

Conception and implementation of a 3D Visualization component for the GML-Toolbox based on web browsers

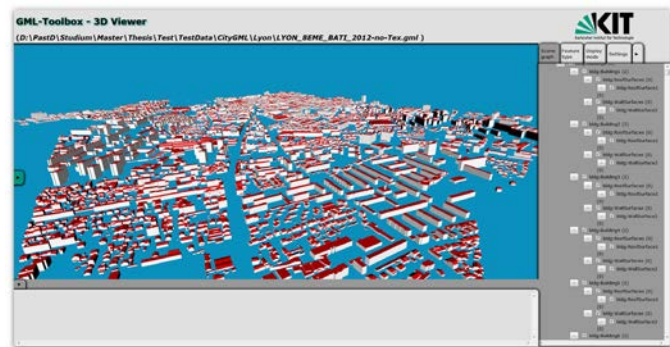
Introduction

The software GML-Toolbox of the Institute of applied Computer Science (IAI) of the KIT is a tool primarily designed to create XPlanGML files based on existing planning schemes running on Windows systems. It also performs geometry and schema validation checks. But the two-dimensional (2D) standard XPlanGML is not the only supported format. Further GML-based formats are:

- CityGML (3D)
- BoreholeML (3D)
- ALKIS/NAS (2D)
- INSPIRE-PLU (2D)

A user can only evaluate the final result when he can see it visually. For this reason, this software supports the visualization of 2D and 3D geospatial data. In case of the two-dimensional formats, the GML-Toolbox creates a Scalable Vector Graphics (SVG) file. SVG data can be visualized in an internet browser, since nowadays all newer versions of browsers support SVG.

In the case of three-dimensional data, actually KML is used in connection with the Google Earth viewer. This has the disadvantage that objects below the ground level can not be seen due to the always visible satellite image on the ground. Especially in case of BoreholeML models this is disturbing, but also in case of CityGML models with offset. Depending on the building elevation and the terrain model, the building can partly or fully disappear under the terrain. Another drawback is that additional software, Google Earth, is required.



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This work has the aim to find another way to visualize three-dimensional data without the disadvantages of the currently used method and requiring no external viewer. The new way has to have the same features as the 2D solution. This especially means the 3D data have to be visualized in an internet browser as well, without using any plug-ins.

Realization

Therefore a C++ module (X3D-Module) was created. This converts the internal representation of the CityGML source files, with its geometry and semantic information, into the X3D format. At the same time, corresponding XHTML elements are created for each CityGML feature as well as each contained feature type. This builds a scene graph, which is linked to the X3D elements. At the end, the content of a template file, the X3D elements and its corresponding XHTML elements are written into a new XHTML file.

This file is linked with a CSS file for the style of the web page, and a JavaScript file to support user interactivity. Both were created for this thesis. The X3D elements can be displayed with support of the WebGL engine x3dom. These elements are linked with the scene graph based on the name attribute, since both corresponding elements has the same attribute value. Hence, a selection of an X3D element is possible by clicking the corresponding scene graph element and vice versa. Additionally, it is possible to show or hide the X3D element by clicking the corresponding checkbox. All these functions are realized by using the DOM.

