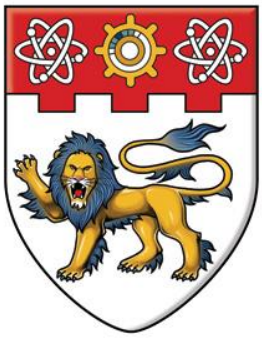


NANYANG TECHNOLOGICAL UNIVERSITY

CZ2003 Computer Graphic

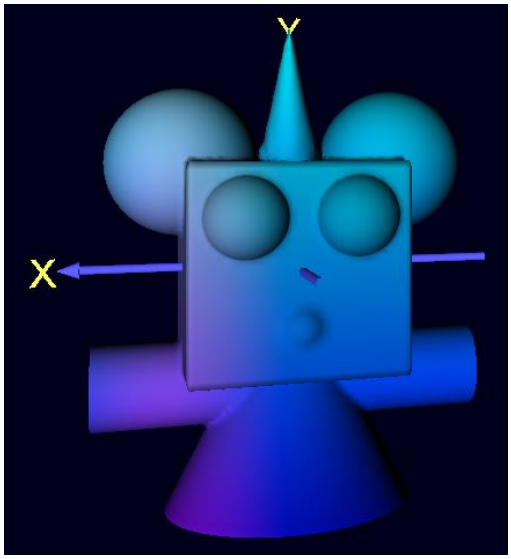
Lab 4

Submitted By: Huang Jian Wei

Matriculation Number: U1521567A

File	Description
JianWeiObject.wrl	CSG solid made up of multiple cones, planes, cylinder and ellipsoid

1.0) Define a complex CSG solid shape using set-theoretic operations in min/max form on at least one plane halfspace, ellipsoid, cylinder, and cone. Using symbols of these operations (| and &) is not allowed. Note that min/max functions can take only two arguments.



Render Time: 2.82 seconds

Plane

Head = min(min(min(min(min(x+0.5,0.5-x), y+0.5),0.5-y), z+0.5),0.5-z);

Ellipsoid

ears_left = 0.35^2-(x+0.5) ^2-(y-0.5) ^2-(z) ^2;

ears_right =0.35^2-(x-0.5) ^2-(y-0.5) ^2-(z) ^2;

eyes_left=0.2^2-(x+0.25) ^2-(y-0.25) ^2-(z+0.45) ^2;

eyes_right=0.2^2-(x-0.25) ^2-(y-0.25) ^2-(z+0.45) ^2;

mouth=0.125^2-(x) ^2-(y+0.25) ^2-(z+0.425) ^2;

Cone

body = min(min(((y/2) ^2-x^2-z^2), -y), y+3);

hat=min(min((((y-1.2)/1) ^2-(z/0.25) ^2-(x/0.2) ^2),1.2-y), y);

Cylinder

arms=min(min(0.2^2-(z) ^2-(y+0.55) ^2, 1.5-x), x+1);

Combining the objects

structure = max (head, body);

structure1 = max (ears_left, structure);

structure2 = max (ears_right, structure1);

structure3= max (eyes_left, structure2);

structure4= max (eyes_right, structure3);

structure5= max (arms, structure4);

structure6= max (hat, structure5);

structure7= max (structure6, mouth);

6 planes are used to form the cube object. The cube object will be merged with a cone object to form the head and body of the figure.

The ears will then be joined with the head and body structure, which will be precede by the pair of eyes.

The cylinder will act as the arm of the figure going thru the body.

Finally, the cone hat is added to complete the figure.

2.) Adjust the tight bounding box (nearly touching the shape) and the optimum resolution for your shape to render it within 5 seconds only.

bboxCenter 0 0 0

bboxSize 1.9 2.3 1.40

resolution [75 75 75]

3.) Define in FMaterial field a variable diffuse color for the whole shape by writing functions r(u,v,w), g(u,v,w), b(u,v,w) where u=x, v=y, and w=z. Make sure the color values are correct (within [0,1]) on the visible surfaces of the shape and the shape rendering is still interactive

```
appearance FAppearance {

material FMaterial {

# Variable color is defined for the CGS solid

diffuseColor "function frep(x1, y1,z1,t){

u=x1*(1) +y1*(0) +z1*(0) +(0);

v=x1*(0) +y1*(1) +z1*(0) +(0);

w=x1*(0) +y1*(0) +z1*(1) +(0);

r=sin(pi*u-+0.25)/2; g=(v+1.25)/2.5; b=sin(w+2.5);

}"
```