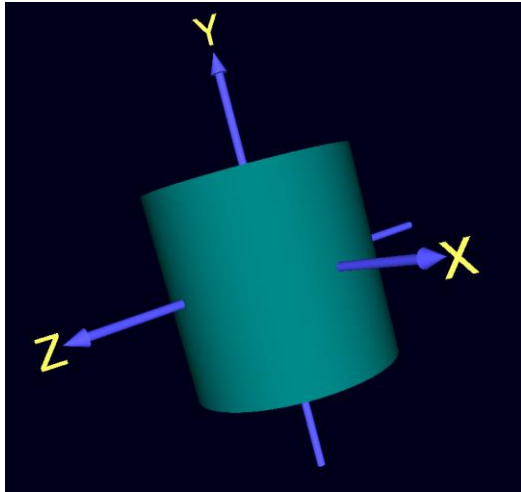
$$Y=w;$$

$$Z= u*0.5*(1-w) *\cos(v*2*\pi);"$$

Parameters [0 1 0 1 0 1]

Resolution [100 100 100]

Solid Cylinder



Introducing parameter “w”

Formula:

$$X = u * \sin(v);$$

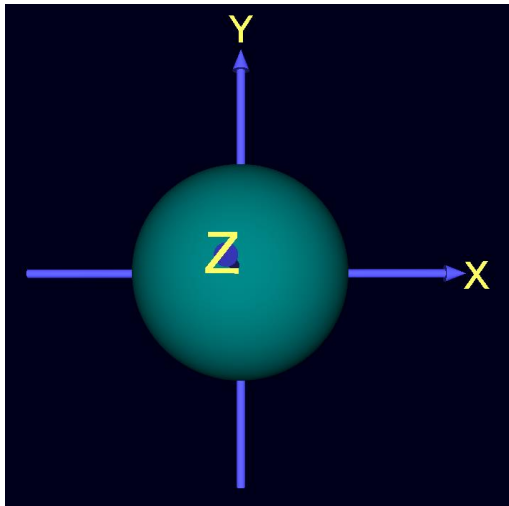
$$Y = w;$$

$$z = u * \cos(v);$$

Parameters [-0.5 0.5 -3.15 3.15 -0.5 0.5]

Resolution [100 100 100]

Solid Sphere



Introducing parameter “w”

Formula:

$$X = 0.5 * w * \cos(u) * \cos(v);$$

$$Y = 0.5 * w * \cos(u) * \sin(v);$$

$$Z = 0.5 * w * \sin(u);$$

parameters [-1.5 1.5 -4 4 0 1]

Resolution [75 75 75]

The third parameter “w” is used to “fill up” the space inside the shapes to form a solid object.