



■ Methods of GEOINFORMATION

KML/COLLADA Export 3DCityDB Import/Export Tool extension

100% CityGML
TU Delft, March 14th, 2011

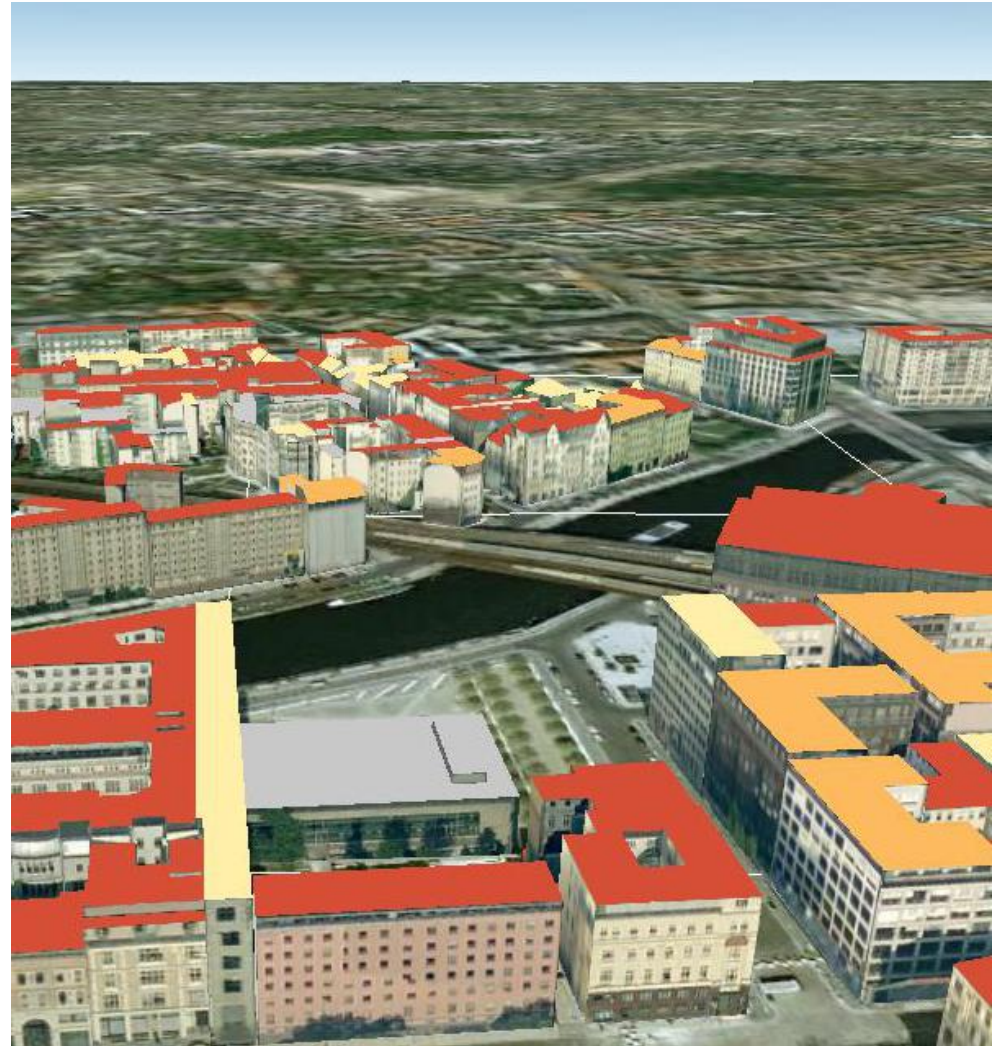
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KML/COLLADA Export: Motivation



- 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



Source: Solar Atlas Berlin, 2011

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

KML/COLLADA Export basics: display styles

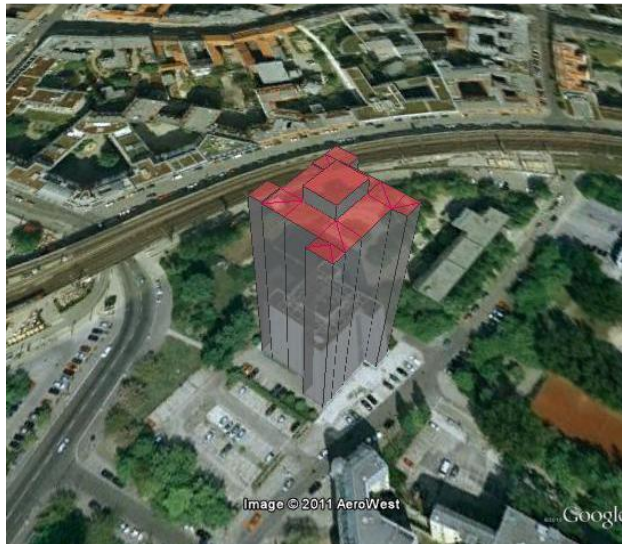
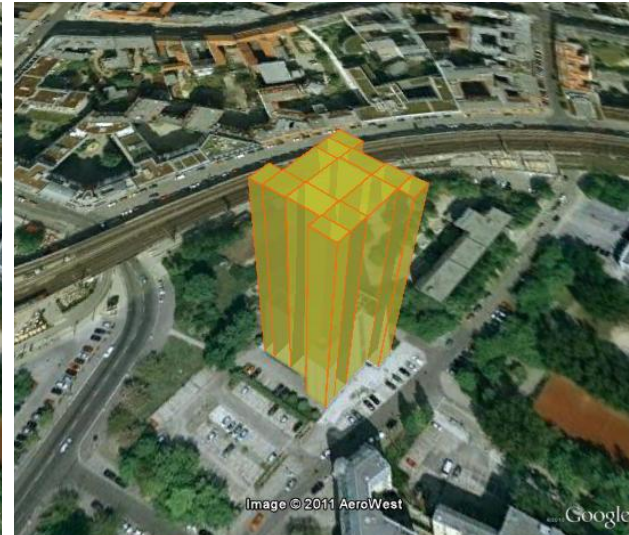


Following display styles are possible depending on the CityGML LoD to export from :

- **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

100% KML

Display styles: example



Several display styles in the same export



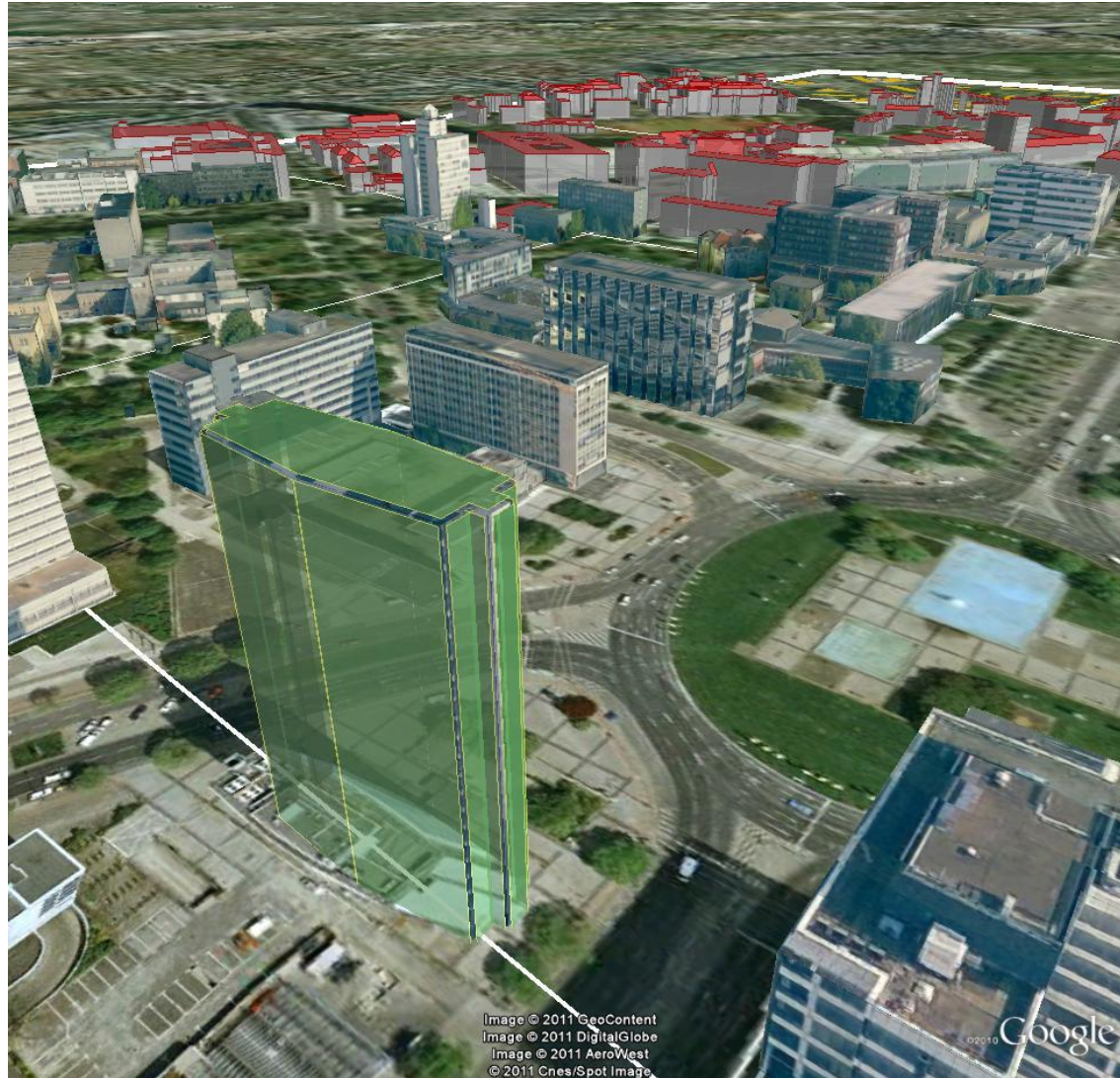
KML/COLLADA Export additional features



- **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

```
[...]
<table width = 400>
<tr><td><b>Address:</b></td></tr>
<tr><td>
  <3DCityDB>ADDRESS/[FIRST]STREET</3DCityDB>
  <3DCityDB>ADDRESS/[FIRST]HOUSE_NUMBER</3DCityDB></td></tr>
<tr><td>
  <3DCityDB>ADDRESS/CITY</3DCityDB></td></tr>
[...]
```

```
<tr><td><b>Existing generic attributes (mouseOver for values):</b>
<script type="text/javascript">
function ga_value_as_tooltip(counter, attrname, datatype, strval, intval, realval) { [...] }
[...]
```

```
<3DCityDB>FOREACH CITYOBJECT_GENERICATTRIB/ATTRNAME,
  DATATYPE,STRVAL,INTVAL,REALVAL</3DCityDB>
  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

What is available?



<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