Appendix 2

From a base Map to a VRML Model

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The task: to create a numerical height model for a virtual model out of base map information.

Initial information

There is a municipal base map already in numerical form on the area in question. The map is maintained with Stella* map program that functions subordinated to MicroStation CAD program. The graphic presentation of the locations on the map is in dgn-format.

In principle all the locations on the base map contain the height information required for the formulation of the height model. In this case, however, the model was created merely on the basis of contour lines.

Omitted objects

2D-objects that do not contain any height information. Scattered height points, because they did not provide considerably more information from the point of view of the precision of the model. Edges of roads, ramps and other man-made objects, because the model was to be designed so that it could also be used to represent moments in history.

The construction of the height model

The model was produced using TerraModeler- program. A 3D irregular triangle network (a TIN model) that represents the ground of the area concerned was constructed out of the contour lines. A grid model – that is, a net consisting of all the points situated at even intervals on the (assumed) ground – was counted on the basis of the triangle network. The accuracy of the model can be adjusted by altering the intervals of the nodes. The grid model was then transformed into a XYZ-file (in ASCii form) in which every node of the net is represented.

The lines of the file are of the following format:

565300.000 707300.000 2.172.

The numbers on the line are Y-coordinate (eastern coordinate), X-coordinate (northern coordinate) and height above sea level.

How to transform the terrain model into VRML

An object of the ElevationGrid type following the VRML 2.0 standard was constructed out of the height model. In the following example *xDimension* determines the quantity of columns in the network model and *zDimension* determines the number of lines. *xSpacing* and *zSpacing* correspondingly determine the distance between the points along the coordinate axes. The three-dimensional terrain model itself is counted on the basis of the height values of the nodes of the network that in the following example are listed in square brackets.

Some VRML code

```
geometry        DEF EG EleavationGrid {
color           NULL
normal          NULL
texCoord        NULL
creaseAngle     0.8
height      [8.490, 10.402, 12.744,
                …
                1.034, 0.845, 0.845]
xDimension      31
xSpacing            10
zDimension      31
zSpacing            10
}
```

The XYZ file contains all the height information needed for ElevationGrid. The coordinate values were arranged in lines from north to south and inside the lines from west to east. Of all the information in the arranged file only the height values were preserved. They were separated with commas and printed into a ASCII file. The VRML determinations required for ElevationGrid (the size of the grid and the distance between the points) were added to the file after which the height model could be viewed using a browser.