

## Appendix 1: Questionnaire for investigation of user requirements for 3D GIS among 15 producers of GIS and 3D CAD urban data

**Table 1: Current status: 2D, 2.5D, 3D**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Orientation	2	2	2	2	2	2	2	2	2	2	2,3	2	2,3	1,2	3
Stored data	1,2 ,3	1,2 ,3	1,2	1,2	1,2	1,2 ,3	1	1,2 ,3	2	1,2	2	2	1,2	1,2	1
Used data	1,2 ,3	1,2 ,3	1,2	1,2	1,2	1,2 ,3	1	1,2 ,3	1,2	1,2	1	1	1,2	1,2	1
Output	1,2 ,3	1,2 ,3	1,2	1	1	1,2 ,3	1	1,2 ,3	1	1	2	2	1	1	1
Data type	1,2 ,3	1,2 ,3	1,2 ,3	1,2 ,3	1,2 ,3	1	1,2	1,2	1,2 ,3	1,2, 3	1,2, 3	1,2, 3	1,2, 3	1,2, 3	1
Software: storage	1,2 ,3	1	1,2 ,3	1	1,2	2	1,2	1,3	1,2	1,2	1,2	1,2	1,2	1,2	2
Software: display	1,2	1,4	1,2 ,4	1	2	2,4	1,2	1	1,2	1,2	1	1,4	2,4	1,4	2

Orientation: 1-Urban areas, 2-combined (urban + something else), 3-others

Geometry: stored, used data, output: 1-2D, 2-2.5D, 3-3D

Data type: 1-geometry, 2-attributes, 3-relationships

Software for data storage: 1-GIS, 2-CAD, 3-DBMS, 4-VR

**Table 2: Analysis in 2D and 2.5D**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Metric	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
Positional	✓	-	✓	-	✓	-	-	✓	✓	✓	✓	-	✓	-	-
Network	✓	-	✓	-	✓	-	-	✓	-	-	-	✓	-	-	-
Analysis															
Proximity	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	-	-	-	-
Relationships	✓	✓	✓	-	✓	-	-	-	✓	✓	-	-	-	-	-
Analysis															
Visibility	✓	-	-	-	-	✓	-	✓	-	-	✓	✓	-	-	-
Semantic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
Mixed	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ yes, -no

**Table 3: Objects of interest: 2D, 2.5D**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Buildings	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	✓	-	✓	✓	-	✓	✓	✓	✓	✓	✓	-	-	✓	✓
Constructions															
Streets	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
Paths	-	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	-	✓	✓	-
Parks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
Utilities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	-
Telecommunications	✓	✓	-	✓	-	✓	✓	✓	✓	✓	✓	-	-	✓	-
Vegetation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ yes, -no

**Table 4: Resolution: 2D**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Buildings	1,6,7	1,9	1,5	1,5	1	r	1,2,5,6,8	1	1,5	1,5	1	1	1	1	1
Streets	1,2	1,2	1,2	1,2,3	1,2,3	1	1,2,3	2	2	2	2	2	2	2	2
Paths (min width)	0.2	in	r	In	-	r	-	-	-	R	r	in	r	In	-
Parks (min area)	0.6	in	0.5	In	0,5	r	-	-	-	R	r	in	r	In	-
Utilities (min area)	0.6	in	r	In	in	r	-	-	-	R	r	in	r	In	-
Telecommunications (min area)	0.6	-	-	-	-	r	-	-	-	-	-	in	-	In	-

Buildings: 1-footprints, 2-roofs, 3-roof facets, 4-chimneys, 5-floors, 6-rooms, 7-room elements, 8-facades, 9-height

Streets: 1-pedestrian areas, 2-car tracks, 3-gardens

r – on request; in – instructions

**Table 5: Visualisation: 3D preferences**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Dimensions	3	1	1	3	3	3	3	1,2,3	3	3	1,2,3	2	1	1	1
Screens	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Methods	1,3	1	1,2,3	1,2	1	1,2,3	1,3	1,2	1	1	1	1,2	1,2	1	1
Photo texture	✓	✓	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Texture instead of geometry	✓	✓	-	-	✓	✓	-	✓	✓	✓	-	-	✓	✓	✓
Sources	1,2,3	1,2,3	-	-	2	1,2,3	1,3	1,2,3	1	1	1,2	1	1,2,3	1	1
Software Different resolution	1	2,3	4	5	1	1,5	-	1,5	1	1	-	1,5	1	1	-

Preferable dimensions: 1-2D, 2-3D, 3-both

Screen spiting with several views: ✓ yes, -no

Methods for geometry display: 1-frame, 2-shading, 3-photo texture

Utilisation of photo texture: ✓ yes, -no

Available source images for photo textures : 1-aerial, 2-terrestrial, 3-conventional camera

Known software for texture mapping: 1-3D Studio, 2-VRML, 3-OpenGL, 4-ArcView, 5-Others

Possibility to visualise geometry with texture: ✓ yes, -no

Necessity of different resolution: ✓ yes, -no

**Table 6: Interaction: 2D, 2.5D**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Elements	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3	3,4	1,2,4	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3	1,2
Updating	1,2	1,2,3	1	2,3	1	3	2,3	1,2	2,3	2	2	2	2,3	1,2	2,3
Means for manipulation	1,2	1,2	1	1	1	1	1,2	1	1	1	1,2	1	1,2	1,2	1
Preferable environment	1	1	1	1	1	1,2	1	1	1	1	1,3	1	2,3	1	1

Mostly manipulated elements: 1-points, 2-lines, 3-faces, 4-bodies

Current manner of updating: 1-automatic, 2-semiautomatic, 3-manual

b

Means for manipulation: 1-mouse, 2-keyboard, 3-other (what)

Preferable visualisation methods for manipulation: 1-wire frame, 2-shaded, 3-textured

**Table 7: Symbolisation: 3D**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Geometric domain	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thematic domain	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
Geodetic network	✓	✓	-	r	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
Utilities	✓	✓	-	r	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
Transport network	✓	✓	-	r	✓	✓	-	✓	✓	✓	-	-	✓	✓	✓
Information signs	✓	✓	-	r	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓
Signs on public buildings	✓	✓	-	r	✓	✓	-	✓	✓	✓	-	✓	✓	✓	✓
Others	i	-	-	r	✓	✓	-	✓	✓	✓	-	✓	✓	r	✓

✓ yes, - no, r- on request, i -instructions

d

## Appendix 2: An approach to display ID of objects in VR browsers

1. An TOUCH PROTO node to visualise ID's of objects on a billboard. The ID is visualised when the cursor is on an object. Two boxes on the snapshot are meant for objects. The TOUCH node changes the image with the ID of the shape according to the ID of the object.

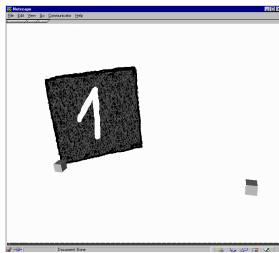


Figure 1: A snapshot of the PROTO TOUCH node in action

```
#VRML V2.0 utf8
#98-99
#S.Zlatanova
#identification of objects

PROTO TOUCH [
  field      SFInt32      nodeID 0
  eventOut   MFString     string_changed
]
{
  DEF SENS TouchSensor {}
  #Script
  DEF NODE Script {
    url "javascript:
      function set_boolean (bool)
      {
        if ((bool == true)&&(nodeID == 1))
          string_changed [0] = '1.jpg';

        if ((bool == true)&&(nodeID == 2))
          string_changed [0] = '2.jpg';

        if ((bool == false)|| (nodeID == 0))
          string_changed [0] = 'x.jpg';

      }
    "
    eventIn SFBool set_boolean
    eventOut MFString string_changed IS string_changed
    field SFInt32 nodeID IS nodeID
  }
  ROUTE SENS.isOver TO NODE.set_boolean
}
```

```

}#TOUCH

Group {
  children [
    DEF Box1 TOUCH {
      nodeID 1
    }
  ]
  Shape {
    appearance Appearance {
      material Material {}
    }
    geometry Box {
      size 0.1, 0.1, 0.1
    }
  ]
}

Transform {
  translation 2 0 0
  children [
    DEF Box2 TOUCH {
      nodeID 2
    }
  ]
  Shape {
    appearance Appearance {
      material Material {}
    }
    geometry Box {
      size 0.1, 0.1, 0.1
    }
  ]
}

Billboard {
  children[
    Shape {
      appearance Appearance {
        material Material {}
        texture DEF TEXT ImageTexture {}
      }
      geometry IndexedFaceSet {
        coord Coordinate {
          point[
            0 0 0,
            1 0 0,
            1 1 0,
            0 1 0,
          ]
        }
        coordIndex [0,1,2,3,]
      }
    }
  ]
  axisOfRotation 0.0 1.0 0.0
}

#changing texture
ROUTE Box1.string_changed TO TEXT.set_url

```

f

```
ROUTE Box2.string_changed TO TEXT.set_url
```

**2. Display of ID's without the designed PROTO node (text shapes are used instead of billboards).** The corresponding lines needed for the same operation are given in a bolt font in both variants.

```
#VRML V2.0 utf8
#98-99
#S. Zlatanova
#identification of objects
Group{
  children[
    Transform {
      children[
DEF Box1 TouchSensor {}
      Shape {
        appearance Appearance {
          material Material {}
        }
        geometry Box {
          size 0.1, 0.1, 0.1}
      }
    ]}

  Transform {
    translation 3 0 0
    children[
DEF Box2 TouchSensor {}
    Shape {
      appearance Appearance {
        material Material {
          diffuseColor 0.60 0.20 0.30
        }
      }
      geometry Box {
        size 0.1, 0.1, 0.1}
    }
  ]}

  Shape {
    appearance Appearance {
      material Material {}
    }
    geometry DEF TEXT Text {
      length [1,6]}
  }
#Script
DEF Node1 Script {
  url "javascript:
    function set_boolean (bool)
    {
      if (bool == true)
        string_changed [0] = '21';
      if (bool == false)
        string_changed [0] = ' ';
    }
  "

```

```

    eventIn SFBool set_boolean
    eventOut MFString string_changed
}
DEF Node2 Script {
    url "javascript:
        function set_boolean (bool)
        {
            if (bool == true)
                string_changed [0] = '22';
            if (bool == false)
                string_changed [0] = ' ';
        }

    "
    eventIn SFBool set_boolean
    eventOut MFString string_changed
}

]
}
#changing text
ROUTE Box1.isOver TO Node1.set_boolean
ROUTE Node1.string_changed TO TEXT.set_string
ROUTE Box2.isOver TO Node2.set_boolean
ROUTE Node2.string_changed TO TEXT.set_string

```

h



### Appendix 3: 3D topological relations

Table 1: Groups of relations, names, closure intersection and exterior intersections

Group	Name	Closure intersections					Exterior intersections					
		$\partial A \cap \partial B$	$A^\circ \cap B^\circ$	$\partial A \cap B^\circ$	$A^\circ \cap \partial B$	$A^\circ \cap B^\circ$	$A^- \cap \partial B$	$A^- \cap B^\circ$	$\partial A \cap B^-$	$A^\circ \cap B^-$	$A^\circ \cap B^-$	
1	Disjoint	R026	0	0	0	0	1	1	0	1	0	R026
		R027	0	0	0	0	1	1	0	1	1	R027
		R030	0	0	0	0	1	1	1	1	0	R030
		R031	0	0	0	0	1	1	1	1	1	R031
		R051	0	0	0	1	1	0	0	1	1	R051
2		R055	0	0	0	1	1	0	1	1	1	R055
		R063	0	0	0	1	1	1	1	1	1	R063
		R092	0	0	1	1	1	1	0	0	0	R092
3		R093	0	0	1	1	1	1	1	0	1	R093
		R095	0	0	1	1	1	1	1	1	1	R095
		R117	0	0	1	1	1	0	1	0	1	R117
4		R119	0	0	1	1	1	1	1	1	1	R119
		R125	0	0	1	1	1	1	1	0	1	R125
		R127	0	0	1	1	1	1	1	1	1	R127
		R159	0	1	0	1	1	1	1	1	1	R159
5		R179	0	1	0	1	1	0	1	1	1	R179
		R183	0	1	0	1	1	0	1	1	1	R183
		R191	0	1	0	1	1	1	1	1	1	R191
		R220	0	1	1	1	1	1	1	0	0	R220
6	Contain	R221	0	1	1	1	1	1	1	0	1	R221
		R223	0	1	1	1	1	1	1	1	1	R223
		R243	0	1	1	1	1	0	0	1	1	R243
		R245	0	1	1	1	1	0	0	1	1	R245
7	Inside	R247	0	1	1	1	1	0	1	1	1	R247
		R252	0	1	1	1	1	1	1	0	0	R252
		R253	0	1	1	1	1	1	1	1	1	R253
		R255	0	1	1	1	1	1	1	1	1	R255
8	Overlap	R243	0	1	1	1	1	0	1	1	1	R243
		R245	0	1	1	1	1	0	0	1	1	R245
		R247	0	1	1	1	1	0	1	1	1	R247
		R252	0	1	1	1	1	1	1	0	0	R252

**Table 1: Groups of relations, names, closure intersection and exterior intersections (continue)**

Group	Name	Closure intersections				Exterior intersections						
		$\partial A \cap \partial B$	$A^\circ \cap B^\circ$	$\partial A \cap B^\circ$	$A^\circ \cap \partial B$	$A^- \cap B^-$	$A^- \cap \partial B$	$A^\circ \cap B^-$	$\partial A \cap B^-$	$A^\circ \cap B^-$		
9	Meet	R272	1	0	0	0	1	0	0	0	0	R272
		R275	1	0	0	0	1	0	0	1	1	R275
		R277	1	0	0	0	1	0	1	0	1	R277
		R279	1	0	0	0	1	0	1	1	1	R279
		R284	1	0	0	0	1	1	1	0	0	R284
		R285	1	0	0	0	1	1	1	0	1	R285
		R287	1	0	0	0	1	1	1	1	1	R287
		R311	1	0	0	1	1	1	0	1	1	R311
10		R316	1	0	0	1	1	1	0	0	R316	
		R317	1	0	0	1	1	1	1	1	R317	
		R319	1	0	0	1	1	1	1	1	R319	
		R339	1	0	1	0	1	0	0	1	1	R339
11		R343	1	0	1	0	1	0	1	1	R343	
		R349	1	0	1	0	1	1	1	0	1	R349
		R351	1	0	1	0	1	1	1	1	1	R351
		R373	1	0	1	1	1	0	1	0	1	R373
		R375	1	0	1	1	1	0	1	1	1	R375
		R381	1	0	1	1	1	1	1	0	1	R381
		R383	1	0	1	1	1	1	1	1	1	R383
13	Equal	R400	1	1	0	0	1	0	0	0	0	R400
		R403	1	1	0	0	1	0	0	1	1	R403
		R405	1	1	0	0	1	0	1	0	1	R405
		R407	1	1	0	0	1	0	1	1	1	R407
		R412	1	1	0	0	1	1	1	0	0	R412
		R413	1	1	0	0	1	1	1	0	1	R413
		R415	1	1	0	0	1	1	1	1	1	R415
14	Covers	R435	1	1	0	1	1	0	0	1	1	R435
		R439	1	1	0	1	1	0	1	1	1	R439
		R444	1	1	0	1	1	1	0	0	0	R444
		R445	1	1	0	1	1	1	1	0	1	R445
		R447	1	1	0	1	1	1	1	1	1	R447

**Table 1: Groups of relations, names, closure intersection and exterior intersections (continue)**

Group	Name	Closure intersections				Exterior intersections				
		$\partial A \cap \partial B$	$A^\circ \cap B^\circ$	$\partial A \cap B^\circ$	$A^\circ \cap \partial B$	$A^- \cap B^-$	$A^- \cap \partial B$	$A^\circ \cap B^-$	$\partial A \cap B^-$	
15	CoveredBy	R467	1	1	0	1	0	1	1	R467
		R471	1	1	0	1	0	1	1	R471
		R476	1	1	0	1	1	0	0	R476
		R477	1	1	0	1	1	0	1	R477
		R479	1	1	0	1	1	1	1	R479
16	Overlap	R499	1	1	1	1	0	1	1	R499
		R501	1	1	1	1	0	1	0	R501
		R503	1	1	1	1	0	1	1	R503
		R508	1	1	1	1	1	1	0	R508
		R509	1	1	1	1	1	1	0	R509
		R511	1	1	1	1	1	1	1	R511

**Table 2: Possible relations between simple objects**

Relation (decimal)	Relation (binary)	P,P	P,X	L,L R	L,L >R	L,S R <sup>2</sup>	L,S >R <sup>2</sup>	L,B	S,S R <sup>2</sup>	S,S >R <sup>2</sup>	S,B	B,B
R026	0000 1 1010	✓										
R030	0000 1 1110		✓									
R031	0000 1 1111			✓	✓	✓	✓	✓	✓	✓	✓	✓
R055	0001 1 0111				✓		✓			✓		
R063	0001 1 1111				✓	✓	✓	✓		✓	✓	
R092	0010 1 1100		✓									
R095	0010 1 1111				-	-	✓	-		-	-	
R117	0011 1 0101				✓					✓		
R125	0011 1 1101				✓		✓			✓		
R127	0011 1 1111				✓		✓			✓		
R159	0100 1 1111				✓		✓			✓		
R191	0101 1 1111				✓	✓	✓	✓		✓	✓	
R220	0110 1 1100			✓	✓	✓	✓	✓	✓	✓	✓	✓
R221	0110 1 1101				✓		✓			✓		
R223	0010 1 1111				-	-	✓	-		-	-	
R245	0111 1 0101				✓							
R252	0111 1 1100					✓	✓	✓			✓	
R253	0111 1 1101				✓	✓	✓	✓		✓	✓	
R255	0111 1 1111			✓	✓	✓	✓	✓		✓		
R272	1000 1 0000	✓										
R277	1000 1 0101				✓					✓		
R284	1000 1 1100		✓									
R285	1000 1 1101					✓	✓	✓			✓	
R287	1000 1 1111			✓	✓	✓	✓	✓	✓	✓	✓	✓
R316	1001 1 1100					✓	✓	✓			✓	
R317	1001 1 1101					✓	✓	✓			✓	
R319	1001 1 1111					✓	✓	✓		✓	✓	
R349	1010 1 1101				✓		✓			✓		
R373	1011 1 0101				✓							
R381	1011 1 1101						✓			✓		
R383	1011 1 1111									✓		
R400	1100 1 0000			✓	✓				✓	✓		✓
R405	1100 1 0101				✓					✓		
R412	1100 1 1100					✓	✓	✓			✓	
R413	1100 1 1101						✓					
R415	1100 1 1111				✓		✓			✓		
R444	1101 1 1100					✓	✓	✓			✓	
R445	1101 1 1101					✓	✓	✓			✓	
R447	1101 1 1111					✓	✓	✓			✓	
R476	1110 1 1100			✓	✓	✓	✓	✓	✓	✓	✓	✓
R477	1110 1 1101				✓		✓			✓		
R501	1111 1 0101				✓							
R508	1111 1 1100					✓	✓	✓			✓	
R509	1111 1 1101					✓	✓	✓			✓	
R511	1111 1 1111								✓	✓	✓	✓
Number relations		2	3	6+	23+	19	31	19	6+	25+	19	6+

**Table 2: Possible relations between simple objects (continue)**

X,P	L,L R	L,L >R	S,L R <sup>2</sup>	S,L >R <sup>2</sup>	B,L	S,S R <sup>2</sup>	S,S >R <sup>2</sup>	B,S	B,B	Converse Relation	Converse Relation	
✓			✓	✓	✓			✓		0000 1 1011	R027	
			✓	✓	✓			✓		0000 1 1111	R031	
		✓	✓	✓	✓		✓	✓		0010 1 1101	R093	
		✓	✓	✓	✓		✓	✓		0010 1 1111	R095	
	✓		-	-	✓	-	-	-		0001 1 0011	R051	
					✓					0001 1 1111	R063	
			✓		✓		✓			0011 1 0111	R119	
					✓		✓			0100 1 1111	R127	
					✓		✓			0101 1 1111	R159	
		✓	✓	✓	✓	✓	✓	✓	✓	0110 1 1111	R223	
✓		✓	✓	✓	✓	✓	✓	✓	✓	0101 1 0011	R179	
		✓	✓	✓	✓	✓	✓	✓	✓	0101 1 0111	R183	
			-	-	✓	-	-	-		0101 1 1111	R191	
				✓	✓	✓		✓		0111 1 0011	R243	
			✓	✓	✓	✓		✓	✓	0111 1 0111	R247	
				✓	✓	✓		✓		0111 1 1111	R255	
										-	-	
										-	-	
	✓			✓	✓	✓		✓		1000 1 0011	R275	
				✓	✓	✓		✓		1000 1 0111	R279	
✓			✓	✓	✓		✓	✓		1000 1 1111	R287	
			✓	✓	✓		✓	✓		1010 1 0011	R339	
			✓	✓	✓		✓	✓		1010 1 0111	R343	
			✓	✓	✓		✓	✓		1010 1 1111	R351	
		✓		✓	✓		✓	✓		1001 1 0111	R311	
				✓			✓			1011 1 0111	R375	
										-	-	
				✓	✓	✓		✓		1100 1 0011	R403	
				✓	✓	✓		✓		1100 1 0111	R407	
				✓	✓	✓		✓		1100 1 1111	R415	
✓			✓	✓	✓		✓	✓		1110 1 0011	R467	
			✓	✓	✓		✓	✓		1110 1 0111	R471	
			✓	✓	✓		✓	✓		1110 1 1111	R479	
	✓	✓	✓	✓	✓	✓	✓	✓	✓	1101 1 0011	R435	
		✓		✓	✓		✓			1101 1 0111	R439	
				✓	✓	✓		✓		1111 1 0011	R499	
				✓	✓	✓		✓		1111 1 0111	R503	
										1111 1 1111	R511	
	3	2	10	19	31	19	2	13	19	2	Number relations	



## Appendix 4: Guiding animation

A standard VRML syntax, which simulates moving around with a "car" (box) though the town when the user selects the option from the view menu. The highlighted co-ordinates are to be created with respect to the particular path.

```
#VRML V2.0 utf8
#March'97
#Sisi Zlatanova
# The carpet to move around

# ... initial information about the world

Group {
  children [
    DEF Clock TimeSensor {
      enabled FALSE
      cycleInterval 4.0
      loop TRUE
    }
    DEF Car Transform {
      translation 110 3 -220
      children [

        DEF CarView Viewpoint {
          position 0 0 0
          orientation 0 1 0 3.14
          jump TRUE
          description "on the carpet"
        }
        Shape {
          appearance Appearance {
            material Material {
              diffuseColor 0.60 0.30 0.2
              specularColor 0.8 0.8 0.8
            }
          }
          geometry Box {size 2 0.1 3}
        }
      ]
    }
  ]#end car
  DEF Path PositionInterpolator {
    key [ 0.0 0.10 0.20 0.30 0.4 0.50 0.6 0.7 0.8 0.9]
    keyValue [
      130 3 -207
      150 3 -208
      160 3 -208
      170 3 -209
      180 3 -209
      190 3 -208
      200 3 -200
      210 3 -190
      220 3 -180
      230 3 -170
    ]
  }
]
```

```
    }  
# ... the description of the world  
    ]  
}  
ROUTE CarView.isBound TO Clock.set_enabled  
ROUTE Clock.fraction_changed TO Path.set_fraction  
ROUTE Path.value_changed TO Car.set_translation
```