

# Dynamic Digital 3D Maps

Juergen Doellner and Oliver Kersting

*Institut fuer Informatik*

*Universitaet Muenster*

*Einsteinstr. 62*

*48149 Muenster, Germany*

*Fax ++49 251 83 337 55*

*Email dollner@uni-muenster.de, kerstio@uni-muenster.de*

Dynamic digital 3D maps are map-related representations used to present and explore geo data in a virtual 3D environment. These maps are based on a digital 3D terrain model which is displayed together with related thematic and topographic information layers as well as 2D and 3D geometric objects situated in the 3D map space. The main characteristic of dynamic digital 3D maps of our approach represents the *dynamic design of the map contents*: the real-time display enables user-map interactivity and new ways to express and display – non-temporal and temporal – geo data since all components of maps and their parameters can be created, modified, and programmed by a scripting language at run-time.

The underlying conceptual model of dynamic 3D maps introduces *abstract building blocks* which can be used and configured for building individual dynamic 3D maps. These building blocks do not only include visual primitives (e.g., multiresolution digital terrain models [2], 3D geometries, 2D textures, and labels) but also structural and behavioral primitives. Structural primitives permit to arrange and hierarchically organize 3D map contents from a map-user's point of view – they categorize and group 3D map contents. Behavioral primitives define the dynamics and interactivity of 3D maps contents. These two additional categories, structural and behavioral abstract building blocks, together with the real-time 3D display can be considered as the main differences to existing digital map approaches.

The powerful map design capabilities of dynamic 3D maps result on the one hand from a sophisticated use of textures used to visualize thematic and topographic information on top of the terrain surface, and on the other hand from the ability to configure and program all map components using a map scripting language. Textures can be generated „on the fly“ using the same scripting language. For example, a road network can be graphical designed each time an image of the map is generated according to the current camera settings – no static, pre-built road network texture is needed anymore [1]. As a consequence, many schemes of cartographic generalization can be directly implemented for dynamic 3D maps. Furthermore, dynamic 3D maps provide the necessary tools to implement animated, cartographic representations (e.g., temporal data, processes), and may lead to new forms of graphical and cartographical expressions used to communicate geo objects and geo phenomena [3].

[1]J. Döllner, K. Baumann, K. Hinrichs: Texturing Techniques for Terrain Visualization. IEEE Visualization 2000, Salt Lake City, Oct. 2000, pp. 207-234.

[2]J. Döllner, K. Hinrichs: 3D Maps and Their Texture-Based Design. IEEE Proc. Computer

Graphics International 2000, pp. 325-334, June 2000.

[3]G. Buziek, J. Döllner: Concept and Implementation of an Interactive, Cartographic Virtual Reality System. International Cartographic Conference ICA'99, Ottawa, pp. Section 05/88-99, 1999.