Methods of GEOINFORMATION

KML/COLLADA Export
3DCityDB Import/Export Tool extension

100% CityGML
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KML/COLLADA Export: Motivation

- Open to a wide audience
- Playful, hands-on approach
- Extendable for professional work
  - Objects can be clicked on for information
  - Fast generation and visualization
  - Can be embedded into the city’s geoinformation infrastructure

Generating KML/COLLADA from CityGML

- KML/COLLADA model is the result of a **portraying process** applied to the CityGML-based data in the 3DCityDB
- Semantic information can be used to influence styling (e.g., coloring of surfaces)

**New extension of the 3DCityDB Import/Export Tool**

- Facilitates **3D visualization** of the database contents with a broad range of applications supporting KML/COLLADA, e.g. Google Earth, ESRI ArcGIS Explorer & ArcGlobe
- In order to convert CityGML to KML/COLLADA, the original CityGML data must be first imported into the 3DCityDB and then exported. This intermediate step is needed
- Since KML/COLLADA focuses on visualization and not on semantics this conversion is bound to be lossy
Following display styles are possible depending on the CityGML LoD to export from:

- **Footprint**: buildings are represented by their footprint projected onto the earth surface. All LoDs.

- **Extruded**: buildings are represented as blocks models by extruding their footprint to their measured height (thematic CityGML attribute).

- **Geometry**: shows the detailed geometry of ground, wall and roof surfaces of buildings + appearance information.
  - Requires semantic information
  - Coloring of surfaces (textures are not supported by KML). From LoD1 upwards.

- **COLLADA**: "Geometry” display style + support for textures. From LoD2 upwards.
Display styles: example
Several display styles in the same export
KML/COLLADA Export additional features

- **Highlighting of model placemarks on mouse over**
  - Up to release 6.0.1 *Google Earth* does not provide any mechanism to highlight model placemarks not being loaded from their own servers
  - In KML/COLLADA exports this is achieved by placing a hull geometry of the building around the building itself

- **Dynamically filled information balloons**
  - Placemarks may contain descriptions shown on a “speech bubble” when clicked on
  - The contents of this description can be dynamically filled at export time with building-specific information. Only an HTML template with embedded simple statements is needed
  - The balloons may have interactive links for further use (content management system)
Highlighting of model placemarks
## Dynamic information balloon template

### BalloonSource.html

```html
[...]
<table width = 400>
<tr><td><b>Address:</b></td></tr>
<tr><td>
  <address/[FIRST]STREET</address/[FIRST]HOUSE_NUMBER</td></tr>
<tr><td>
  <address/CITY</address>
</td></tr>
[...]
<tr><td><b>Existing generic attributes (mouseOver for values):</b></td></tr>
<tr><td>
  <script type="text/javascript">
    function ga_value_as_tooltip(counter, attrname, datatype, strval, intval, realval) { [...]
    [...]
    FOREACH CITYOBJECT_GENERICATTRIB/ATTRNAME,
      DATATYPE,STRVAL,INTVAL,REALVAL
    ga_value_as_tooltip(%0, %1, %2, %3, %4, %5);
  <3DCityDB>END FOREACH</3DCityDB>
  </script></td></tr>
[...]```
Dynamic information balloon result

**BLDG_0003000e00a0e252**

**Address:**
Ernst-Reuter-Platz 7
Berlin

**Envelope:** (19253.9938209008,20668.1229904062,33.2299995422363, 19285.1961790992,20720.931091,113.776)

**Appearances:** 2
**Measured height:** 75.98926 m

**Existing generic attributes (mouseover for values):** FOLIE, GE_LoD2_zOffset, GMDE, H_First_Max, H_First_Min, HNR, H_Trauf_Max, H_Trauf_Min, Kachel, KREIS, LAND, LFD, RBEZ, STR, TexVersion

**External reference name:** 0003000e00a0e252

**Total surface amount:** 19
**First surface geometry id:** 3927404
**Last surface geometry id:** 3936152
**Roof surface id:** 3927433
**Wall surface id:** 3927409
**Ground surface id:** 3927404
Altitude problems in KML/COLLADA Exports

- Proper model placement on the ground
  - Height values in the 3DCityDB Coordinate Reference System may not match Google Earth’s (CRS WGS84 / Geoid92) Digital Terrain Model
  - As a result buildings (or their highlighting surfaces) may hover over or sink into the ground

- Solution: grounding algorithm
  - Use absolute altitude values (KML tag: <altitudeMode>)
  - Call Google’s Elevation API to get the point in the building’s footprint with the lowest elevation value of the DTM
  - Subtract this point’s z-coordinate from this point’s elevation value to get a z-offset value
  - Apply the z-offset value to all z-coordinates in the building
Altitude problems in KML/COLLADA Exports

With grounding algorithm

Without grounding algorithm
KML/COLLADA Export basics: further features

- In order to enhance the rendering performance (especially when using textured KML/COLLADA models) the exporter allows for
  - Packing all texture images into a single image (texture atlas)
  - Reducing texture image size by scaling

- Support for tiling
  - Facilitates automated (un)loading of parts of the models
  - Allows for applying LOD concepts for visualization
  - Reduces the file size of the exported KML/COLLADA files

- Exported files can be packed as KMZ archive
- Surface colors can be customized
Current status and future steps

- New functionality is near to be released
  - First version of tool allowing for exporting KML/COLLADA models will be **published in 2nd quarter of 2011**
  - Will be **Open Source** and **LGPLv3**
  - **Stay tuned!**

- **Codebase will be used to realize a server-side W3DS interface for the 3D City Database**
  - As part of the OGC Portrayal Interoperability Experiment to be started soon
  - Caching/streaming approaches
  - Extended filtering and styling options
  - May possibly include support for X3D as visualization format
KML/COLLADA Export Demo
http://opportunity.bv.tu-berlin.de/software

- **3D City Database (current version 2.0.3)**
  - Oracle SQL scripts and PL/SQL functions
  - Comprehensive documentation

- **3D City Database Import/Export Tool (current version 1.2.2)**
  - Executable Java binaries
  - Complete source code
  - Comprehensive documentation
  - **KML/COLLADA exporter to be released in 2nd quarter 2011**

- **citygml4j (current version 1.0)**
  - Java class library and API for reading and writing CityGML datasets
  - Library files for Java5 and Java6
  - Source code, comprehensive documentation, tutorials