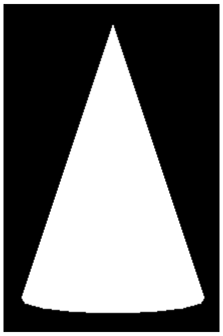
VRML Basics

- The basic elements of VRML files are nodes.
- Every type of node has a set of fields associated with it.
  - Common single-valued field types are:
    - SFNode, SFFloat SFInt32 SFColor, SFVec3f, SFRotation, etc.
  - Common multi-valued field types are:
    - MFColor, MFFloat, MFNode, MFVec3f, MFRotation, etc…
- Nodes need to be able to talk to each other.
  - ROUTEs -- When a field changes in one node, other fields in other nodes are automatically updated.

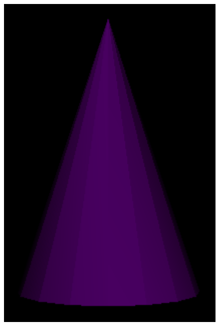
Hello Upside-down Cone -- Shape

```
#VRML V2.0 utf8

Shape {
    geometry Cone {
        height 3.0
        # radius defaults to 1.0
    }
}
```



Hello Upside-down Cone -- Appearance

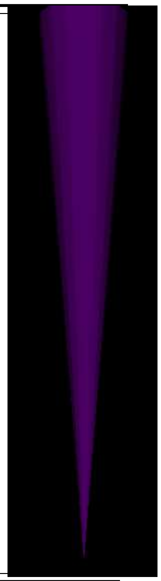
```
#VRML V2.0 utf8

Shape {
    appearance Appearance {
        material Material {
            diffuseColor 0.3 0 0.4
        }
    }
    geometry Cone {
        height 3.0
        # radius defaults to 1.0
    }
}
```



cse591 Spring 98 3

Hello Upside-down Cone -- Flip it over

```
#VRML V2.0 utf8

Transform {
    translation  0.0 1 0.0         # happens third
    scale        0.5 2.0 0.5       # happens first
    rotation     0   0   1   3.141 # happens second
    children [
        Shape {
            appearance Appearance {
                material Material {
                    diffuseColor 0.3 0 0.4
                }
            }

            geometry Cone { height 3.0 }
        }
    ]
}
```

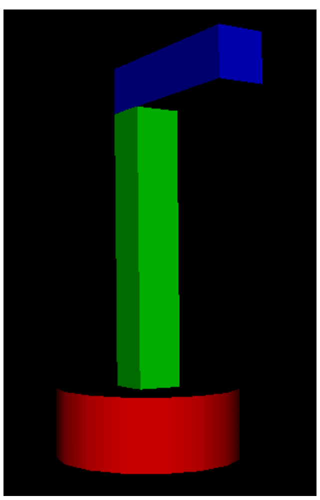


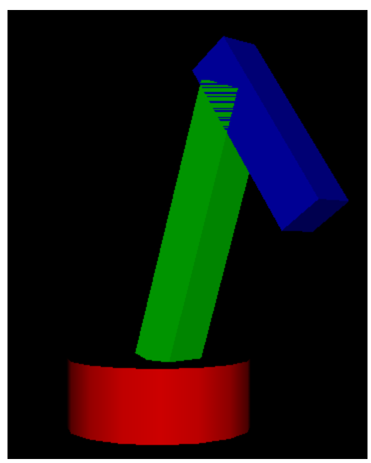
cse591 Spring 98 4

Bouncing Ball -- ROUTEs and Interpolators

```
#VRML V2.0 utf8

DEF ball_ts TimeSensor {
        cycleInterval 2
        loop TRUE
}

DEF ball_pi PositionInterpolator {
        key [0 0.5 1]
        keyValue [0 0 0   0 3.0 0   0 0 0]
}

DEF ball_t Transform {
        translation 0 0 0
        children Shape {
                geometry Sphere {}
        }
}

ROUTE ball_ts.fraction_changed TO ball_pi.set_fraction
ROUTE ball_pi.value_changed    TO ball_t.set_translation
```


Robot Arm Example





The Robot Arm Model -- Base

```
#VRML V2.0 utf8

WorldInfo {
    title "cse591 -- Robot Arm from class"
}

NavigationInfo {
    type "EXAMINE"
}


Group {
    children [
        DEF base Transform {
            translation 0 -1.5 0
            children [
                Shape {
                    appearance Appearance {
                        material Material {
                            diffuseColor 0.8 0 0
                        }
                    }
                    geometry Cylinder {
                        height 0.75
                    }
                }
```


The Robot Arm Model -- Lower Arm

```
DEF lowerArm Transform {
    center 0 -1.875 0
    translation 0 1.875 0
    children [
        Shape {
            appearance Appearance {
                material Material {
                    diffuseColor 0 0.8 0
                }
            }
            geometry Box {
                size 0.5 3 0.5
            }
        }
```

The Robot Arm Model -- Upper Arm

```
                DEF upperArm Transform {
                   center 0 0 -1
                   translation 0 1.75 0.75
                   children [
                       Shape {
                           appearance Appearance {
                               material Material {
                                   diffuseColor 0 0 0.8
                               }
                           }
                           geometry Box {
                               size 0.5 0.5 2
                           }
                       }
                   ]
               }
           ]
       }
   ]
  }
 ]
}
```


Rotating the Base

```
DEF timer TimeSensor {
    cycleInterval 3
    loop TRUE
}

DEF baseOI OrientationInterpolator {
    key [ 0 0.25 0.5 0.75 1 ]
    keyValue [
        0 1 0 0,
        0 1 0 0.3,
        0 1 0 0,
        0 1 0 -0.3,
        0 1 0 0
    ]
}

ROUTE timer.fraction_changed   TO baseOI.set_fraction
ROUTE baseOI.value_changed     TO base.set_rotation
```

Rotating the Lower Arm

```
DEF lowerArmOI OrientationInterpolator {
    key [ 0 0.25 0.5 0.75 1 ]
    keyValue [
        1 0 0 0,
        1 0 0 0.4,
        1 0 0 0,
        1 0 0 -0.4,
        1 0 0 0
    ]
}

ROUTE timer.fraction_changed   TO lowerArmOI.set_fraction
ROUTE lowerArmOI.value_changed TO lowerArm.set_rotation
```


Rotating the Upper Arm

```
DEF upperArmOI OrientationInterpolator {
    key [ 0 0.25 0.5 0.75 1 ]
    keyValue [
        1 0 0 0,
        1 0 0 0.8,
        1 0 0 0.6,
        1 0 0 0.2,
        1 0 0 0
    ]
}

ROUTE timer.fraction_changed   TO upperArmOI.set_fraction
ROUTE upperArmOI.value_changed TO upperArm.set_rotation
```