INTEGRATED 3D MODELING OF MULTI-UTILITY NETWORKS AND THEIR INTERDEPENDENCIES FOR CRITICAL INFRASTRUCTURE ANALYSIS

Becker, T., Nagel, C., Kolbe, T. H.

Institute for Geodesy and Geoinformation Science
Technische Universität Berlin,
Strasse des 17. Juni, 10623 Berlin, Germany
{becker, nagel, kolbe}@igg.tu-berlin.de

Commission IV, WG IV/8

KEY WORDS: 3D Data Models, 3D City Models, 3D Utility Networks, Interdependent Critical Infrastructures, Cascading Effects, Disaster Management, Emergency Response, CityGML

ABSTRACT:

In today's technologically advanced society the dependency of every citizen and company on working infrastructures is extremely high. Failures of critical infrastructures, such as the Italian blackout in 2003 or the failure of power supply in wide parts of Europe in 2006, demonstrate the strong linkage of networks across borders. However, also infrastructures within the same geographic region but of different types have strong interdependencies and failures in one type of network can have cascading effects onto the other networks. In order to support risk analysis and planning of emergency response actions the modeling of critical infrastructures and their mutual dependencies in 3D space is required. Decision makers need a comprehensive view of the disaster situation to be able to estimate the consequences of their action. For this purpose, a comprehensive understanding and simulation of cascading or looping effects as well as the propagation of the disaster extend is needed. But neither the existing utility networks models nor the international standards for modeling cities or buildings map the mutual interrelationships between different infrastructures or between the city and its infrastructures.
In this paper the requirements and a novel framework for the integrated 3D modeling of critical infrastructures within cities is presented. By giving a *dual representation* utility network components are modeled both according to their 3D topography and by a complementary graph structure embedded into 3D space.

This contribution was selected in a double blind review process to be published within the *Lecture Notes in Geoinformation and Cartography* series (Springer-Verlag, Heidelberg).

Advances in 3D Geo-Information Sciences

Kolbe, Thomas H.; König, Gerhard; Nagel, Claus (Eds.) 2011, X
ISBN 978-3-642-12669-7, Hardcover
Date of Publication: January 5, 2011
Series Editors: Cartwright, W., Gartner, G., Meng, L., Peterson, M.P.
ISSN: 1863-2246