CZ2003 Computer Graphics and Visualization

Report for Lab 1

In this report creation of objects using polygons is described with respect to the attached files consisting of hexagon, cube and hypercube with emphasis on the last.

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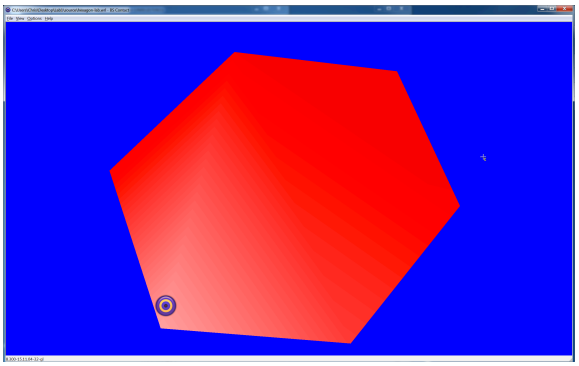
Description of files

In this lab I have created 3 objects consisting of polygons. These objects are: Hexagon, Cube and Hypercube. To see the code for each object see section *Attachments* for the corresponding object.

Hexagon

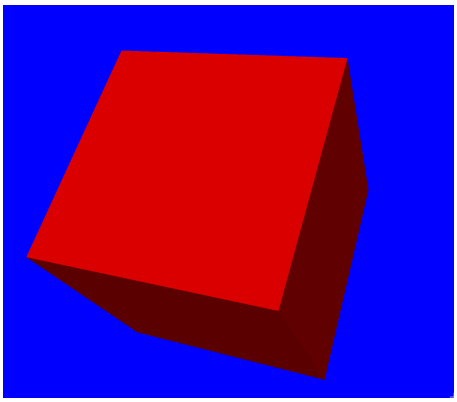
The object has 6 vertices of which 2 are placed on the first axis of the coordinate system. The rest have either positive or negative value of 0.5 on the first axis to create a hexagon. Then the edges are simply set to create the hexagon. Since this hexagon is 2D it may not be visible unless it is viewed from the correct angles since any polygons viewed from the wrong sides are hidden.



A picture of the polygon viewed from a correct angle

Cube

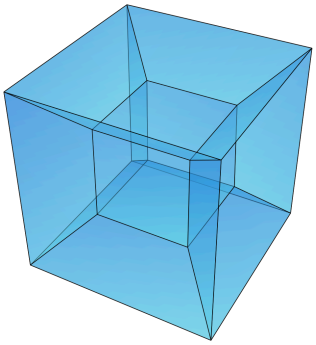
The cube consists of 8 vertices. The edges create a total of 6 square which make up the cube. Since this object should be perceived as solid its polygons must be facing outward such that no matter where the users looks the object will be a interpreted as a cube.



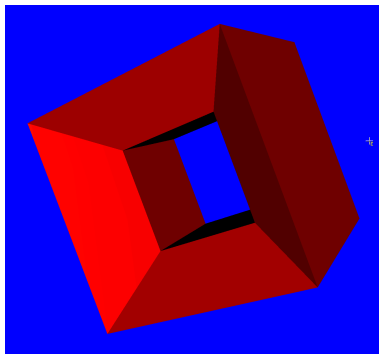
The cube. As said we can see it has three sides.

Hypercube

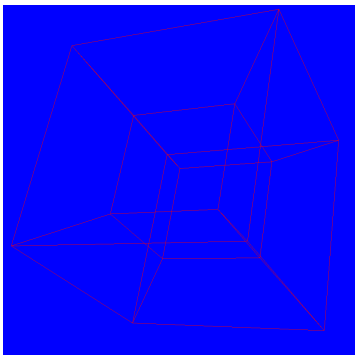
Hypercubes can be illustrated in multiple ways. Since proper hypercube illustrations is beyond the scope of this lab my hypercube is inspired by a Torus by allowing sight on two sides while blocking it on the others. To achieve this 16 vertices were used and 16 square or square-like polygons.



Appearence of a hypercube



My hypercube



Wireframe of my hypercube

Attachments

Onesided-Hexagon.wrl

```
#VRML V2.0 utf8

# Author: Christian Abdelmassih

# Description: One sided hexagon, may have to be rotated to be
# viewed due to viewing angle

Background {skyColor 0 0 1}


Shape {
	appearance Appearance{
		material Material {
			diffuseColor	1 0 0	#r g b
			specularColor	1 1 1
			transparency 0
			shininess 1
			}
		}
	geometry IndexedFaceSet {
		coord Coordinate {
		   point [
				1	0	0	#vertex 0
				0.5	-1	0	#vertex 1
				-0.5	-1	0	#vertex 2
				-1	0	0	#vertex 3
				-0.5	1	0	#vertex 4
				0.5	1	0	#vertex 5
		   ]
		}
		coordIndex [
			#bottom
			 5, 4, 3, 2, 1, 0, -1,
			]

	}
}
```

Cube.wrl

```
#VRML V2.0 utf8

# Author: Christian Abdelmassih
# Description: a cube made up of 6 squares

Background {skyColor 0 0 1}


Shape {
	appearance Appearance {
		material Material {
			diffuseColor	1 0 0	#r g b
			specularColor	1 1 1
			transparency 0
			shininess 1
		}
	}
	geometry IndexedFaceSet {
		coord Coordinate {
		   point [
				# bottom vertices
				1	-1	-1	#vertex 0
				-1	-1	-1	#vertex 1
				-1	1	-1	#vertex 2
				1	1	-1	#vertex 3

				# upper verticess
				1	-1	1	#vertex 4
				-1	-1	1	#vertex 5
				-1	1	1	#vertex 6
				1	1	1	#vertex 7
		   ]
		}
		coordIndex [
			0,  1,  2,  3, -1, # bottom
			7,  6,  5,  4, -1, # top, cannot be 4,5,6,7 due to wrong normalvector
			0,  4,  5,  1, -1, # side 1
			1,  5,  6,  2, -1, #side 2
			2,  6,  7,  3, -1, #side 3
			3,  7,  4,  0, -1, #side 4
		]

	}
}
```

Hypercube.wrl

```
#VRML V2.0 utf8

# Author: Christian Abdelmassih
# Description: a hypercube made up of two cubes making a hole into the inner cube made up
of 16 squares

Background {skyColor 0 0 1}


Shape {
	appearance Appearance{
		material Material {
			diffuseColor	1 0 0	#r g b
			specularColor	1 1 1
			transparency 0
			shininess 1
			}
		}
	geometry IndexedFaceSet {
		coord Coordinate {
```

```
                point [
                # bottom vertices
                1       -1      -1      #vertex 0
                -1      -1      -1      #vertex 1
                -1      1        -1     #vertex 2
                1       1       -1      #vertex 3

                # bottom upper vertices
                0.5     -0.5    -0.5    #vertex 4
                -0.5    -0.5            -0.5    #vertex 5
                -0.5    0.5     -0.5    #vertex 6
                0.5     0.5     -0.5    #vertex 7

                # upper bottom vertices
                0.5     -0.5    0.5     #vertex 8
                -0.5    -0.5            0.5     #vertex 9
                -0.5    0.5     0.5     #vertex 10
                0.5     0.5     0.5     #vertex 11

                # upper verticess
                1       -1      1       #vertex 12
                -1      -1      1       #vertex 13
                -1      1        1      #vertex 14
                1       1       1       #vertex 15
                        ]
                }
        coordIndex [
                0, 1, 2, 3, -1, #bottom
                7, 6, 5, 4, -1, #bottom upper
                0, 4, 5, 1, -1, #bottom side 1
                2, 6, 7, 3, -1, #bottom side 2
                6, 10, 9, 5, -1, # inner side 1
                4, 8, 11, 7, -1, # inner side 2
                0, 12, 8, 4, -1, # outer link 1
                5, 9, 13, 1, -1, # outer link 2
                2, 14, 10, 6, -1, # outer link 3
                7, 11, 15, 3, -1, # outer link 4
                8, 9, 10, 11, -1, #upper bottom
                8, 12, 13, 9, -1, #upper side 1
                10, 14, 15, 11, -1, #upper side 2
                15, 14, 13, 12, -1, #top
                1,13,14,2,-1, #outer side 1
                3,15,12,0,-1, #outer side 2
        ]

    }
}
```