CZ2003 Computer Graphic

Lab 1

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| File	Description
Cube.wrl	3D cube figure with 8 vertices
Hexagon.wrl	3D Hexagon with 12 vertices

1.0) Display a simple polygon mesh as it is illustrated
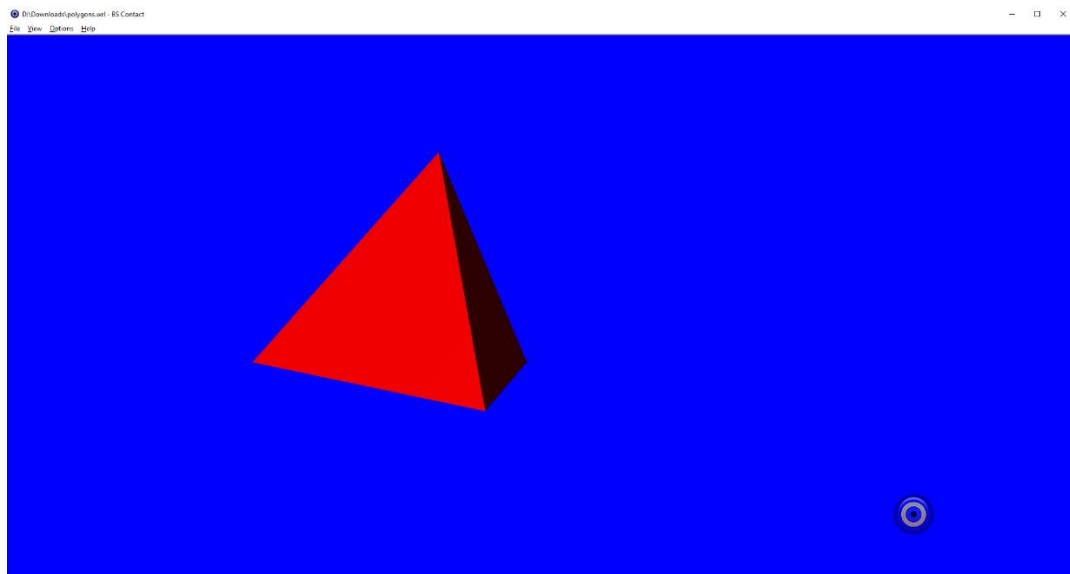
2.0) Explore different Graphics Modes of the VRML browser (Wireframe, Vertices, Flat). Make sure OpenGL is selected in Settings/Renderer when you right-click at the VRML browser window (See Fig. 1b).
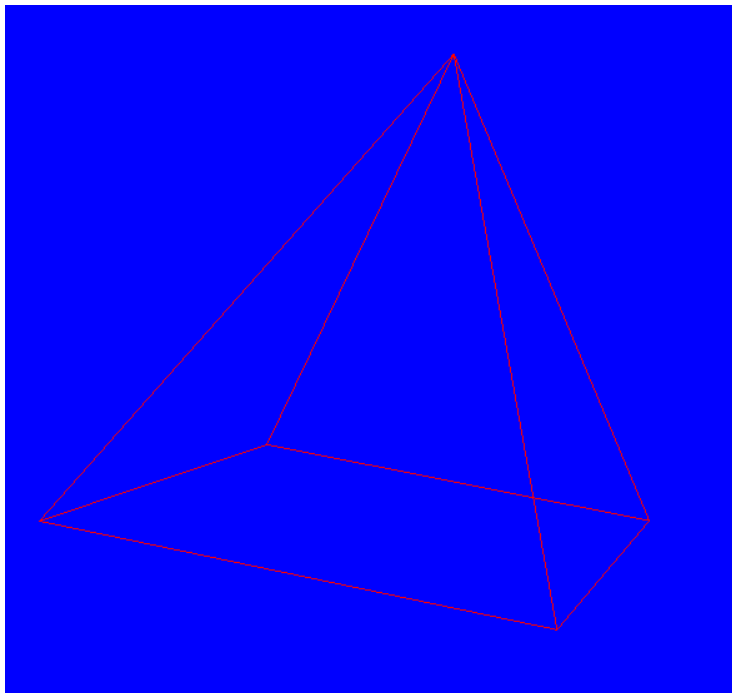
3.0) Examine how the color of the shape defined in diffuseColor field can be changed. Note that the color values must be real numbers between 0 and 1. See what happens if the color values are less than 0 or greater than 1.
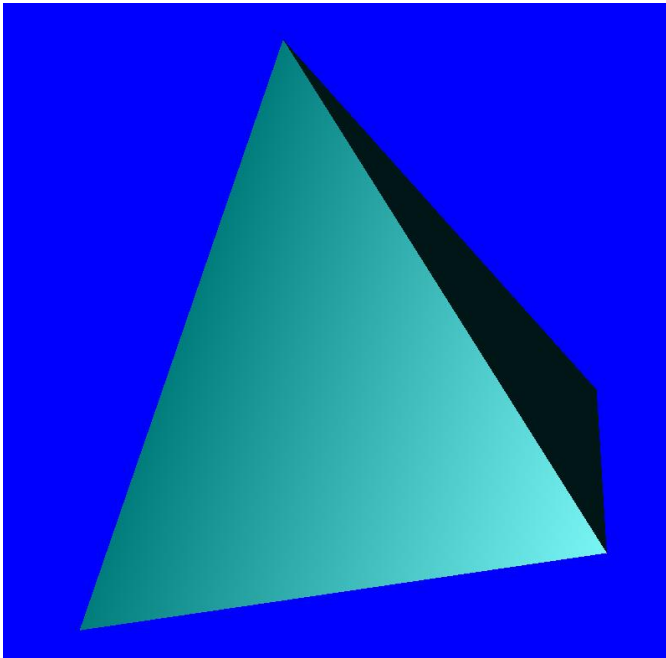
Result: Color of the shape changes according to the value. (R.G.B 0 0.5 0.5)

4.0) Change the displayed polygon mesh (a pyramid) to anything else by adding new vertices and polygons. Make a 2D regular hexagon (six-sided equilateral and equiangular polygon https://en.wikipedia.org/wiki/Hexagon) and a 3D cube.
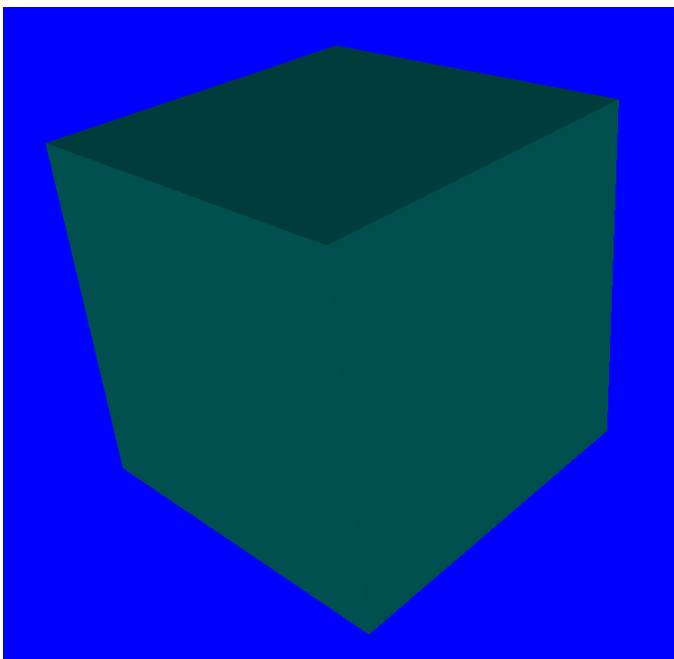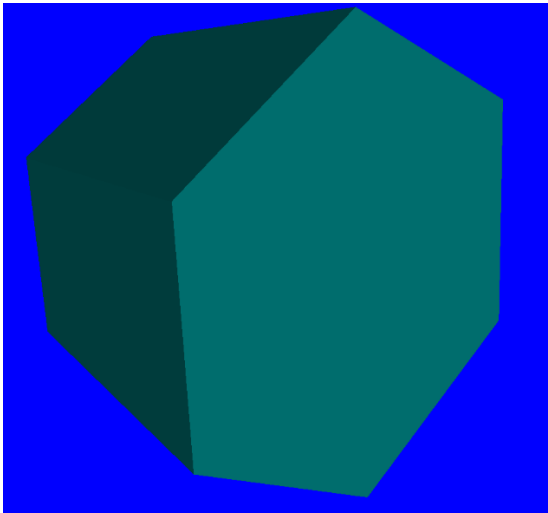
3D Cube

```
#VRML V2.0 utf8
#polygon mesh example: a pyramid

Background {skyColor 0 0 1}


Shape {
    appearance Appearance{
        material Material {
            diffuseColor    0 0.5 0.5    #red=1, green=0, blue=0
            specularColor   1 1 1    #red=1, green=1, blue=1
            transparency 0   # try values between 0 and 1
            shininess 1      # shiny surface, try values between 0 and 1
            }
        }
    geometry IndexedFaceSet {
        coord Coordinate {
                point [
            # bottom vertices
            -1.0  -1.0   1.0,    #vertex 0
             1.0  -1.0   1.0,    #vertex 1
             1.0  -1.0  -1.0,    #vertex 2
            -1.0  -1.0  -1.0,    #vertex 3
            # top vertex
            -1.0   1.0   1.0,    #vertex 4
             1.0   1.0   1.0,    #vertex 5
             1.0   1.0  -1.0,    #vertex 6
            -1.0   1.0  -1.0,    #vertex 7
                ]
            }
        coordIndex [
            #bottom square
             0,   3,   2,   1,   -1,
            #top square
             4,   5,   6,   7,   -1,
            #side 1
             4,   0,   1,   5,   -1,
            #side 2
             7,   6,   2,   3,   -1,
            #side 3
             4,   7,   3,   0,   -1,
            #side 4
             6,   5,   1,   2,   -1
            ]

    }
}
```

Cube requires 8 vertices.

3D Hexagon


```
#polygon mesh example: a hexagon

Background {skyColor 0 0 1}


Shape {
    appearance Appearance{
        material Material {
            diffuseColor    0 0.5 0.5   #red=1, green=0, blue=0
            specularColor   0 0 1   #red=1, green=1, blue=1
            transparency 0   # try values between 0 and 1
            shininess 1      # shiny surface, try values between 0 and 1
        }
    }
    geometry IndexedFaceSet {
        coord Coordinate {
                point [
                # bottom vertices, 6
                0.0    -1.0   0.0,     #vertex 0
                1.0    -1.0   0.0,     #vertex 1
                1.5    -1.0   -1       #vertex 2
                1.0    -1.0   -2,      #vertex 3
                0.0    -1.0   -2,      #vertex 4
               -0.5    -1.0   -1       #vertex 5

                # top vertex, 6
                0.0     1.0   0.0,     #vertex 6
                1.0     1.0   0.0,     #vertex 7
                1.5     1.0   -1       #vertex 8
                1.0     1.0   -2,      #vertex 9
                0.0     1.0   -2,      #vertex 10
               -0.5     1.0   -1       #vertex 11
                ]
            }
        coordIndex [
            #bottom hex
            5, 4, 3, 2,1, 0, -1,
            #top hex
            6, 7, 8, 9, 10, 11, -1,
            #side 1
            0, 1, 7,6,   -1,
            #side 2
            1, 2, 8, 7, -1,
            #side 3
            2, 3, 9, 8, -1,
            #side 4
            3, 4, 10, 9, -1,
            #side 5
            4, 5, 11, 10, -1,
            #side 6
            5, 0, 6, 11, -1,
            ]

    }
}
```

Hexagon requires 12 vertices.

5. Notice how the order of vertices changes the visible side of polygons.

The order of the vertices should follow the right-hand rule e.g. thumb pointing upwards = top surface visible, thumb pointing downwards, order of the vertices follows the rest of the fingers. Incorrect order will not display the surface(s) of the polygons.