User Interactivity Nodes

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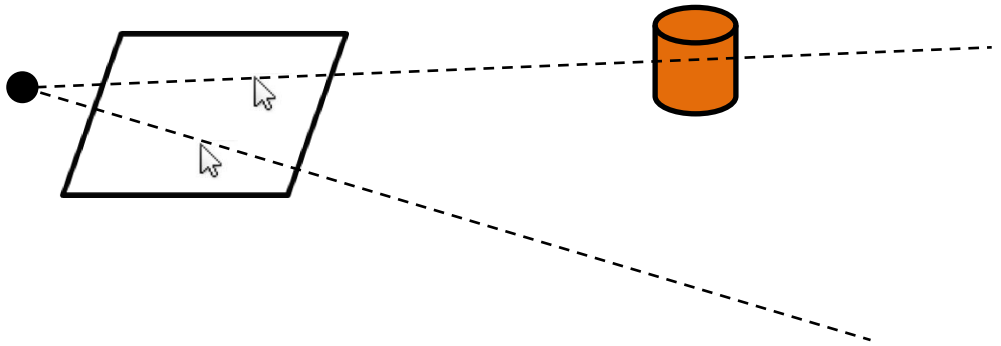
Bearing

- Bearing (*διόπτευση*) λέγεται η νοητή ευθεία που ξεκινάει από το *θεατή* (viewer), περνάει από τον *δείκτη (*pointer) της συσκευής διεπαφής (mouse) και εκτείνεται μέσα στη σκηνή



Pointing Device Sensing

Μεταφραστική σύμβαση:

Ενεργός: πεδίο enabled

Ενεργοποιημένος: πεδίο isActive

Pointing Device Sensing

- Ένας PointingDeviceSensor σχετίζεται με τις γεωμετρίες που εντάσσονται στους κόμβους-αδέρφια του και τους απογόνους τους
- Αν, εντός μιας ιεραρχίας, περισσότεροι του ενός **ενεργοί** PointingDeviceSensors σχετίζονται με μια γεωμετρία, αποκρίνεται αποκλειστικά ο πλησιέστερος
- Αν υπάρχουν άνω του ενός, εξίσου κοντινοί ενεργοί PointingDeviceSensorSensors, αποκρίνονται όλοι ταυτόχρονα
- Αν ένας ανενεργός PointingDeviceSensor γίνει ενεργός (enabled="true") ενώ ήδη εκπληρώνονται οι προϋποθέσεις ενεργοποίησής του (πχ. το κουμπί του mouse είναι ήδη πατημένο), **ΔΕΝ** προξενείται συμβάν απόκρισης.

Pointing Device Sensing

- Όλοι οι **ενεργοί** PointingDeviceSensors ανιχνεύουν συνεχώς τη σχέση του bearing με τη γεωμετρία με την οποία συνδέονται (πεδίο isOver)
- Αν παρεμβάλλεται άλλη γεωμετρία μεταξύ του θεατή και της γεωμετρίας του αισθητήρα, ο αισθητήρας δεν ενεργοποιείται
- Όταν ένας αισθητήρας ενεργοποιηθεί, όλη η σκηνή "κλειδώνει" και κανείς άλλος δε μπορεί να ενεργοποιηθεί.
- Η είσοδος της γεωμετρίας στην ευθεία του bearing ενώ η συσκευή είναι ήδη ενεργοποιημένη δεν επιστρέφει isActive true. Το ίδιο ισχύει αν ο αισθητήρας γίνει enabled ενώ η συσκευή είναι ήδη ενεργοποιημένη.

X3DSensorNode type

Type	accessType	Name	Default	Range	Profile
SFBool	inputOutput	enabled	true		Interactive
SFBool	outputOnly	isActive			Interactive
SFNode	inputOutput	metadata	NULL	[X3DMetadataObject]	Core

Additional field definitions for X3DPointingDeviceSensorNode

Type	accessType	Name	Default	Range	Profile
SFString	inputOutput	description	""		Interactive
SFBool	outputOnly	isOver			Interactive

Additional field definitions for X3DTouchSensorNode

Type	accessType	Name	Default	Range	Profile
SFTime	outputOnly	touchTime			Interactive

X3DSensorNode type (cont.)

Additional field definitions for X3DDragSensorNode

Type	accessType	Name	Default	Range	Profile
SFBool	inputOutput	autoOffset	true		Interactive
Vec3f	outputOnly	trackPoint_changed			Interactive
(node dependent)	inputOutput	offset		(node dependent)	Interactive
(node dependent)	outputOnly	[somevalue]_changed		(node dependent)	Interactive

TouchSensor node

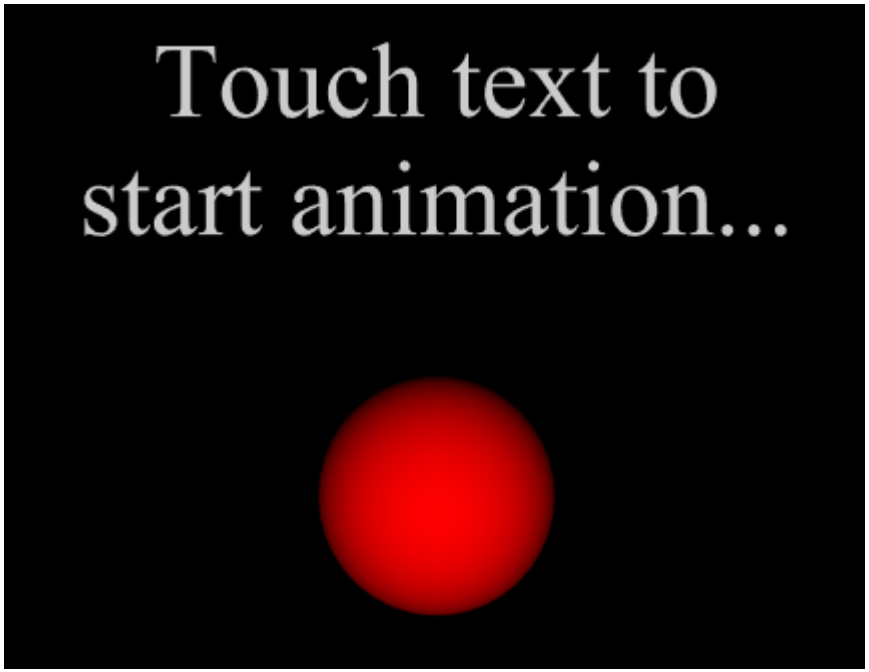
Type	accessType	Name	Default	Range	Profile
SFBool	inputOutput	enabled	true		Interactive
SFString	inputOutput	description	""		Interactive
SFBool	outputOnly	isOver		(node dependent)	Interactive
SFBool	outputOnly	isActive		(node dependent)	Interactive
SFTime	outputOnly	touchTime			Interactive
SFVec3f	outputOnly	hitNormal_changed			Interactive
SFVec3f	outputOnly	hitPoint_changed			Interactive
SFVec2f	outputOnly	hitTexCoord_changed			Interactive
SFNode	inputOutput	metadata	NULL	[X3DMetadataObject]	Core

```
<TouchSensor DEF="MyTouchSensor"
  description="Click to activate" />
```

TouchSensor node

```
<Transform translation='0 2 0'>
    <Shape>  <Text string='"Touch text to" "start animation..."' />  </Shape>
    <TouchSensor DEF='TextTriggerTouchSensor' description='Touch text to start...'/>
</Transform>
<Transform translation='0 -1 0'>
    <Shape>
        <Sphere/>
        <Appearance>
            <Material DEF='SphereMaterial' diffuseColor='1 0 0'/>
        </Appearance>
    </Shape>
</Transform>
<TimeSensor DEF='AnimationClock' cycleInterval='3'/>
<ROUTE fromNode='TextTriggerTouchSensor' fromField='touchTime'
    toNode='AnimationClock'  toField='startTime'/>
<ColorInterpolator DEF='ColorChanger' key='0 0.5 1' keyValue='1 0 0 0 1 0 1 0 0'/>
<ROUTE fromNode='AnimationClock' fromField='fraction_changed'
    toNode='ColorChanger'  toField='set_fraction'/>
<ROUTE fromNode='ColorChanger' fromField='value_changed'
    toNode='SphereMaterial'  toField='diffuseColor'/>
```

TouchSensor node



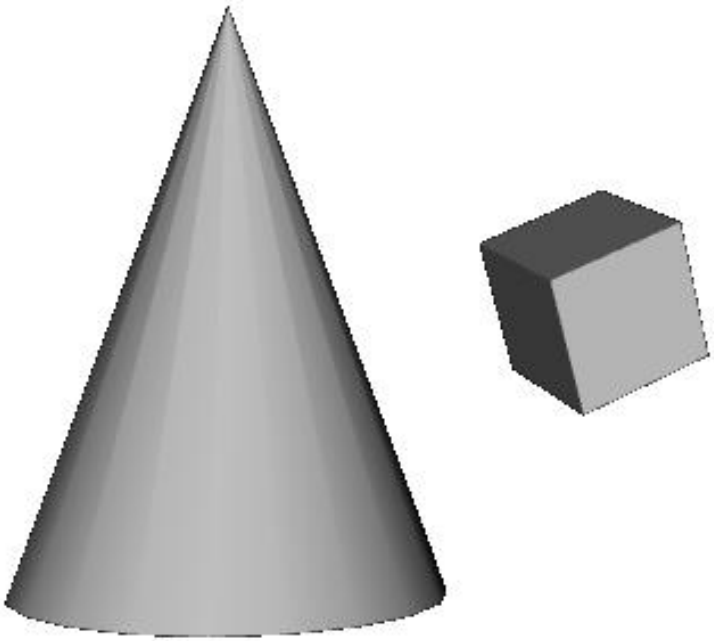
TouchSensor node

- Ο TouchSensor αποστέλλει το touchTime κάθε φορά που ενεργοποιείται από το pointing device
- Τυπικά: το touchTime αποστέλλει τον τρέχοντα χρόνο αμέσως αφού συμβούν διαδοχικά τα:
  - Πεδίο isOver, τιμή true (το bearing τέμνει τη γεωμετρία)
  - Πεδίο isActive, τιμή true (η συσκευή ενεργοποιήθηκε -πχ πατήθηκε το κουμπί του mouse)
  - Πεδίο isActive, τιμή false (η συσκευή απενεργοποιήθηκε -πχ αφέθηκε το κουμπί του mouse)

hitPoint_changed field

```
<Viewpoint position="0 0 20"/>
<Transform scale="1 1 2">
    <TouchSensor DEF="Touch"/>
    <Shape>
        <Cone height="8" bottomRadius="3"/>
    <Appearance> <Material/> </Appearance>
    </Shape>
</Transform>
<Transform translation="5 0 0" rotation="1 1 1 0.6">
    <Transform DEF="Target">
        <Shape><Box/><Appearance><Material/></Appearance></Shape>
    </Transform>
</Transform>
<ROUTE fromNode="Touch" fromField="hitPoint_changed"
    toNode="Target" toField="translation"/>
```

hitPoint_changed field



PlaneSensor node

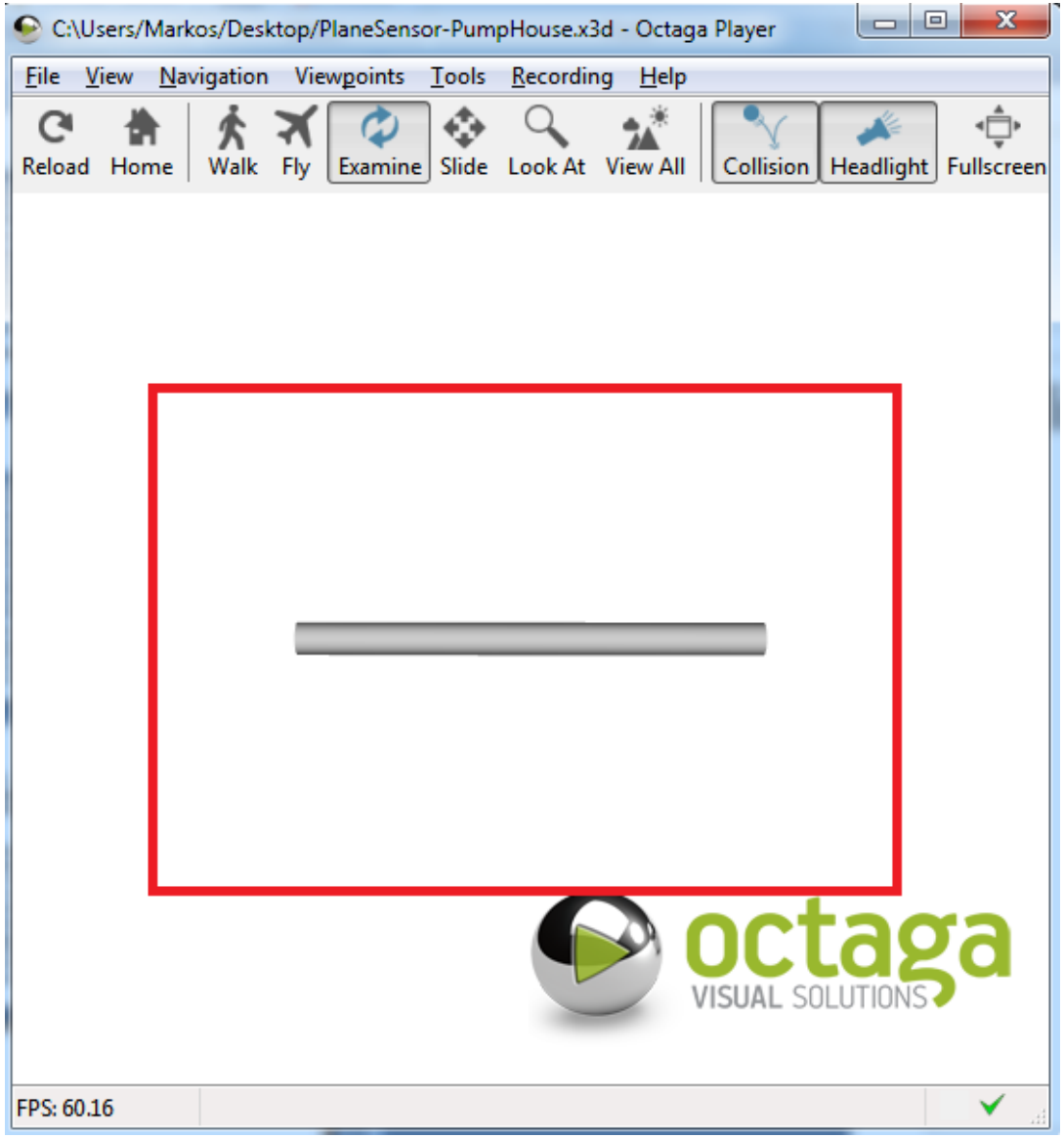
Type	accessType	Name	Default	Range	Profile
SFBool	inputOutput	enabled	true		Interactive
SFString	inputOutput	description	""		Interactive
SFVec2f	inputOutput	minPosition	0 0	(-∞, ∞)	Interactive
SFVec2f	inputOutput	maxPosition	-1 -1	(-∞, ∞)	Interactive
SFVec3f	inputOutput	offset	0 0 0	(-∞, ∞)	Interactive
SFBool	inputOutput	autoOffset	true		Interactive
SFBool	outputOnly	isOver			Interactive
SFBool	outputOnly	isActive			Interactive
SFVec3f	outputOnly	trackpoint_changed			Interactive
SFVec3f	outputOnly	translation_changed			Interactive
SFNode	inputOutput	metadata	NULL	[X3DMetadataObject]	Core

```
<PlaneSensor DEF="MyPlaneSensor"
    description="Adjust Intensity"
    maxPosition="1 0"
    minPosition="-1 0"
    offset="0 0 0" />
```

PlaneSensor node

```
<Scene>
  <Background skyColor='1 1 1'/>
     <PlaneSensor DEF='MoveSensor'
                  description='click and drag to move cylinder'
                   minPosition='-0.5 -1' maxPosition='0.5 1'/>
     <Transform DEF='CylinderGroup' rotation='0 0 1 1.57'>
      <Shape>
       <Appearance> <Material/> </Appearance>
       <Cylinder radius='.07'/>
      </Shape>
     </Transform>
     <ROUTE fromField='translation_changed'
        fromNode='MoveSensor' toField='translation'
        toNode='CylinderGroup'/>
 </Scene>
```

PlaneSensor node



CylinderSensor node

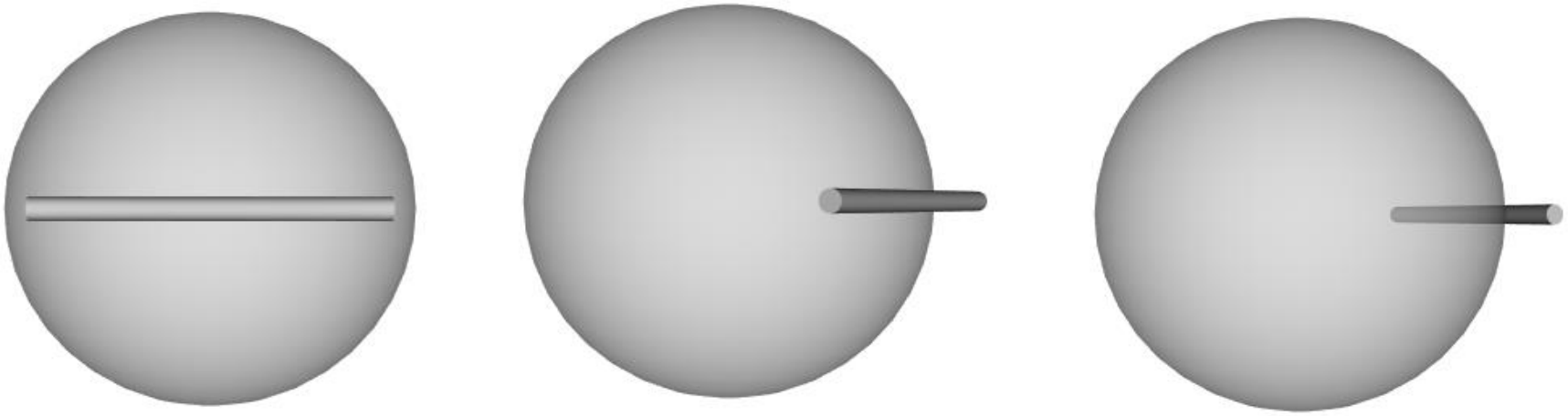
Type	accessType	Name	Default	Range	Profile
SFBool	inputOutput	enabled	true		Interactive
SFString	inputOutput	description	""		Interactive
SFFloat	inputOutput	minAngle	0	(-2π, 2π)	Interactive
SFFloat	inputOutput	maxAngle	-1	(-2π, 2π)	Interactive
SFFloat	inputOutput	diskAngle	π/12	[0, π/2)	Interactive
SFFloat	inputOutput	offset	0	(-∞, ∞)	Interactive
SFBool	inputOutput	autoOffset	true		Interactive
SFBool	outputOnly	isOver			Interactive
SFBool	outputOnly	isActive			Interactive
SFVec3f	outputOnly	trackPoint_changed			Interactive
SFRotation	outputOnly	rotation_changed			Interactive
SFNode	inputOutput	metadata	NULL	[X3DMetadataObject]	Core

```
<CylinderSensor DEF="MyCylinderSensor"
    diskAngle="0"
    enabled="true"
    maxAngle="1.57"
    minAngle="-1.57"
    description="Click and drag to rotate view" />
```

CylinderSensor node

```
<Group>
    <CylinderSensor DEF='MySensor' description='click and drag to move cylinder' />
     <Shape>
    <Sphere radius="1.4"/>
     <Appearance>
            <Material transparency="0.3"/>
    </Appearance></Shape></Group>
<Transform DEF='SampleCylinder' translation="0 0 1.4" center="0 0 -1.4">
    <Transform rotation='0 0 1 1.57'>
            <Shape>
                    <Appearance> <Material/> </Appearance> <Cylinder radius='.07'/>
            </Shape>
</Transform> </Transform>
<ROUTE fromField='rotation_changed' fromNode='MySensor' toField='rotation'
    toNode='SampleCylinder'/>
```

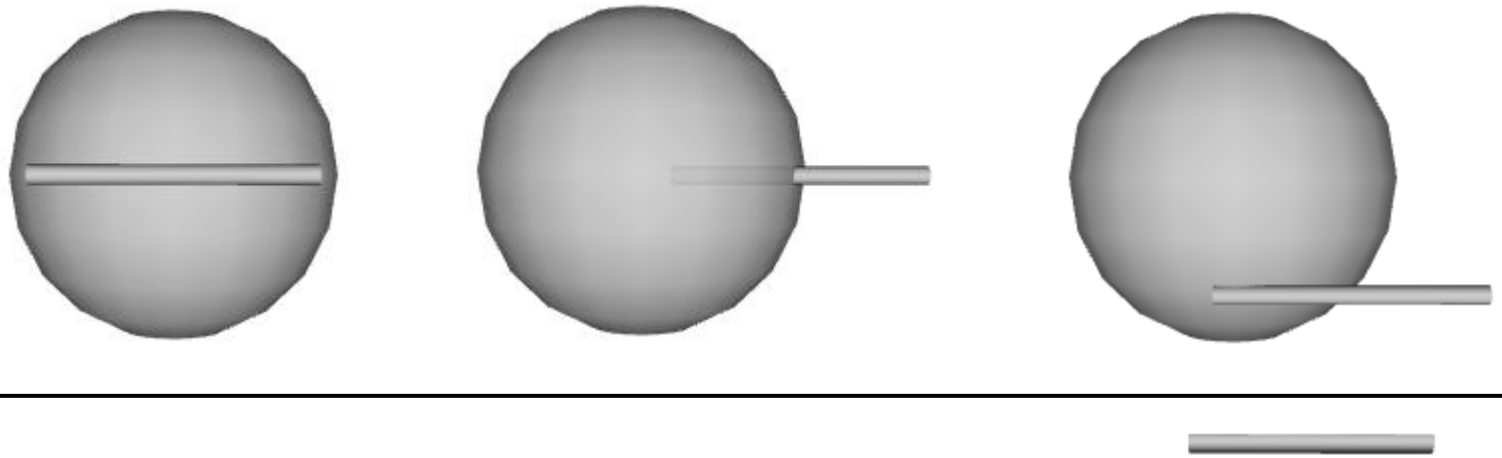
CylinderSensor node



trackPoint_changed field

```
<Group>
    <CylinderSensor DEF='MySensor' description='click and drag to move cylinder' />
     <Shape>
    <Sphere radius="1.4"/>
     <Appearance>
            <Material transparency="0.3"/>
    </Appearance></Shape></Group>
<Transform DEF='SampleCylinder' translation="0 0 1.4" center="0 0 -1.4">
    <Transform rotation='0 0 1 1.57'>
            <Shape>
                    <Appearance> <Material/> </Appearance> <Cylinder
    radius='.07'/>
            </Shape>
</Transform> </Transform>
<ROUTE fromField='trackPoint_changed' fromNode='MySensor' toField='translation'
    toNode='SampleCylinder'/>
```

trackPoint_changed field



SphereSensor node

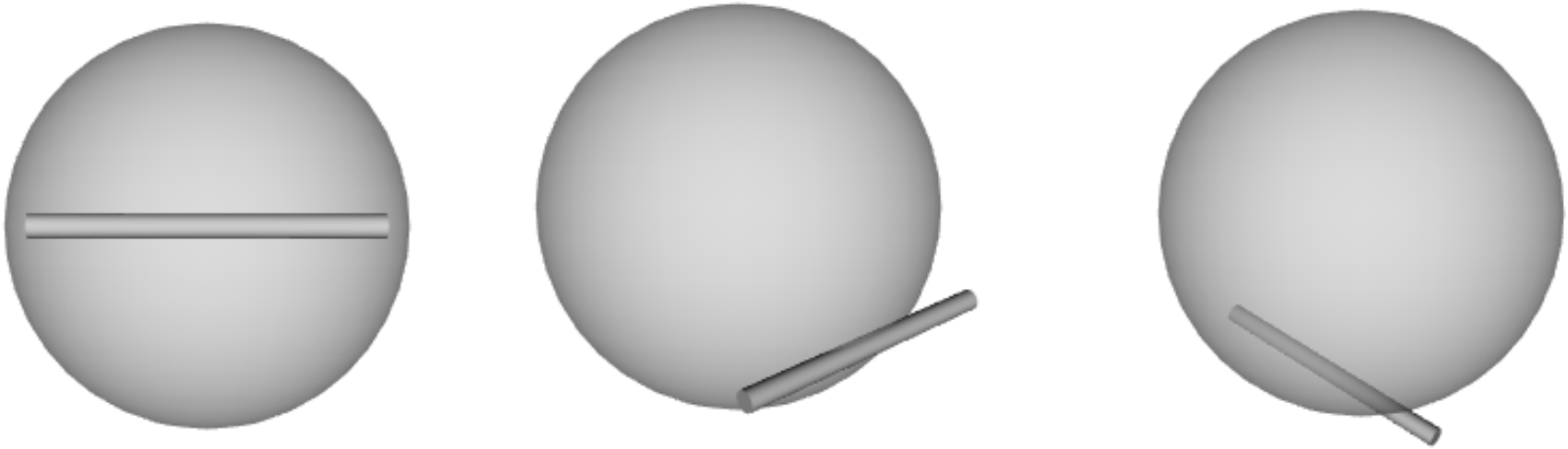
Type	accessType	Name	Default	Range	Profile
SFBool	inputOutput	enabled	true		Interactive
SFString	inputOutput	description	""		Interactive
SFBool	inputOutput	autoOffset	true		Interactive
SFRotation	inputOutput	offset	0 1 0 0	[-1, 1] (-∞, ∞)	Interactive
SFBool	outputOnly	isOver			Interactive
SFBool	outputOnly	isActive			Interactive
SFVec3f	outputOnly	trackPoint_changed			Interactive
SFRotation	outputOnly	rotation_changed			Interactive
SFNode	inputOutput	metadata	NULL	[X3DMetadataObject]	Core

```
<SphereSensor DEF=
        "MySphereSensor"
   description=
        "Click and drag to view" />
```

SphereSensor node

```
<Group>
    <SphereSensor DEF='MySensor' description='click and drag to move cylinder' />
     <Shape>
    <Sphere radius="1.4"/>
     <Appearance>
            <Material transparency="0.3"/>
    </Appearance></Shape></Group>
<Transform DEF='SampleSphere' translation="0 0 1.4" center="0 0 -1.4">
    <Transform rotation='0 0 1 1.57'>
            <Shape>
                    <Appearance> <Material/> </Appearance> <Cylinder radius='.07'/>
            </Shape>
</Transform> </Transform>
<ROUTE fromField='rotation_changed' fromNode='MySensor' toField='rotation'
    toNode='SampleSphere'/>
```

SphereSensor node



KeySensor node

Type	accessType	Name	Default	Range	Profile
SFBool	inputOutput	enabled	true		Interactive
SFInt32	outputOnly	actionKeyPress			Interactive
SFInt32	outputOnly	actionKeyRelease			Interactive
SFString	inputOutput	keyPress			Interactive
SFString	outputOnly	keyRelease			Interactive
SFBool	outputOnly	shiftKey			Interactive
SFBool	outputOnly	controlKey			Interactive
SFBool	outputOnly	altKey			Interactive
SFBool	outputOnly	isActive			Interactive
SFNode	inputOutput	metadata	NULL	[X3DMetadataObject]	Core

```
<KeySensor DEF="MyKeySensor"
    enabled="false" />
```

actionKeyPress/Release values

Key	Value	Interaction Default
F1-F12	1-12	
Home	13	First viewpoint
End	14	Last viewpoint
PageUp	15	Prior viewpoint
PageDown	16	Next viewpoint
Arrow up	17	Cursor up
Arrow down	18	Cursor down
Arrow left	19	Cursor left
Arrow right	20	Cursor right

KeySensor node

```
<KeySensor DEF="TextTriggerTouchSensor"/>
<Shape>
    <Sphere/>
    <Appearance>
        <Material DEF='SphereMaterial' diffuseColor='0.5 0.5 0.5'/>
    </Appearance>
</Shape>
<TimeSensor DEF='AnimationClock' cycleInterval='6' loop="true"
        enabled="false"/>
<ROUTE fromNode='TextTriggerTouchSensor' fromField= 'isActive'
        toNode='AnimationClock' toField='enabled'/>
<ColorInterpolator DEF='ColorChanger' key='0 0.5 1' keyValue='1 1 1 0 0 0 1 1
        1'/>
<ROUTE fromNode='AnimationClock' fromField='fraction_changed'
        toNode='ColorChanger' toField='set_fraction'/>
<ROUTE fromNode='ColorChanger' fromField='value_changed'
        toNode='SphereMaterial' toField='diffuseColor'/>
```

KeySensor node

```
<KeySensor DEF="TextTriggerTouchSensor"/>
<Shape>
    <Sphere/>
    <Appearance>
        <Material DEF='SphereMaterial' diffuseColor='1 1 1'/>
    </Appearance>
</Shape>
<TimeSensor DEF='AnimationClock' cycleInterval='6' loop="true"
        enabled="false"/>
<ROUTE fromNode='TextTriggerTouchSensor' fromField='shiftKey'
        toNode='AnimationClock' toField='enabled'/>
<ColorInterpolator DEF='ColorChanger' key='0 0.5 1' keyValue='1 1 1 0 0 0 1 1
        1'/>
<ROUTE fromNode='AnimationClock' fromField='fraction_changed'
        toNode='ColorChanger' toField='set_fraction'/>
<ROUTE fromNode='ColorChanger' fromField='value_changed'
        toNode='SphereMaterial' toField='diffuseColor'/>
```

StringSensor node

Type	accessType	Name	Default	Range	Profile
SFBool	**inputOutput**	**enabled**	**true**		**Interactive**
SFBool	inputOutput	deletionAllowed	true		Interactive
SFString	outputOnly	enteredText			Interactive
SFInt32	outputOnly	finalText			Interactive
SFNode	inputOutput	metadata	NULL	[X3DMetadataObject]	Core

```
<KeySensor DEF="MyStringSensor"
   deletionAllowed="true" />
```

StringSensor node

```
<Shape>
   <Text DEF="ShowText" string="Replace This"/>
</Shape>
<StringSensor DEF="WriteText" enabled="true"/>
<Script DEF='Converter' url='"converter.js"'>
        <field accessType='inputOnly' name='SFString_MFString'
        type='SFString'/>
        <field accessType='outputOnly' name='MFString_out'
        type='MFString'/>
</Script>
<ROUTE fromNode="WriteText" fromField="enteredText"
   toNode="Converter"       toField="SFString_MFString"/>
<ROUTE fromNode="Converter" fromField="MFString_out"
        toNode="ShowText" toField="string"/>
```