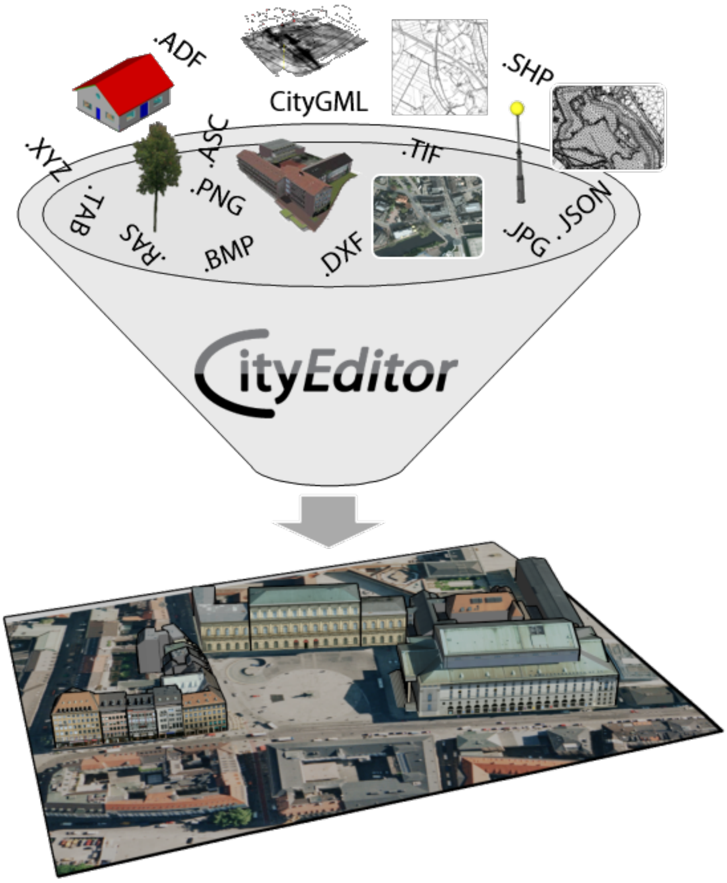
User's Manual

CityEditor

Version 2.7.3.815



3DIS GmbH
3D Information Systems

Date: 05/26/2017

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Used Libraries

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This documentation has been translated from it's german original by Anne Kaiser.

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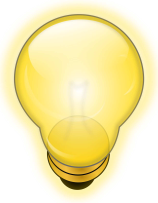
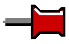
Symbols and Highlightings



This symbol indicates useful hints that simplify the dealing with the CityEditor.

This symbol marks important advice that should be followed in order to avoid malfunctioning.



This symbol marks file appendices that may be extracted from the document and saved to the hard disk.

Italics denote designators of elements of graphical user interfaces.

Sans serifs indicate names of objects and software modules.

`Type writer font` is used for source code listings and abstracts of source code listings in continuous texts. This includes e.g. names of classes or functions as well as path and file names.

Underline are important terms at their first usage. They are explained more thoroughly in the glossary.

Abstract

A seat license is required for the activation of the CityEditor. If you are using the CityEditor for the first time you may request a time limited evaluation license that will allow you to test the full range of the CityEditor's features. Further information about requesting an evaluation license can be found in section 1.6.

Contents

1 Chapter 1 General Information

1.1 The CityEditor

The CityEditor is not an independent program but an extension for Trimble SketchUp allowing the import of CityGML models and other 3D geo data into SketchUp.

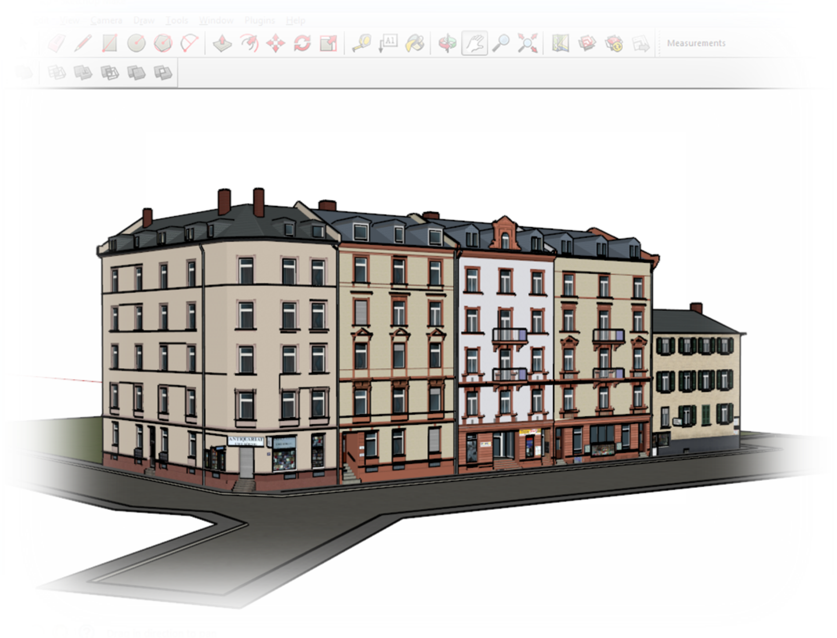


Figure 1.1: Imported CityGML model in SketchUp

During the file import, the CityEditor does not only take over the geometry and materials of the source files but also imports object attributes. Moreover, editing mechanisms for those attributes in the CityGML-specific attribute scheme as well as a feature for the export of edited models to CityGML are available.

A certain basic knowledge of the CityGML standard [GKCN08, GKNH12] in order to understand the following explanations as well as for the correct handling of the CityEditor tools with regards to the construction of “correct” CityGML models. This user’s manual does not aim at conveying this basic knowledge. Therefore it is recommended to consult additional literature from other sources as needed.

After the editing of imported model data in SketchUp they can be exported from SketchUp as CityGML models, 3D-PDF documents, interactive 3d web presentations that can be displayed by the CityBrowser as well as 3D models in the 3D Studio (`.3ds`), Alias Wavefront (`.obj`), OpenInventor (`.iv`), OpenSceneGraph Binary (`.ive`), OpenSceneGraph ASCII (`.osg`), AC3D (`.ac`), 3D Manufacturing Format (`.3mf`) and Stereolithography (`.stl`) format.

1.2 System Requirements

The following system requirements must be me met in order to ensure the CityEditor operates correctly.

Working Memory

- At least 1 GB, 2 GB are recommended

Software Environment

- Windows XP (Service Pack $\geq$ 2), Windows Vista, Windows 7, Windows 8, Windows 8.1, Windows 10
- .NET-Framework 4.0.3 Full (or later)
- Trimble SketchUp 8 (or later, 32- and 64-bit versions of later SketchUp versions are not supported)

The free version of SketchUp (SketchUp Make) may be used as well as the fee-based version SketchUp Pro.

Running the CityEditor in a version of SketchUp that has been packaged using VMWare ThinApp or any similar virtualizing/packaging solution is NOT recommended.

⚠ The CityEditor consists of a number modules which are being invoked in sequence during import, data processing and export processes. In order to ensure all processes working correctly, the invocation of those modules must not be blocked in any way, e. g. by security restrictions or software..

1.3 Features

1.3.1 Import

The CityEditor imports

- CityGML models, building models (other than CityGML) from `.dxf`, `.ply`, `.cco`, `.3mf`, `.stl` and `.shp` files,
- terrain models from`.asc`, `.ras`, `.xyz`, `.adf`, `.tif`, `.dem` and `.dxf` files,
- terrain textures from`.jpg`, `.png`, `.bmp`, `.tif`, `.ecw`, `.jp2` files and OpenStreetMap or WMS web sources,
- point, line, and polygon elements from`.shp`, `.dxf`, `.gml`, `.json`, `.geojson` and `.tab` files,
- point clouds from`.xyz` and `.csv` files
- as well as triangulated surface models from `.ply` and `.obj` files.

The data import is facilitated by the external module CityEditorImporter which can be invoked through the extension menu of the CityEditor.

Buildings/CityGML

The current version supports the following CityGML object types:

- `Building`
- `BuildingPart`
- `BuildingInstallation`
- `IntBuildingInstallation`
- `Window`
- `Door`
- `BreaklineRelief`
- `TINRelief`

- `RasterRelief` (with the terrain grid as `QuantityList`)
- `LandUse`
- `GenericCityObject`
- `CityObjectGroup`
- `Track`
- `Road`
- `Square`
- `Railway`
- `PlantCover`
- `SolitaryVegetationObject`
- `WaterBody`
- `CityFurniture`
- `TrafficArea`
- `AuxiliaryTrafficArea`
- `Bridge`
- `BridgePart`
- `BridgeInstallation`
- `IntBridgeInstallation`
- `BridgeConstructionElement`
- `Tunnel`
- `TunnelPart`
- `TunnelInstallation`
- `IntTunnelInstallation`
- `Room`
- `BuildingFurniture`
- `BridgeRoom`
- `BridgeFurniture`
- `HollowSpace`
- `TunnelFurniture`

CityGML attributes and the IDs of `Polygon` and `LinearRing` elements as well as of the object types listed above will be processed during import. Imported faces within the listed object types can be distinguished as follows:

- `RoofSurface`
- `WallSurface`
- `GroundSurface`
- `ClosureSurface`
- `CeilingSurface`
- `InteriorWallSurface`
- `FloorSurface`
- `OuterCeilingSurface`
- `OuterFloorSurface`
- `WaterSurface`
- `WaterGroundSurface`
- `WaterClosureSurface`
- `OrientableSurface`

When importing buildings from `.dxf`-files the DXF versions

- AutoCad2000
- AutoCad2004
- AutoCad2007
- AutoCad2010
- AutoCad2013

are supported. Objects of the types

- `3dFace`
- `Insert`
- `Mesh`
- `PolyfaceMesh`
- `Solid`

will be processed. Other object types will be ignored. Objects may be grouped as groups or blocks.

If `.shp` files serve as building data sources, objects with the geometry types

- `PolygonZ`
- `Multipatch` (`Ring, OuterRing, TriangleStrip`)

can be imported from these data sources.

Terrain

Terrain models may be adopted as terrain grids from `.asc`, `.tif`, `.dem` and `.adf` files. If unordered point sets are imported from `.ras` or `.xyz` files they will be rendered into a regular grid if necessary. When importing a terrain model from a `.dxf` file it has to contain `3DFaces` (a triangulated terrain model).

Terrain Textures

Terrain textures may be read from the file system as `GeoreferencedTexture` elements from CityGMLor as singular files (with related worldfiles or integrated georeference). Web based services such as OpenStreetMap or any WMS can also serve as sources for terrain textures.

Vector Data

Point, line and polygon elements from `.shp`-, `.dxf`-, `.gml`-, `.json`-, `.geojson`- or `.tab`-files – if available – will be imported considering three-dimensional coordinates. If the vector data formats only contain two-dimensional coordinates, the elements will be placed flatly (at height 0).

Format-specific special elements such a fillings, texts, symbols, colors, styles, etc. cannot be taken over during vector data import. It focusses on the adoption of simple point, line, and polygon geometries that may function as placement aids for 3D objects.

Point Clouds

Point clouds can be imported from `.xyz` and `.csv` files that may contain the coordinates of a point as well as an RGB color value (0-255).

Triangulated Surface Models

Triangulated, colored surface models, e. g. generated models based on UAV data, can be imported from `.ply` and `.obj` files.

1.3.2 Model Editing

Editing of CityGML Attributes

The CityEditor contains tools for displaying, editing, adding, and deleting of standard attributes for buildings and surfaces, as well as of generic attributes for buildings.

Editing of Model Geometry

Faces may be attributed with one of the CityGML surface types (e.g. `WallSurface`) as well as with a LoD. For grouped elements the CityGML feature types can be applied.

Correction Functions

A correction function can be applied to faces that interchanges their front and back sides while maintaining their materials. The faces will optically not change in SketchUp. This correction aims at reducing the models to actually visible elements and assigning the front and back sides properly for the CityGML export.

1.3.3 Export

The CityEditor allows to export SketchUp models to CityGML, as 3D-PDF documents, as CityBrowser projects and as 3D models in the 3D Studio (`.3ds`), Alias Wavefront (`.obj`), OpenInventor (`.iv`), OpenSceneGraph Binary (`.ive`, `.osgb`), OpenSceneGraph ASCII (`.osg`), AC3D (`.ac`), 3D Manufacturing Format (`.3mf`) and Stereolithography (`.stl`) format.

During the CityGML export, objects modeled in SketchUp will be exported as CityGML models with the inclusion of their CityGML-specific object and face classification and attributes.

For the purpose of a 3D-PDF export, SketchUp models may be newly generated or integrated into existing PDF documents.

Exported as a CityBrowser project, a SketchUp model can be presented in a ready-to-use, interactive 3D web presentation.

Using the CityEditor's export capabilities to the 3D Studio (`.3ds`), Alias Wavefront (`.obj`), OpenInventor (`.iv`), Autodesk FBX (`.fbx`), OpenSceneGraph Ascii (`.osg`), OpenSceneGraph Binary (`.ive`, `.osgb`) , AC3D (`.ac`), 3D Manufacturing Format (`.3mf`) and Stereolithography (`.stl`) format enables users of SketchUp Make, who do not have access to SketchUp's Pro exporters, to export their models to other formats.

1.3.4 Miscellaneous Functions

Convex Hull Computation and Hull Volume

Through computing the convex hull of any model element selections the CityEditor allows for the (approx.) volume calculation of grouped objects which are no solid groups.

Extrusion of Edges to Cylinders

Selected edges can be converted to cylinders. The conversion process can be parameterized with the cylinder's diameter and the number of segments from which the circular base of the cylinder is constructred.

1.4 Versions

CityEditor licenses are sold as a *lite*, *standard* and *professional* version. The *standard* version includes the basic range of the CityEditor's functionality whereas the *professional* version enables additional functions. The following table shows what range of functions is provided by either version.

Function/Description	**lite**	**standard**	**professional**
Import			
○ File Formats			
- Buildings	CityGML	CityGML, .dxf, .cco, .3mf, .stl, .shp	CityGML, .dxf, .cco, .3mf, .stl, .shp
- Vector Data	✖	.shp, .dxf, .tab, .gml, .json, .geojson, WFS	.shp, .dxf, .tab, .gml, .json, .geojson, WFS
- Terrains	CityGML	CityGML, .asc, .adf, .tif, .dxf, .ras, .xyz	CityGML, .asc, .adf, .tif, .dxf, .ras, .xyz, .dem
- Terrain Textures	.bmp, .png, .jpg, .tif (if included in CityGML model)	.bmp, .png, .jpg, .tif	.bmp, .png, .jpg, .tif, .ecw, .jp2, OpenStreetMap, WMS
- Point Clouds	✖	✖	.xyz, .csv
- Triangulated Surface Models	✖	.ply, .obj	.ply, .obj
○ Operations			
- Terrain Model Optimization	✖	✔	✔

- Reduction of point clouds with the voxel grid procedure	✖	✖	✔
- Tiled Import of Large Data Sets	✖	✖	✔
- Automatic Roof Texturing/Coloring	✖	✖	✔
○ Tools			
- Local Tile Database as Map Source for Region Selection	✖	✖	✔
Model Editing			
○ Attribute Editing	✔	✔	✔
- Advanced Attribute Editing, Import & Export	✖	✖	✔
○ Object Typing	✔	✔	✔
○ Face Typing	✔	✔	✔
○ LoD Assignment	✔	✔	✔
○ Correction Functions	✔	✔	✔
○ Rule-based Boundary Surface Type Assignment	✖	✖	✔
Export			
○ CityGML	✔	✔	✔
○ 3D-PDF	✔ (“unlicensed“-water mark, no export of object metadata, no adoption of viewpoints of SketchUp models)	✔ (“unlicensed“-water mark, no export of object metadata, no adoption of viewpoints of SketchUp models)	✔
○ CityBrowser	✔ (“unlicensed“-water mark, no export of object metadata, no adoption of viewpoints of SketchUp models)	✔ (“unlicensed“-water mark, no export of object metadata, no adoption of viewpoints of SketchUp models)	✔
○ 3D Studio (`.3ds`), Wavefront Alias (`.obj`), OpenInventor (`.iv`), Autodesk FBX (`.fbx`), OpenSceneGraph Ascii (`.osg`), OpenSceneGraph Binary (`.ive`, `.osgb`) und AC3D (`.ac`), 3D Manufacturing Format (`.3mf`), Stereolithography (`.stl`)	✖	✔	✔
Miscellaneous Functions			

○ Convex Hull Computation	✖	✖	✔
○ Extrusion of Edges to Cylinders	✔	✔	✔

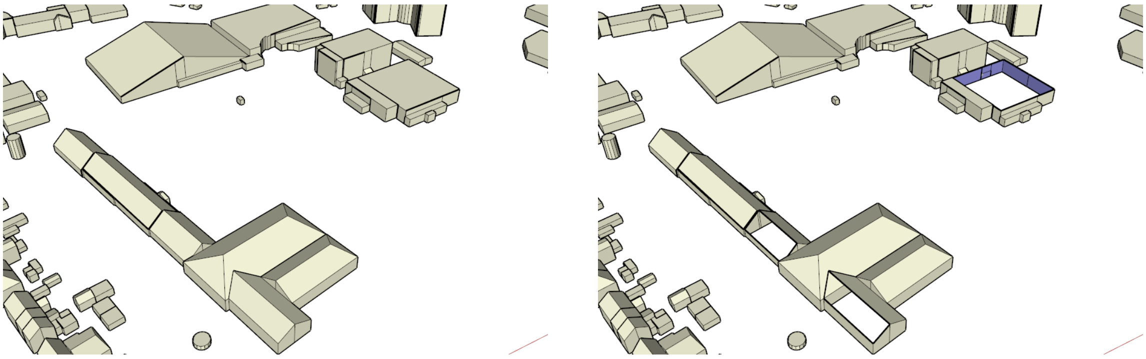
1.5 Restrictions

1.5.1 The Problem of Planarity

When importing CityGML models it may happen that single faces (particularly roof surfaces) are triangulated automatically. This is due to the fact that the tolerance regarding the planarity of faces in SketchUp is rather low.

1.5.2 Model Validation in SketchUp

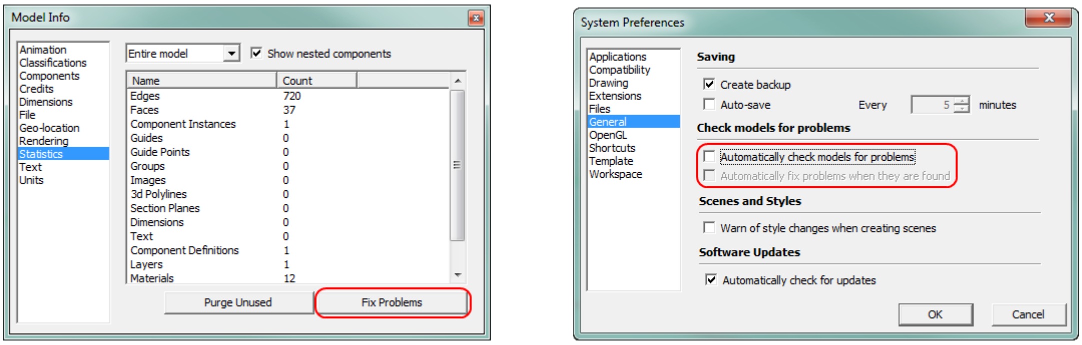
The model validation mechanism integrated into SketchUp in many cases removes geometries that have been imported with the CityEditor and have initially been displayed correctly in SketchUp. One aspect the model validation typically flags as a modelling error are vertices that are located very close together (e.g. closer than 0.02 model units). Geometries with such as that commonly occur in city models containing roofs that have been constructed by an (semi-)automated process. Prior



(a) Model displayed correctly BEFORE performing model validation (b) Model with missing (mistakenly removed) roof surfaces AFTER model validation

Figure 1.2: Model validation in SketchUp

Therefore invoking the model validation on models that have been imported using the CityEditor automatically as well as manually should be avoided or at least only be invoked manually in such cases where it has been tested, that no geometries are being mistakenly removed that have previously been displayed correctly.



☑ Show nested components

Name	Count
Edges	720
Faces	37
Component Instances	1
Guides	0
Guide Points	0
Groups	0
Images	0
3d Polylines	0
Section Planes	0
Dimensions	0
Text	0
Component Definitions	1
Layers	1
Materials	12

Saving

☑ Create backup

□ Auto-save Every 5 minutes

Check models for problems

□ Automatically check models for problems

□ Automatically fix problems when they are found

Scenes and Styles

□ Warn of style changes when creating scenes

Software Updates

☑ Automatically check for updates

(a) Tab *Statistics* in *Model Info* dialog, manual model validation should NOT be invoked

(b) Tab *General* in *System Preferences* preferences, automatic model validation on loading should be DEACTIVATED

Figure 1.3: Model validation settings and invocation in SketchUp

1.5.3 The Problem of Defective Building Modeling

SketchUp is not a tool that is natively meant for the CityGML-based creation and editing of models. The export of semantically and geometrically correct CityGML models requires a correct modeling with regards to the CityGML export. Not everything that looks flawless in SketchUp at first sight will proof to be a “good” CityGML model. This user’s manual contains a chapter containing directions and hints with regards to modeling which usually lead to correctly exportable models.

1.6 Evaluation License

For the activation of the CityEditor a seat license is required. With the integrated licensing mechanism (see section 5.3.2) interested users can request a time-limited evaluation license to familiarize themselves with the CityEditor’s features.

Please be patient while a license request is being processed. It may take up to 48 hours until a license request sent via the integrated licensing mechanism is verified and answered.

Please note that while using an evaluation license certain restrictions (e.g. a 3D ’watermark’ included in every CityGML export) are applied.

Chapter 2

2 Installation/Updating and License Activation

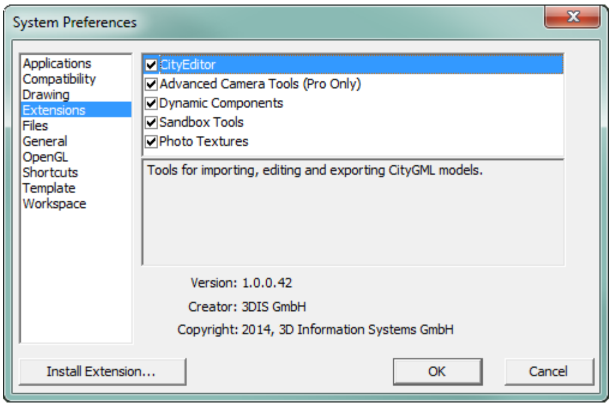
2.1 Installation

2.1.1 32- or 64-bit?

Beginning with version 2.6.0 the CityEditor is available in a 32-bit as well as a 64-bit version. The 64-bit version allows for importing larger datasets with a better performance and therefore should be used whenever the system architecture supports 64-bit applications.

2.1.2 SketchUp 8 to 2016

The CityEditor is delivered as a SketchUp extension package (file extension `.rbz`) which can be downloaded from the 3DIS website. The installation of the extension package can be managed via the dialog *Preferences* (through the menu item *Window→Preferences*) in SketchUp. In the category *Extensions* all currently installed extensions are displayed.



☑ CityEditor
☑ Advanced Camera Tools (Pro Only)
☑ Dynamic Components
☑ Sandbox Tools
☑ Photo Textures

Tools for importing, editing and exporting CityGML models.

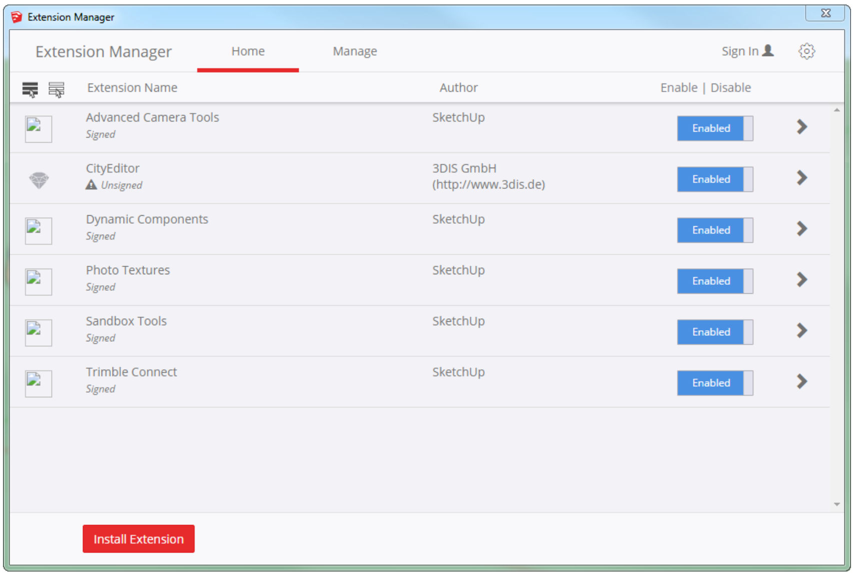
Version: 1.0.0.42
Creator: 3DIS GmbH
Copyright: 2014, 3D Information Systems GmbH

Figure 2.1: Management of SketchUp extensions

The CityEditor extension can be installed by clicking the button *Install Extension...*. This will open a file dialog in which the locally saved extension package has to be located. After selecting the extension package it may take a few seconds until the installation is complete and a CityEditor entry appears in the list of installed extensions.

2.1.3 SketchUp 2017 and above

Starting with version 2017 of SketchUp the new Extension Manager is used to install and manage extensions. In order to install the CityEditor, which is delivered as a SketchUp extension package (file extension `.rbz`) that can be downloaded from the 3DIS website, the Extension Manager can be invoked via menu item *Window→Extension Manager* from the application menu.



Extension Name	Author	Enable | Disable
Advanced Camera Tools Signed	SketchUp	Enabled
CityEditor Unsigned	3DIS GmbH (http://www.3dis.de)	Enabled
Dynamic Components Signed	SketchUp	Enabled
Photo Textures Signed	SketchUp	Enabled
Sandbox Tools Signed	SketchUp	Enabled
Trimble Connect Signed	SketchUp	Enabled

Figure 2.2: SketchUp Extension Manager

The CityEditor extension can be installed by clicking the button *Install Extension...*. This will open a file dialog in which the locally saved extension package has to be located. After selecting the extension package it may take a few seconds until the installation is complete and a CityEditor entry appears in the list of installed extensions.

2.2 Updating

Updating the CityEditor works exactly as the initial installation. By using the dialog *Update* it can be checked whether a newer version of the CityEditor is available. If a new version has been downloaded and installed through an older version of the CityEditor, a restart of SketchUp is necessary in order to correctly install the updated extension.

Structural modifications to the file hierarchy of the CityEditor extension can make it necessary for the CityEditor to be cleanly reinstalled after a prior complete removal of all extension files. Whenever such a structural change has taken place a notification is inserted into the changelog informing users of the necessity of a clean reinstall.

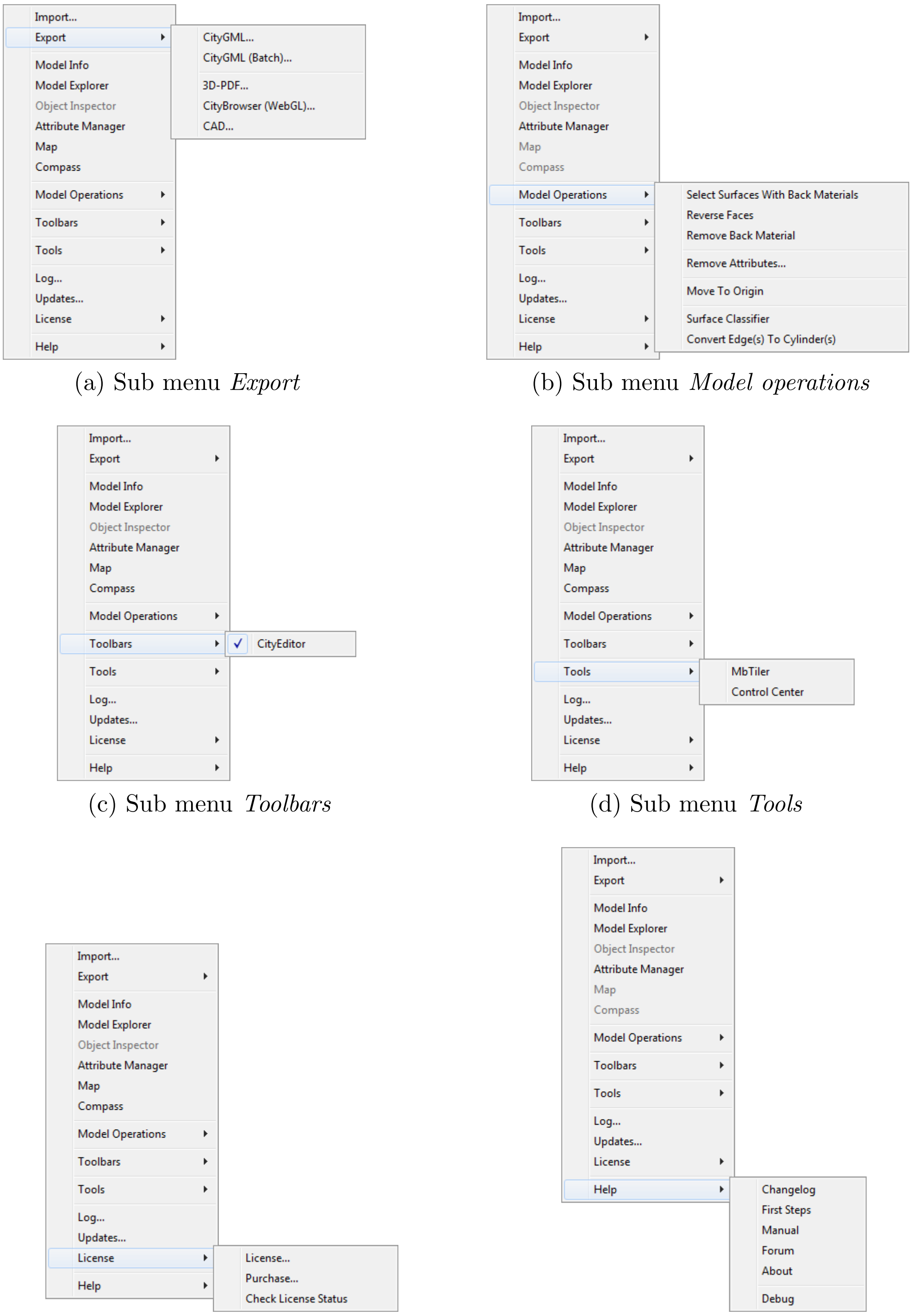
2.3 License Activation

The CityEditor is not ready for operation immediately after installation as a seat license is required for the activation of the CityEditor's features. The procedure of requesting and activating a workplace license is explained in paragraph 5.3.2.

3 Chapter 3 CityEditor Extension Menu

3.1 Preface

With it's installation the CityEditor creates a separate sub menu within the menu *Plugins*. Via this sub menu, various features and dialogs can be activated.



(a) Sub menu *Export*

(b) Sub menu *Model operations*

(c) Sub menu *Toolbars*

(d) Sub menu *Tools*

(e) Sub menu *License*

(f) Sub menu *Help*

Figure 3.1: CityEditor extension menu

3.2 Main menu

Import

Opens the external module CityEditorImporter for the import of model data.

Export

Opens a sub menu with which export operations to various formats can be initiated.

Model Info

Opens a dialog showing the version information of the CityGML importer through which the current model has been imported.

Model Explorer

Opens a dialog that displays the CityGML object hierarchy of the objects in the current model.

Attribute Manager

Opens a dialog that displaying an overview of all CityGML attributes contained in the current model.

Object Inspector

Opens a dialog that displays the SketchUp object hierarchy of the currently selected object.

Map

Opens a dialog that displays the current camera position on a map.

Compass

Opens a dialog displaying the camera orientattion as compass image.

Model Operations

Opens a sub menu with which various operations can be initiated that affect all elements of the current model.

Toolbars

Opens a sub menu in which the toolbars belonging to the CityEditor can be shown or hidden.

Tools

Opens a sub menu with items invoking various external tools.

Log

Opens a dialog with information and error notifications generated by the CityEditor.

Updates

Opens a dialog to check for application updates.

License

Opens a sub menu from which a seat license can be requested/purchased.

Help

Opens a sub menu in which version information and user documentation for the CityEditor can be called up.

3.3 Sub Menu Export

CityGML

Opens a dialog for the export of a CityGML model.

CityGML (Batch)

Opens a dialog for the conversion of a directory with CityGML files.

3D-PDF

Opens the external module CityEditorExporter for the export of models as 3D-PDFs.

CityBrowser (WebGL)

Opens the external module CityEditorExporter for the export of models as CityBrowser projects.

CAD

Opens the external module CityEditorExporter for the export of models to vaious 3D model formats.

3.4 Sub Menu Model Operations

Select Surfaces With Back Materials

Selects all surfaces of a model that have back sides covered with material.

Reverse Faces

Turns it/them around and puts the material back on the face/s. Thus they do not change their appearance although the orientation changes.

Remove Back Material

Removes the material of the back side of the selected face/s.

Remove Attributes

Removes all CityGML-specific attributes from the objects in the currently loaded model.

Move To Origin

Centers the currently selected object(s) above the coordinate system origin in SketchUp. If no object is selected, the entire model in centered around the origin.

Surface Classifier

Opens a tool for rule-based classification of surfaces.

Convert Edge(s) To Cylinder(s)

Converts the currently selected edges to cylinders.

3.5 Sub Menu Toolbars

CityEditor

Shows or hides the CityEditor toolbar.

3.6 Sub Menu Tools

MbTiler

Opens the MbTiler tool that creates map tile databases for offline map viewing.

Control Center

Opens the Control Center that allows access to various external modules belonging to the CityEditor.

3.7 Sub Menu License

License

Opens a dialog for license requests/activation.

Purchase

Opens a browser window and navigates to the 3DIS website where seat licenses for the CityEditor can be purchased.

Check License Status

Verifies the validity of the currently installed workplace license.

3.8 Sub Menu Help

Changelog

Opens a dialog showing the history of changes of the CityEditor.

First Steps

Opens a dialog showing information for first time users of the CityEditor.

Manual

Opens a PDF document containing this user manual.

Forum

Opens a web browser window and navigates to the 3DIS product forum.

About

Opens a dialog showing the legal framework conditions for the use of the CityEditor as well as version information.

Debug

Activates/Deactivates debug mode in which more detailed error information are generated using the CityEditor's logging mechanism.

Chapter 4

4 CityEditor Toolbar

The CityEditor toolbar offers a quick access to selected features of the CityEditor extension menu.

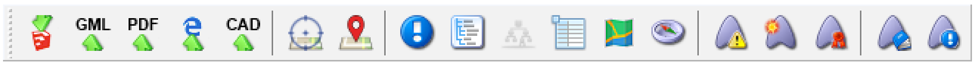


Figure 4.1: CityEditor toolbar

Opens the external module CityEditorImporter for the import of model data.

GML Opens a dialog for the export of a CityGML model.

PDF Opens the external module CityEditorExporter for the export of SketchUp models as 3D-PDFs.

Opens the external module CityEditorExporter for the export of SketchUp models as CityBrowser projects.

CAD Opens the external module CityEditorExporter for the export of SketchUp models as 3D models in various formats.

Activates the GeoCursor tool that can be used to query the geo coordinates for any given point on the SketchUp model's geometry.

Activates the GeoLocation tool that can be used to edit a model's georeference.

Opens a dialog that shows the version information of the CityEditorImporter through which the current model has been imported.

Opens a dialog that displays the CityGML object hierarchy of the objects in the current model.

Opens a dialog that displays the object hierarchy of the currently selected object.

Opens a dialog that displaying an overview of all CityGML attributes contained in the current model.

Opens a dialog that displays the current camera position on a map.

Opens a dialog that displays the camera orientation as compass image.

Opens a dialog with information and error notifications generated by the CityEditor.

Opens a dialog to check for application updates.

Opens a dialog for license requests/activation.

Opens a PDF document containing this user manual.

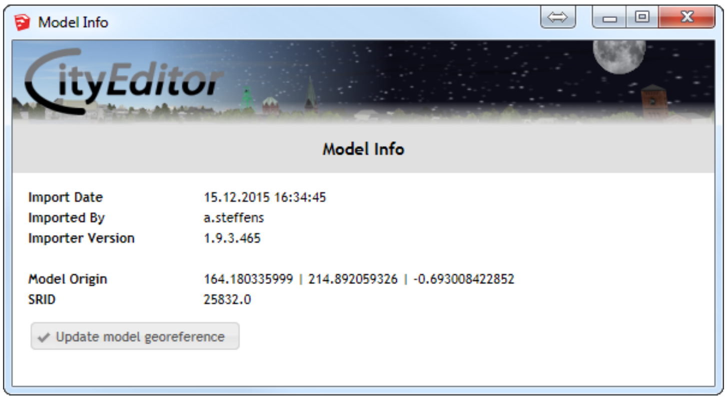
Opens a dialog showing the legal framework conditions for the use of the CityEditor as well as version information.

5 Chapter 5 Tools

5.1 Dialog Tools

5.1.1 Model Info

This dialog shows the version information of the CityEditorImporter through which the current model has been imported as well as import date and georeferences of the model.



Model Info

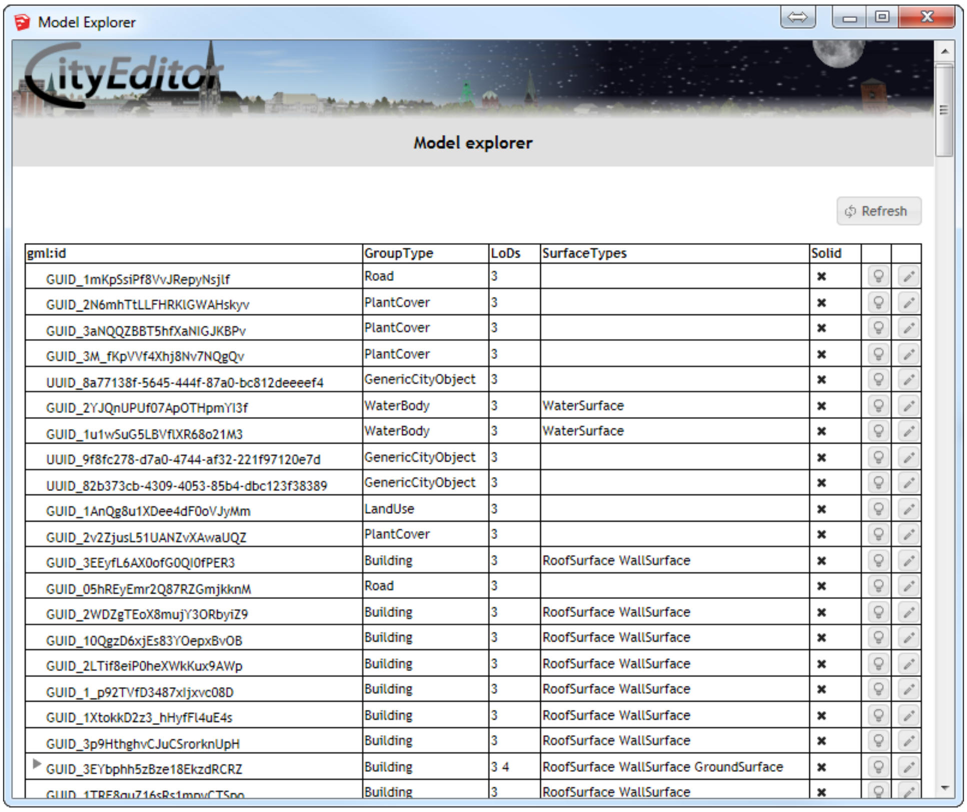
Import Date	15.12.2015 16:34:45
Imported By	a.steffens
Importer Version	1.9.3.465
Model Origin	164.180335999 | 214.892059326 | -0.693008422852
SRID	25832.0

Figure 5.1: *Model Info* dialog

Through clicking on the *Update Model Georeference* button the GeoLocation tool is brought which allows to edit the model's georeference.

5.1.2 Model Explorer

This dialog displays the CityGML object hierarchy of the objects in the current model.



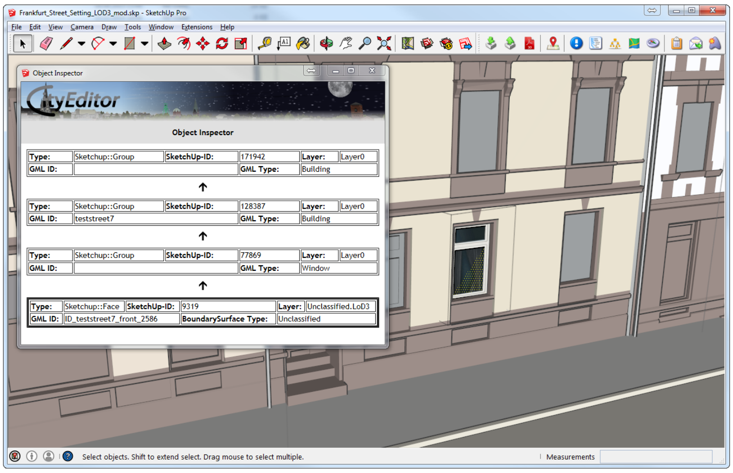
gml:id	GroupType	LoDs	SurfaceTypes	Solid		
GUID_1mKpSsiPf8VvJRepyNsjlf	Road	3		✖	💡	✎
GUID_2N6mhTtLLFHRKlGWAHskyv	PlantCover	3		✖	💡	✎
GUID_3aNQQZBBT5hfXaNIGJKBPv	PlantCover	3		✖	💡	✎
GUID_3M_fKpVVf4Xhj8Nv7NQgQv	PlantCover	3		✖	💡	✎
UUID_8a77138f-5645-444f-87a0-bc812deeeef4	GenericCityObject	3		✖	💡	✎
GUID_2YJQnUPUf07ApOTHpmYl3f	WaterBody	3	WaterSurface	✖	💡	✎
GUID_1u1wSuG5LBVflXR68o21M3	WaterBody	3	WaterSurface	✖	💡	✎
UUID_9f8fc278-d7a0-4744-af32-221f97120e7d	GenericCityObject	3		✖	💡	✎
UUID_82b373cb-4309-4053-85b4-dbc123f38389	GenericCityObject	3		✖	💡	✎
GUID_1AnQg8u1XDee4dF0oVJyMm	LandUse	3		✖	💡	✎
GUID_2v2ZjusL51UANZvXAwaUQZ	PlantCover	3		✖	💡	✎
GUID_3EEyfL6AX0ofG0QI0fPER3	Building	3	RoofSurface WallSurface	✖	💡	✎
GUID_05hREyEmr2Q87RZGmjkknM	Road	3		✖	💡	✎
GUID_2WDZgTEoX8mujY3ORbyiZ9	Building	3	RoofSurface WallSurface	✖	💡	✎
GUID_10QgzD6xjEs83YOepxBvOB	Building	3	RoofSurface WallSurface	✖	💡	✎
GUID_2LTif8eiP0heXWkKux9AWp	Building	3	RoofSurface WallSurface	✖	💡	✎
GUID_1_p92TVfD3487xIjxvc08D	Building	3	RoofSurface WallSurface	✖	💡	✎
GUID_1XtokkD2z3_hHyfFl4uE4s	Building	3	RoofSurface WallSurface	✖	💡	✎
GUID_3p9HthghvCJuCSrorknUpH	Building	3	RoofSurface WallSurface	✖	💡	✎
▶ GUID_3EYbphh5zBze18EkzdRCRZ	Building	3 4	RoofSurface WallSurface GroundSurface	✖	💡	✎
GUID_1TRF8qu716sRs1mpvCTSpo	Building	3	RoofSurface WallSurface	✖	💡	✎

Figure 5.2: *Model explorer* dialog

For each object a series of CityGML-specific metadata is listed. Furthermore it is indicated whether an object is a volume body. Objects that contain sub-objects can be folded out in a tree diagram-like structure so that sub objects may be inspected as well. For each object there are two buttons available on the right edge of the corresponding table row. They can be used to select an object resp. to open their metadata editing dialog.

5.1.3 Object Inspector

This dialog displays the object hierarchy of the currently selected object.


Frankfurt_Street_Setting_LOD3_mod.skp - SketchUp Pro
File Edit View Camera Draw Tools Window Extensions Help
Object Inspector
CityEditor
Measurements

Object Inspector

Type:	Sketchup::Group	SketchUp-ID:	171942	Layer:	Layer0
GML ID:		GML Type:	Building		

↑

Type:	Sketchup::Group	SketchUp-ID:	128387	Layer:	Layer0
GML ID:	teststreet7	GML Type:	Building		

↑

Type:	Sketchup::Group	SketchUp-ID:	77869	Layer:	Layer0
GML ID:		GML Type:	Window		

↑

Type:	Sketchup::Face	SketchUp-ID:	9319	Layer:	Unclassified.LoD3
GML ID:	ID_teststreet7_front_2586	BoundarySurface Type:	Unclassified		

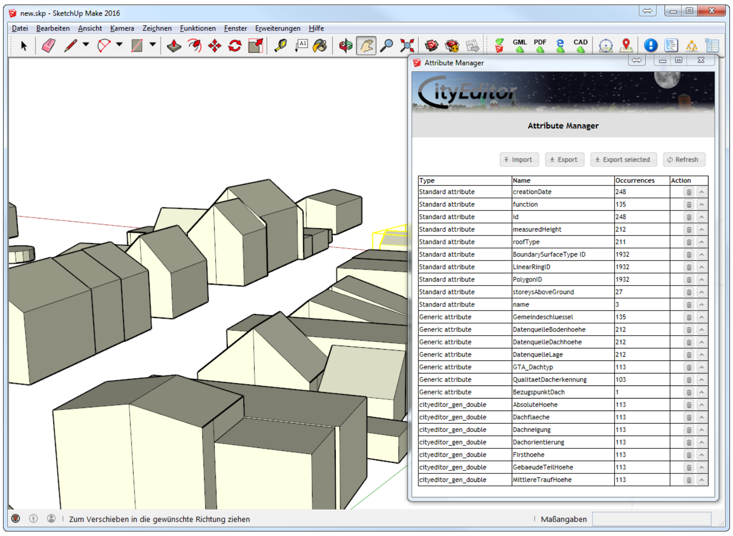
Select objects. Shift to extend select. Drag mouse to select multiple.

Figure 5.3: *Object Inspector* dialog

For each object in the object tree the object type, SketchUp name, layer and a number of CityGML-specific attributes are displayed.

5.1.4 Attribute Manager

This dialog displays an overview of all CityGML attributes contained in the current model.


new.skp - SketchUp Make 2016
Datei Bearbeiten Ansicht Kamera Zeichnen Funktionen Fenster Erweiterungen Hilfe
GML
PDF
CAD
Attribute Manager
CityEditor
Import
Export
Export selected
Refresh
Maßangaben

Attribute Manager

Type	Name	Occurrences	Action
Standard attribute	creationDate	248	
Standard attribute	function	135	
Standard attribute	id	248	
Standard attribute	measuredHeight	212	
Standard attribute	roofType	211	
Standard attribute	BoundarySurfaceType ID	1932	
Standard attribute	LinearRingID	1932	
Standard attribute	PolygonID	1932	
Standard attribute	storeysAboveGround	27	
Standard attribute	name	3	
Generic attribute	Gemeindeschluessel	135	
Generic attribute	DatenquelleBodenhoehe	212	
Generic attribute	DatenquelleDachhoehe	212	
Generic attribute	DatenquelleLage	212	
Generic attribute	GTA_Dachtyp	113	
Generic attribute	QualitaetDacherkennung	103	
Generic attribute	BezugspunktDach	1	
cityeditor_gen_double	AbsoluteHoehe	113	
cityeditor_gen_double	Dachflaeche	113	
cityeditor_gen_double	Dachneigung	113	
cityeditor_gen_double	Dachorientierung	113	
cityeditor_gen_double	Firsthoehe	113	
cityeditor_gen_double	GebaeudeTeilHoehe	113	
cityeditor_gen_double	MittlereTraufHoehe	113	

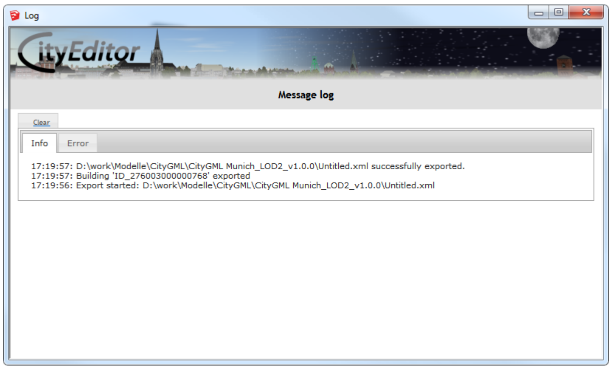
Zum Verschieben in die gewünschte Richtung ziehen

Figure 5.4: *Object Inspector* dialog

For each attribute it's type and number of occurences are displayed. Furthermore the user can delete each attribute from all objects in the model.

5.1.5 Log

Information and error notifications from different modules of the CityEditor are collected centrally and can be examined with the help of this dialog.



```
17:19:57: D:\work\Modelle\CityGML\CityGML Munich_LOD2_v1.0.0\Untitled.xml successfully exported.
17:19:57: Building 'ID_276003000000768' exported
17:19:56: Export started: D:\work\Modelle\CityGML\CityGML Munich_LOD2_v1.0.0\Untitled.xml
```

Figure 5.5: Dialog for the display of information and error notifications

The display of information and error notifications happens separately on two tabs. If the button *Clear* is clicked, the entire log recorded so far is deleted.

5.1.6 Map

This dialog shows the current camera position on a map with an OpenStreetMap map layer. The camera position on the map is updated when the camera is moved.

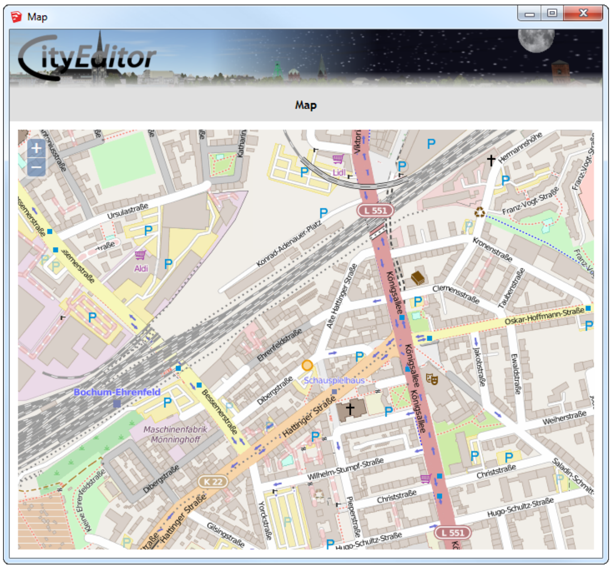


Figure 5.6: Dialog show the georeferenced position of the camera

The map is only available in georeferenced models.

5.1.7 Compass

This dialog shows the current camera orientation as a compass image. The compass is updated when the camera is rotated.

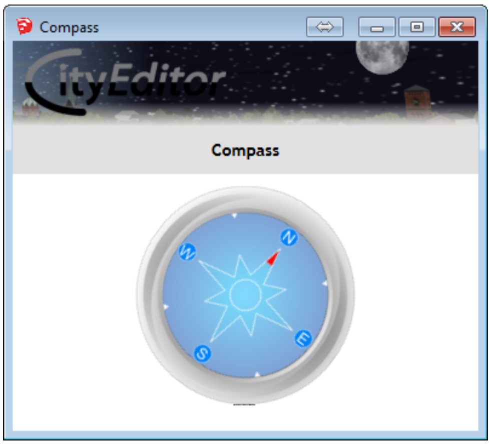
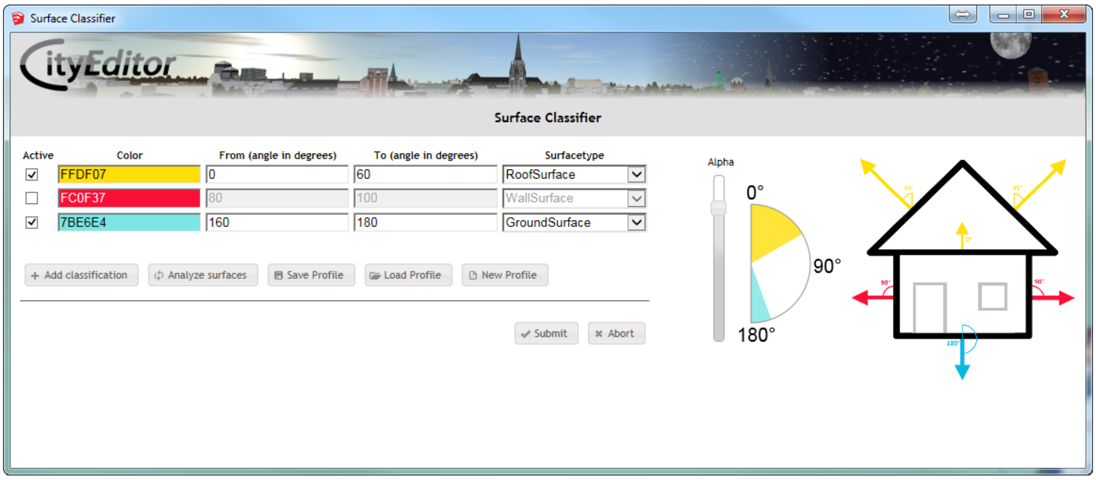


Figure 5.7: Dialog displaying the camera orientation as compass image

The compass is only available in georeferenced models.

5.1.8 Surface Classifier

Featuring a rule-based classification engine the CityEditor allows for the automatic classification of surfaces based on their normal orientation. If the Surface Classifier is invoked from the context menu on a number of currently selected elements, the classification will only affect these elements. Is the Surface Classifier invoke from the extension menu, the classification will affect the entire model.



Active	Color	From (angle in degrees)	To (angle in degrees)	Surfacetype
☑	FFDF07	0	60	RoofSurface
☐	FC0F37	80	100	WallSurface
☑	7BE6E4	160	180	GroundSurface

Figure 5.8: Surface Classifier dialog

The classification of a surface is based on the elevation angle (angle to the ground) of the surface's normal. For a (very simple) building model the classification criteria could be the following:

Angle	Surface Type	Description
0°	`RoofSurface`	Surface normal is perpendicular (pointing upward) to the ground
90°	`WallSurface`	Surface normal is parallel to the ground
180°	`GroundSurface`	Surface normal is perpendicular (pointing downward) to the ground

Before the classification process can be started, the classification criteria has to be specified in the form of one or more ranges of surface normal elvation angles. The surface type that is to be assigned to surfaces whose normal falls within the defined elevation range can be chosen from a drop-down box. The specified elevation ranges are visualized as colored areas in the half-circle diagram on the right side of the Surface Classifier dialog. Additional rows for defining elevation range criteria can be added by clicking the *Add classification* button.

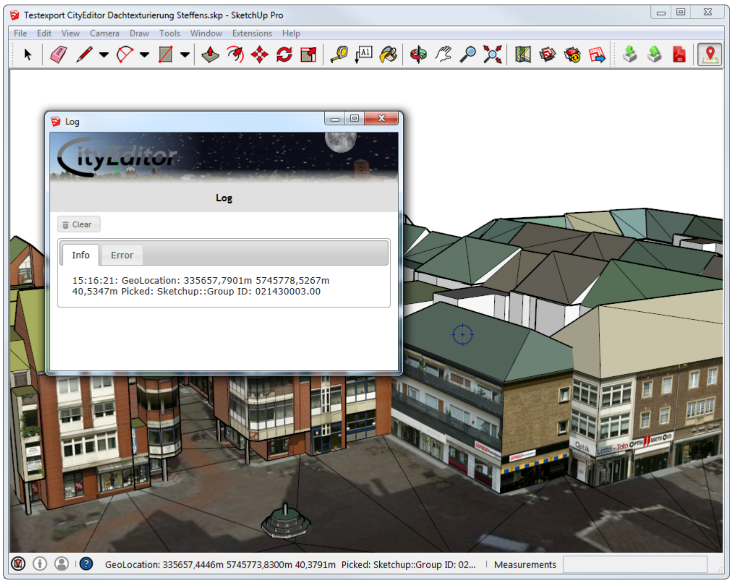
By clicking the *Analyze surfaces* button, the elevation angles of the current model's surfaces are calculated and visualized as lines in the half-circle diagram.

To perform the surface classication, the *Submit* button has to be pressed. During the classification process only those elevation range criteria that are marked *Active* will be applied. Using the *Abort* button the Surface Classifier can be closed without affecting any surfaces.

5.2 Interactive Tools

5.2.1 GeoCursor

With the GeoCursor the CityEditor adds a new tool to SketchUp's tool palette allowing a user to query the geo coordinates of any position in a SketchUp model that has been imported by the CityEditorImporter.



```
15:16:21: GeoLocation: 335657,7901m 5745778,5267m
40,5347m Picked: Sketchup::Group ID: 021430003.00
```

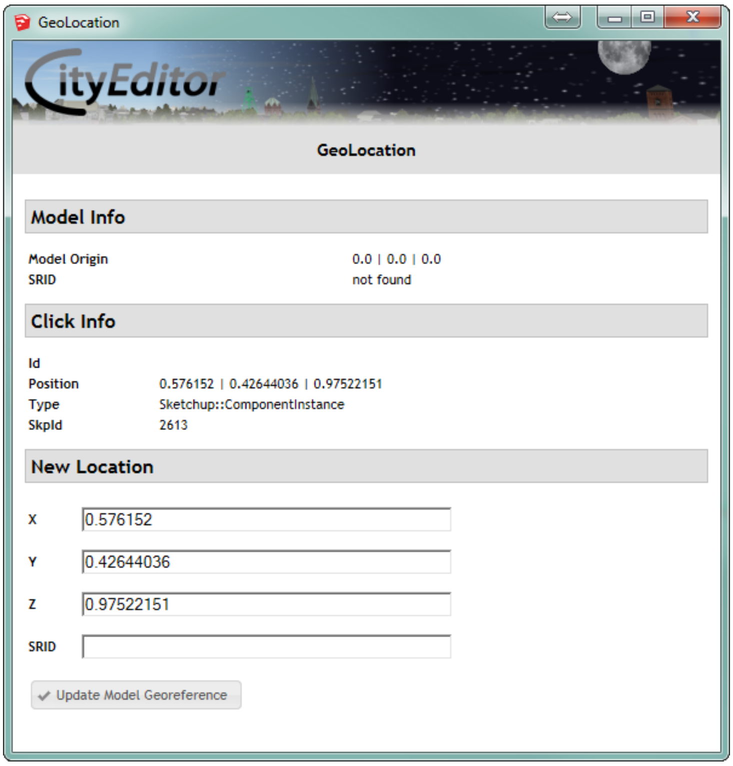
```
GeoLocation: 335657,4446m 5745773,8300m 40,3791m  Picked: Sketchup::Group ID: 02...
```

Figure 5.9: Using the GeoCursor tool

The GeoCursor can be activated through it's corresponding button in the CityEditor-Toolbar. After it has been activated, the mouse cursor takes on the shape of a crosshair. The crosshair can be moved over any model element to query the geo coordinates of the intersection point with the element under the crosshair. The computed geo coordinates are displayed in SketchUp's status bar. By clicking the LEFT MOUSE BUTTON the geo coordinates of the current element intersection point are transferred to the protocol window from where they can be copied and used in any other application.

5.2.2 GeoLocation

Using the GeoLocation tool any point in a model can be georeferenced, thereby georeferencing an entire model. The GeoLocation tool can be activated through it's corresponding button in the CityEditor-Toolbar. After it has been activated, the mouse cursor takes on the shape of a crosshair. The crosshair can be moved over any model element. By clicking the LEFT MOUSE BUTTON a window is brought up that allows to enter geo coordinates of the current element intersection point under the mouse cursor.



GeoLocation

Model Info

Model Origin	0.0 | 0.0 | 0.0
SRID	not found

Click Info

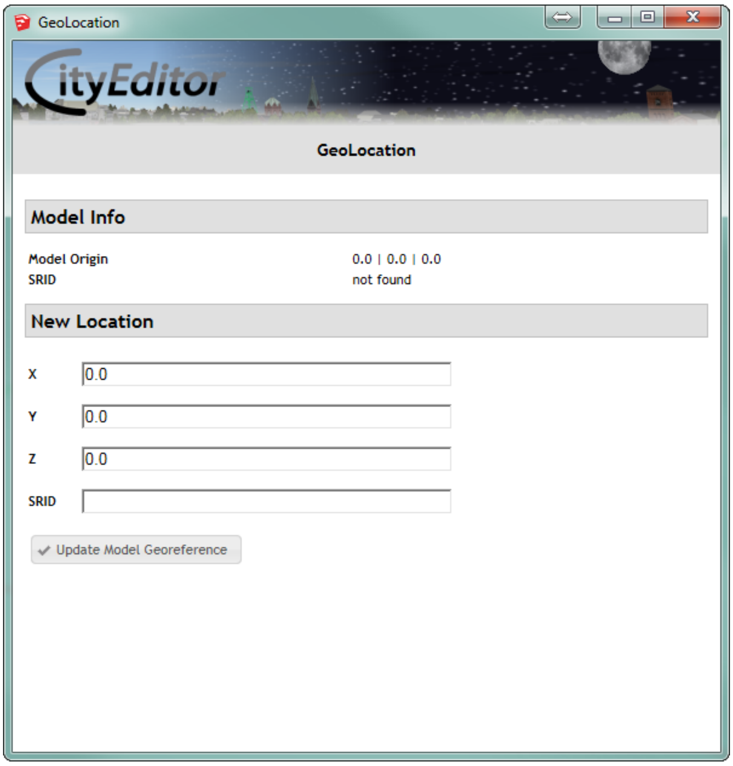
Id	
Position	0.576152 | 0.42644036 | 0.97522151
Type	Sketchup::ComponentInstance
SkpId	2613

New Location

X	0.576152
Y	0.42644036
Z	0.97522151
SRID	

Figure 5.10: GeoLocation tool when opened through a picking operation

If the GeoLocation tool is opened from the *Model Info* dialog it can be used to set the georeference of a model's origin manually.



GeoLocation

Model Info

Model Origin 0.0 | 0.0 | 0.0
SRID not found

New Location

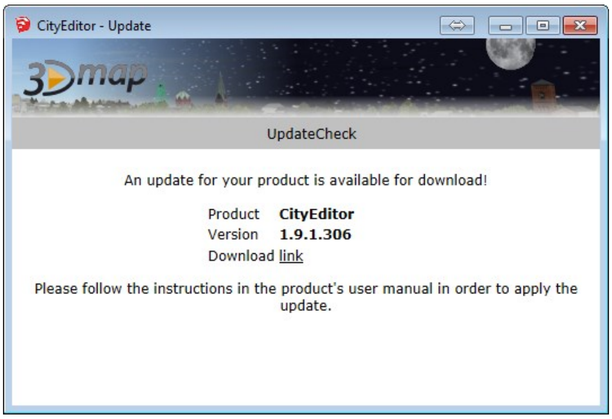
X 0.0
Y 0.0
Z 0.0
SRID

Figure 5.11: GeoLocation tool when opened from the *Model Info* dialog

5.3 External Tools

5.3.1 Update

This dialog checks whether a newer version of the CityEditor is available. If a new version exists, an according notification with a download link will appear.



UpdateCheck

An update for your product is available for download!

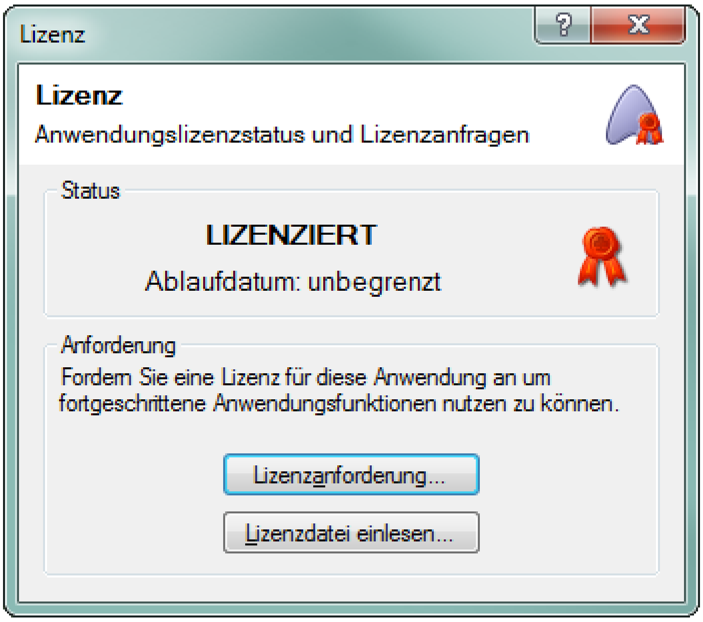
Product **CityEditor**
Version **1.9.1.306**
Download link

Please follow the instructions in the product's user manual in order to apply the update.

Figure 5.12: Dialog to check for application updates

5.3.2 License

In this dialog the current status of an installed seat license can be checked. Furthermore, a new workplace license can be requested and activated.



Ablaufdatum: unbegrenzt

Fordern Sie eine Lizenz für diese Anwendung an um fortgeschrittene Anwendungsfunktionen nutzen zu können.

Figure 5.13: Dialog for license request/activation

License Request

A seat license for the CityEditor may be requested by clicking the button *License request* . A new dialog will open. Therein, a valid e-mail address should be entered, as the licensing system generates a license file that will be sent to that address.

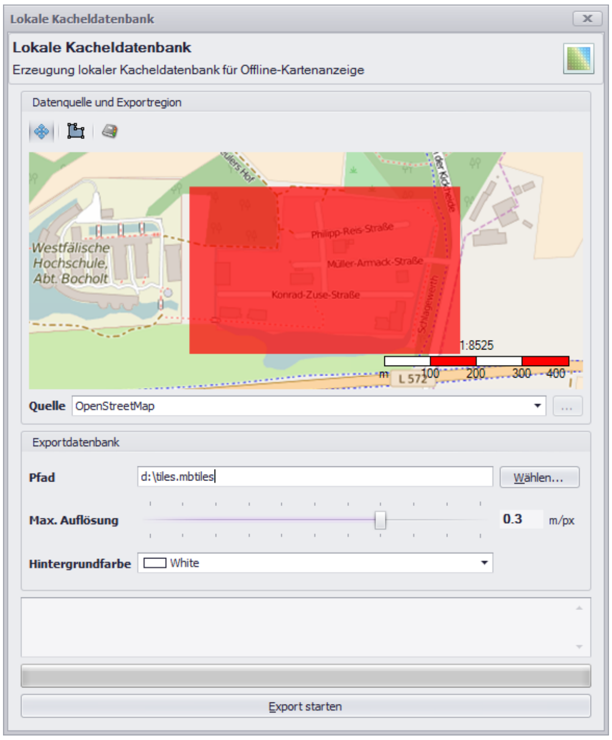
License Activation

After receiving the license file via e-mail, the file should be saved on a local data medium first. By clicking on *Read license file* a selection of files will open. The saved license file has to be selected.

A seat license is bound to certain technical attributes of a workplace computer. Thus, it is not transferable to other workplaces. If the hardware configuration of a workplace changes, a license may lose its validity. In such a case, we ask you to consult us by phone before a new license can be issued.

5.3.3 MbTiler

Using the MbTiler raster data from online map sources such as OpenStreetMap and WMS services can be saved to local map tile databases that can be used offline in the CityEditorImporter module.



Lokale Kacheldatenbank

Lokale Kacheldatenbank

Erzeugung lokaler Kacheldatenbank für Offline-Kartenanzeige

Datenquelle und Exportregion

Quelle OpenStreetMap

Exportdatenbank

Pfad d:\tiles.mbtiles

Max. Auflösung 0.3 m/px

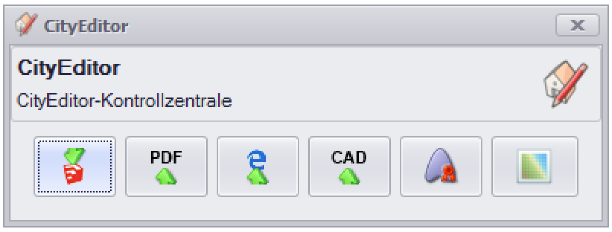
Hintergrundfarbe White

Figure 5.14: MbTiler

5.3.4 Control Center

Via the Control Center the following external modules belonging to the CityEditor can be invoked:

- CityEditorImporter
- CityEditorExport (for exporting to 3D-PDF, CityBrowser or other 3D formats)
- MbTiler
- License Request



CityEditor

CityEditor

CityEditor-Kontrollzentrale

Figure 5.15: Control Center

Chapter 6

6 Import

6.1 Preface

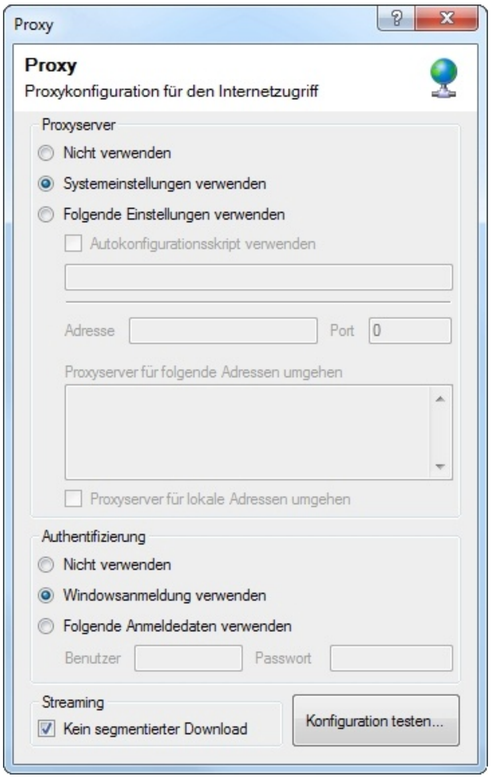
The import happens through the external module CityEditorImporter which can be started through the extension menu under the menu item *Import*.

The CityEditorImporter allows the import of several different data types into a SketchUp model. It is possible to import

- CityGML models, building models from `.dxf`, `.ply` , `.cco`, `.3mf`, `.stl` and `.shp` files,
- terrain grids from `.asc`, `.dem`, `.tif` and `.adf` files, regularly and irregularly distributed terrain points from `.ras` and `.xyz` files that may be processed to a grid, triangulated terrain models from `.dxf` files,
- terrain textures from `.jpg`, `.png`, `.bmp`, `.tif`, `.ecw` and `.jp2` files, OpenStreetMap services or WMS servers,
- vector data from `.shp`, `.dxf`, `.gml`, `.json`, `.geojson` and `.tab` files with the properties described in paragraph 1.3,
- point clouds from `.xyz` and `.csv` files that may optionally contain RGB color values (0-255)
- as well as triangulated, colored surface models from `.ply` and `.obj` files.

For the purposes of an import process, multiple files or directories of the same data type may be imported.

> SketchUp is NOT designed to completely load and edit large-scale city models. Depending on the complexity of a model, one should work with sections of the model not larger than one to three square kilometers.



Proxy

Proxy

Proxykonfiguration für den Internetzugriff

Proxyserver

○ Nicht verwenden

● Systemeinstellungen verwenden

○ Folgende Einstellungen verwenden

□ Autokonfigurationsskript verwenden

Adresse Port 0

Proxyserver für folgende Adressen umgehen

□ Proxyserver für lokale Adressen umgehen

Authentifizierung

○ Nicht verwenden

● Windowsanmeldung verwenden

○ Folgende Anmeldedaten verwenden

Benutzer Passwort

Streaming

☑ Kein segmentierter Download

Figure 6.1: Configutation dialog for accessing a proxy server

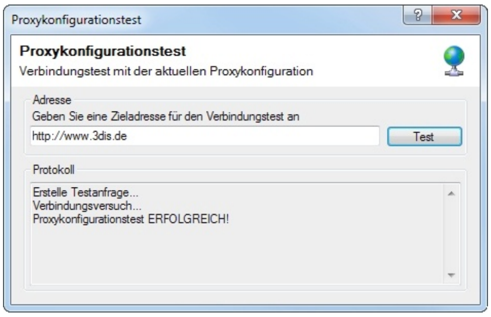
The CityEditorImporter is constructed as an assistant that gradually leads the user through the configuration of an import process. The single configuration steps are explained below.

6.2 Proxy Settings for Online Map Access

The CityEditorImporter allows the regionally limited import of partial datasets. The required import region can be interactively marked by the user in a map view. The map view uses freely available map material from online data sources such as Google and OpenStreetMap. To access these data sources the use of a proxy server may be necessary. The CityEditorImporter offers an according dialog for the configuration of a proxy server access. It can be opened through the main menu (*Settings*→*Proxy...*).

To access the Internet from company networks, the use of a proxy server is frequently required. To adjust the settings as needed, the CityEditorImporter provides the configuration dialog pictured above.

When selecting the option *Use system preferences* takes over the HTTP proxy settings from the Internet settings of the windows control panel. Alternatively, the proxy configurations can be entered manually. Basically, the same configuration options are on hand as in the control panel. Proxy servers in company or agency networks frequently require a user



Proxykonfigurationstest

Proxykonfigurationstest

Verbindungstest mit der aktuellen Proxykonfiguration

Adresse

Geben Sie eine Zieladresse für den Verbindungstest an

http://www.3dis.de

Protokoll

```
Erstelle Testanfrage...
Verbindungsversuch...
Proxykonfigurationstest ERFOLGREICH!
```

Figure 6.2: Dialog for testing the proxy configuration

authentication as well. In this case, the Windows login can be used or username and password can be entered by the user.

In order to optimize the transmission performance, the CityEditorImporter downloads larger files as several segments. Although this segmentation is part of the HTTP standard, experientially, some proxy servers do not support this transmission procedure. In this instance, transmission errors happen that prevent a successful streaming. By deactivating the segmented transmission with the option *No segmented download* this problem can be avoided. This option is automatically set by the download logics, if it recognizes a proxy server.

By clicking the button *Test configuration* another dialog will open in which the proxy configuration can be tested. To find out whether data can be streamed from the Internet with the current proxy configuration, any Internet address can be entered as destination address for the connection test. Out of some agency and company networks, only designated, explicitly approved websites can be accessed, resp. certain websites cannot be accessed. If it is known that the computer on which the connection test is performed is part of such a network, the address chosen as destination address should preferably be that of the host of whom data shall be loaded.

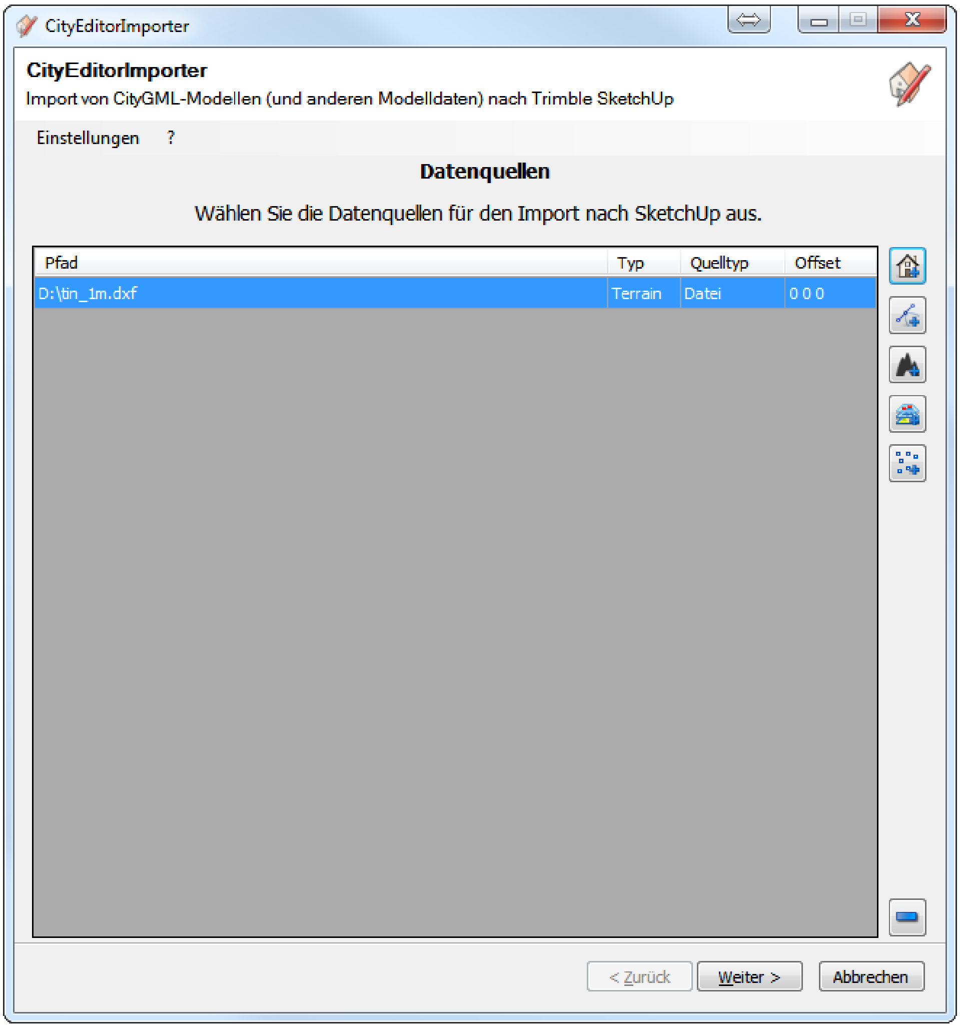
In the log area, any error reports that may appear during the connection test will be listed. They may help with the correction of the defective proxy settings.

The automatic usage of the Windows login information for the proxy authentication is only possible if the authentication is encoded (not with the so-called `Basic` authentication scheme) as the Windows operating system refuses an unsecured transfer of login information. The proxy configuration test checks the proxy login process regarding the use of an unsecured authentication scheme and shows a warning if applicable.

6.3 Import Wizard

6.3.1 Step Data Sources

In this step the user selects files and/or directories for import.



CityEditorImporter

CityEditorImporter

Import von CityGML-Modellen (und anderen Modelldaten) nach Trimble SketchUp

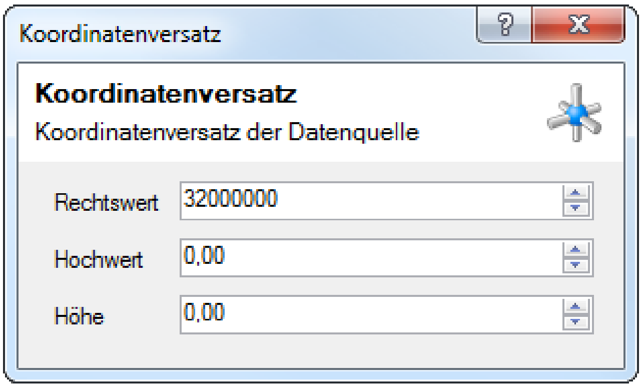
Datenquellen

Wählen Sie die Datenquellen für den Import nach SketchUp aus.

Pfad	Typ	Quelltyp	Offset
D:\tin_1m.dxf	Terrain	Datei	0 0 0

Figure 6.3: Configuration Step *Data sources*

For every added data source a dialog can be opened by double-clicking on the cell in the column Offset. This dialog indicates the coordinate offset for the corresponding data source. The entered offset is added up to the coordinates of the data source before they are taken over into a SketchUp model generated by the CityEditorImporter. This mechanism can be used to harmonize coordinates from different data sources (e.g. when importing data in the UTM system where some files contain coordinates with UTM zone offset that the coordinates of other files do not contain).



Koordinatenversatz
Koordinatenversatz der Datenquelle

Rechtswert 32000000
Hochwert 0,00
Höhe 0,00

Figure 6.4: Dialog for the input of the coordinate offset of a data source

The following file/data types can be imported:

Buildings/CityGML

CityGML models may contain building models, terrain models as well as terrain textures and may be imported from files with the file extension .xml und .gml. Furthermore, the batch mode is available for CityGML models in the scope of which all files selected for import are conveyed into one separate SketchUp model per input file.

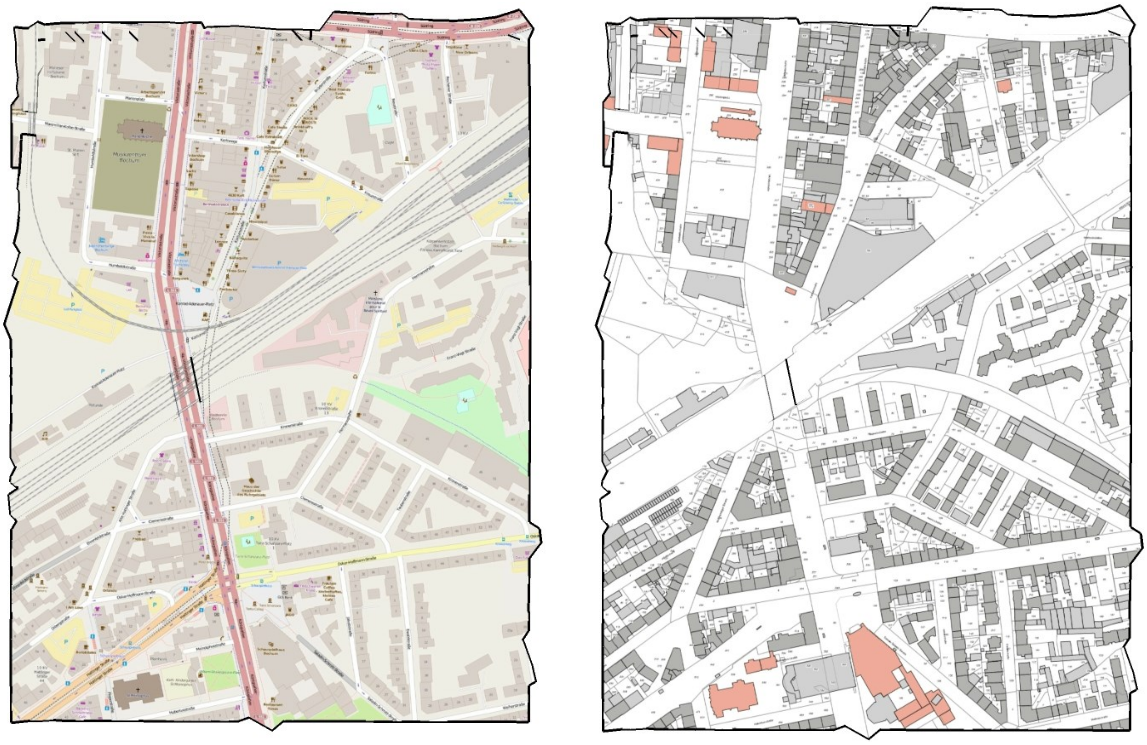
.dxf as well as .shp files may serve as additional data sources for the import of buildings. Due to the variety of format versions and element types, the supported versions and types listed in paragraph 1.3.1 should be particularly regarded.

Terrain Models

Terrain models can be imported as terrain grids from .asc, .dem, .tif and .adf files, as regularly or irregularly distributed terrain points that are processed into a grid from .ras and .xyz files , and as triangulated terrain models from .dxf files.

Terrain Textures

Terrain textures can be put in as. jpg, .png, .bmp and .tif files with related worldfiles and as .ecw and .jp2 files with integrated georeferencing. In these cases a georeference has to be enclosed in a CityGML file or as a separate worldfile. Terrain textures can also be downloaded from web based services such as OpenStreetMap or WMS.

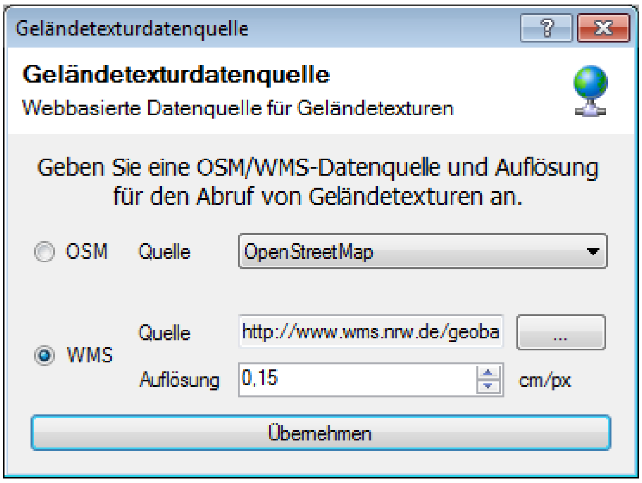


(a) OpenStreetMap-textured terrain

(b) WMS-textured terrain

Figure 6.5: Textured terrain with maps from web based sources

In order to configure an import to use a web based terrain texture source either an OpenStreetMap source or a WMS needs to be specified. If a WMS is used as data source the requested resolution has to be specified as well.



Geländetexturdatenquelle

Geländetexturdatenquelle

Webbasierte Datenquelle für Geländetexturen

Geben Sie eine OSM/WMS-Datenquelle und Auflösung für den Abruf von Geländetexturen an.

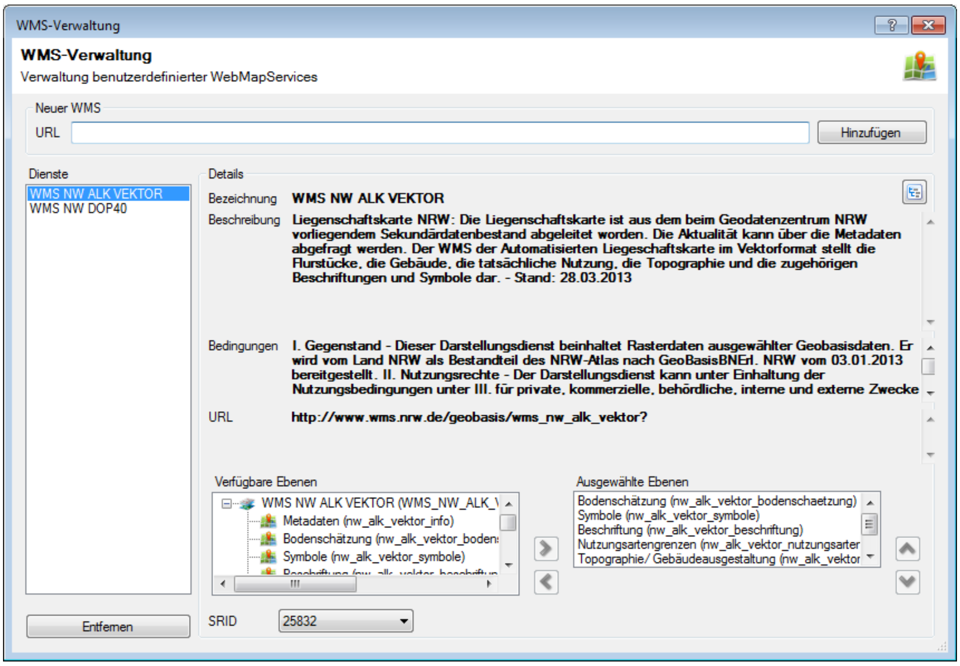
○ OSM Quelle: OpenStreetMap

● WMS Quelle: http://www.wms.nrw.de/geoba

Auflösung: 0,15 cm/px

Figure 6.6: Dialog used to choose a web based source for terrain textures

The WMS-Manager is used to manage multiple WMS services as well as to choose the service to be used as data source for the current import.



Dienste:
- WMS NW ALK VEKTOR
- WMS NW DOP40

Bezeichnung: WMS NW ALK VEKTOR

Beschreibung: Liegenschaftskarte NRW: Die Liegenschaftskarte ist aus dem beim Geodatenzentrum NRW vorliegendem Sekundärdatenbestand abgeleitet worden. Die Aktualität kann über die Metadaten abgefragt werden. Der WMS der Automatisierten Liegeschaftskarte im Vektorformat stellt die Flurstücke, die Gebäude, die tatsächliche Nutzung, die Topographie und die zugehörigen Beschriftungen und Symbole dar. - Stand: 28.03.2013

Bedingungen: I. Gegenstand - Dieser Darstellungsdienst beinhaltet Rasterdaten ausgewählter Geobasisdaten. Er wird vom Land NRW als Bestandteil des NRW-Atlas nach GeoBasisBNErl. NRW vom 03.01.2013 bereitgestellt. II. Nutzungsrechte - Der Darstellungsdienst kann unter Einhaltung der Nutzungsbedingungen unter III. für private, kommerzielle, behördliche, interne und externe Zwecke

URL: http://www.wms.nrw.de/geobasis/wms_nw_alk_vektor?

Verfügbare Ebenen:
- WMS NW ALK VEKTOR (WMS_NW_ALK_V
  - Metadaten (nw_alk_vektor_info)
  - Bodenschätzung (nw_alk_vektor_boden:
  - Symbole (nw_alk_vektor_symbole)

Ausgewählte Ebenen:
- Bodenschätzung (nw_alk_vektor_bodenschaetzung)
- Symbole (nw_alk_vektor_symbole)
- Beschriftung (nw_alk_vektor_beschriftung)
- Nutzungsartengrenzen (nw_alk_vektor_nutzungsarter
- Topographie/ Gebäudeausgestaltung (nw_alk_vektor

SRID: 25832

Figure 6.7: Dialog used for managing WMS services

If a terrain model and terrain textures are selected in the context of an import process, the terrain textures are fitted onto the (three-dimensional) terrain model. Any areas of the texture protruding beyond the terrain model are cut off.

If merely one or several terrain textures are given as import data sources, an even terrain model is generated automatically onto which the terrain textures are fitted. The generated terrain model is on height 0.

Vektor Data

.dxf, .shp, .gml, .json, .geojson and .tab files may serve as vector data sources. If the imported vector objects possess 3D coordinates, the z-coordinate is preserved during import.

The CityEditorImporter uses external data processing components that may cause problems when processing file paths with special characters. Thus, file paths containing special characters (e.g. German umlauts, or 'ß') should be avoided.

Point Cloud

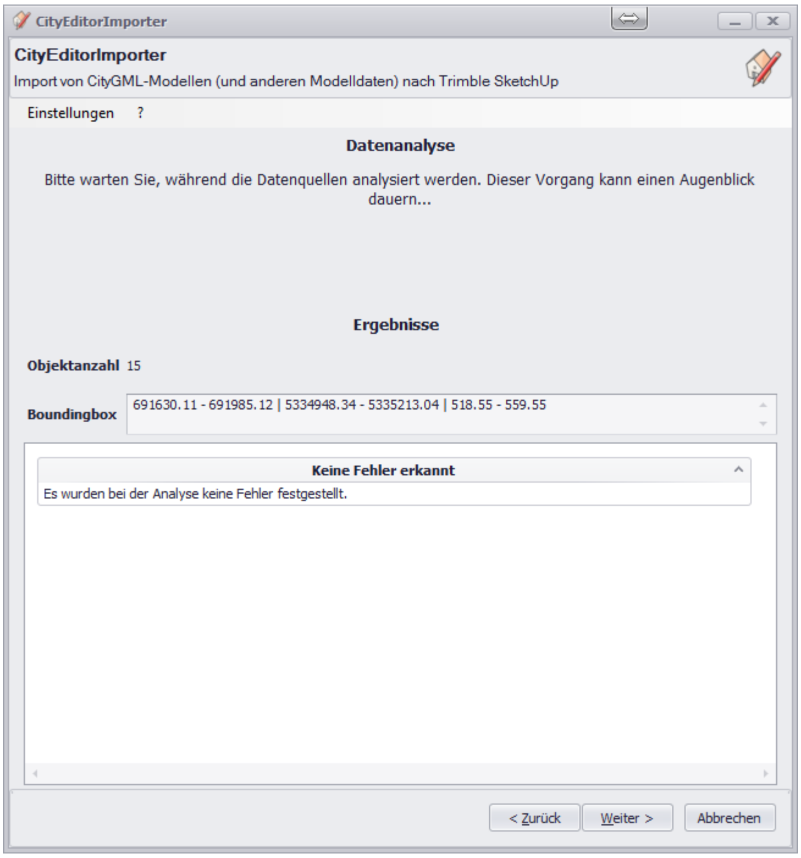
Point clouds can be imported from `.xyz` and `.csv` files that may contain the coordinates of a point as well as an RGB color value (0-255).

Triangulated surface models

Triangulated, colored surface models, e. g. generated models based on UAV data, can be imported from `.ply` and `.obj` files.

6.3.2 Step Preparsing

After the data sources have been selected, the data from those sources is analyzed. Should any problems or inconsistencies be detected additional information is displayed in the result list.



CityEditorImporter

CityEditorImporter

Import von CityGML-Modellen (und anderen Modelldaten) nach Trimble SketchUp

Datenanalyse

Bitte warten Sie, während die Datenquellen analysiert werden. Dieser Vorgang kann einen Augenblick dauern...

Ergebnisse

Objektanzahl 15

Boundingbox 691630.11 - 691985.12 | 5334948.34 - 5335213.04 | 518.55 - 559.55

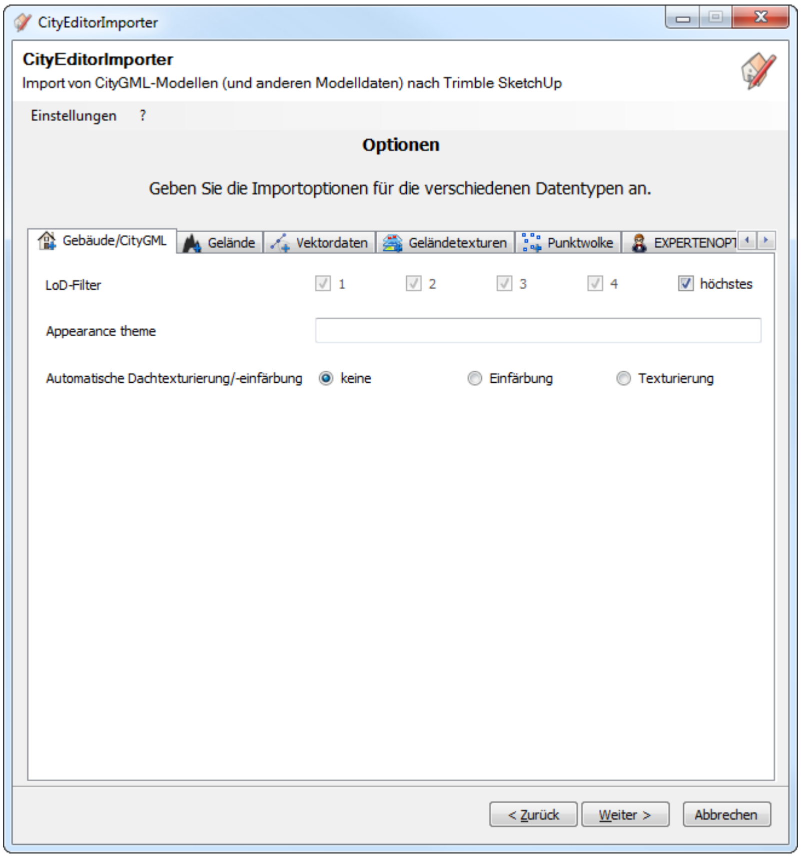
Keine Fehler erkannt

Es wurden bei der Analyse keine Fehler festgestellt.

Figure 6.8: Configuration step *Preparsing*

6.3.3 Step Options

Here, the user can select options to control the import of different data types.



CityEditorImporter

CityEditorImporter

Import von CityGML-Modellen (und anderen Modelldaten) nach Trimble SketchUp

Optionen

Geben Sie die Importoptionen für die verschiedenen Datentypen an.

LoD-Filter ☑ 1 ☑ 2 ☑ 3 ☑ 4 ☑ höchstes

Appearance theme

Automatische Dachtexturierung/-einfärbung ● keine ○ Einfärbung ○ Texturierung

Figure 6.9: Configuration step *Options*

Buildings

If files are imported from CityGML data sources that contain multiple LoDs, the option *LoD-Filter* controls which LoD shall be imported. If one or more LoDs are selected, only such objects are imported that contain geometry definitions in the selected LoDs. If this option is set on *h*ighest, the geometry definition will be imported in the highest LoD for every object that is to be imported. Any lower LoDs will be ignored.

Desweiteren kann ein zu importierendes appearance theme spezifiziert werden. Im Rahmen des Imports kann lediglich ein appearance theme übernommen werden. Enthält ein zu importierendes Modell keine appearance themes, kann dieser Parameter fehlen. Ist vor dem Start eines Imports nicht bekannt, ob ein Modell appearance themes enthält, kann zur Ermittlung der enthaltenen appearance themes nach dem Import die erzeugte Protokolldatei herangezogen werden, in der die gefunden appearance themes in folgendem Format augeführt werden:

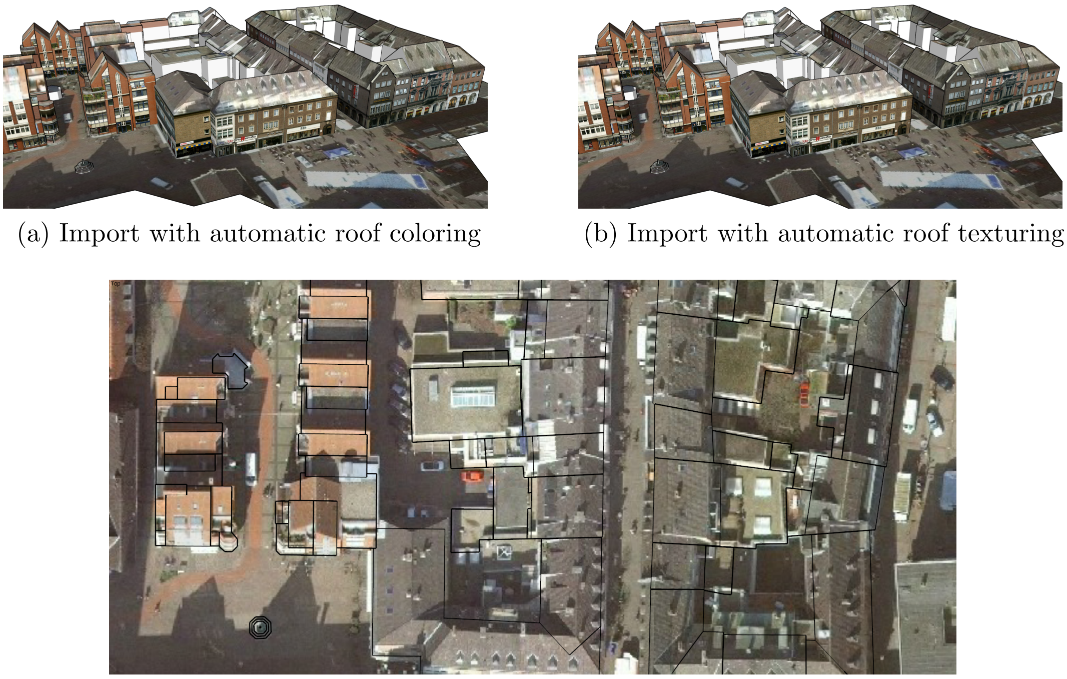
```
[DD.MM.YYYY HH:MM:SS] -----------------------------------------------
[DD.MM.YYYY HH:MM:SS] Input data contains multiple appearance themes:
[DD.MM.YYYY HH:MM:SS] Eignung Solarthermie
[DD.MM.YYYY HH:MM:SS] Eignung Photovoltaik
[DD.MM.YYYY HH:MM:SS] rgbTexture
```

```
[DD.MM.YYYY HH:MM:SS] ------------------------------------------------
```

Listing 6.1: Log message containing a list of collected appearance themes in the import dataset

After picking one of the collected appearance themes the import process can be repeated.

During the import of a CityGML model the roof surfaces contained in this model can be automatically textured or colored using orthophotos imported in the same process.



(a) Import with automatic roof coloring

(b) Import with automatic roof texturing

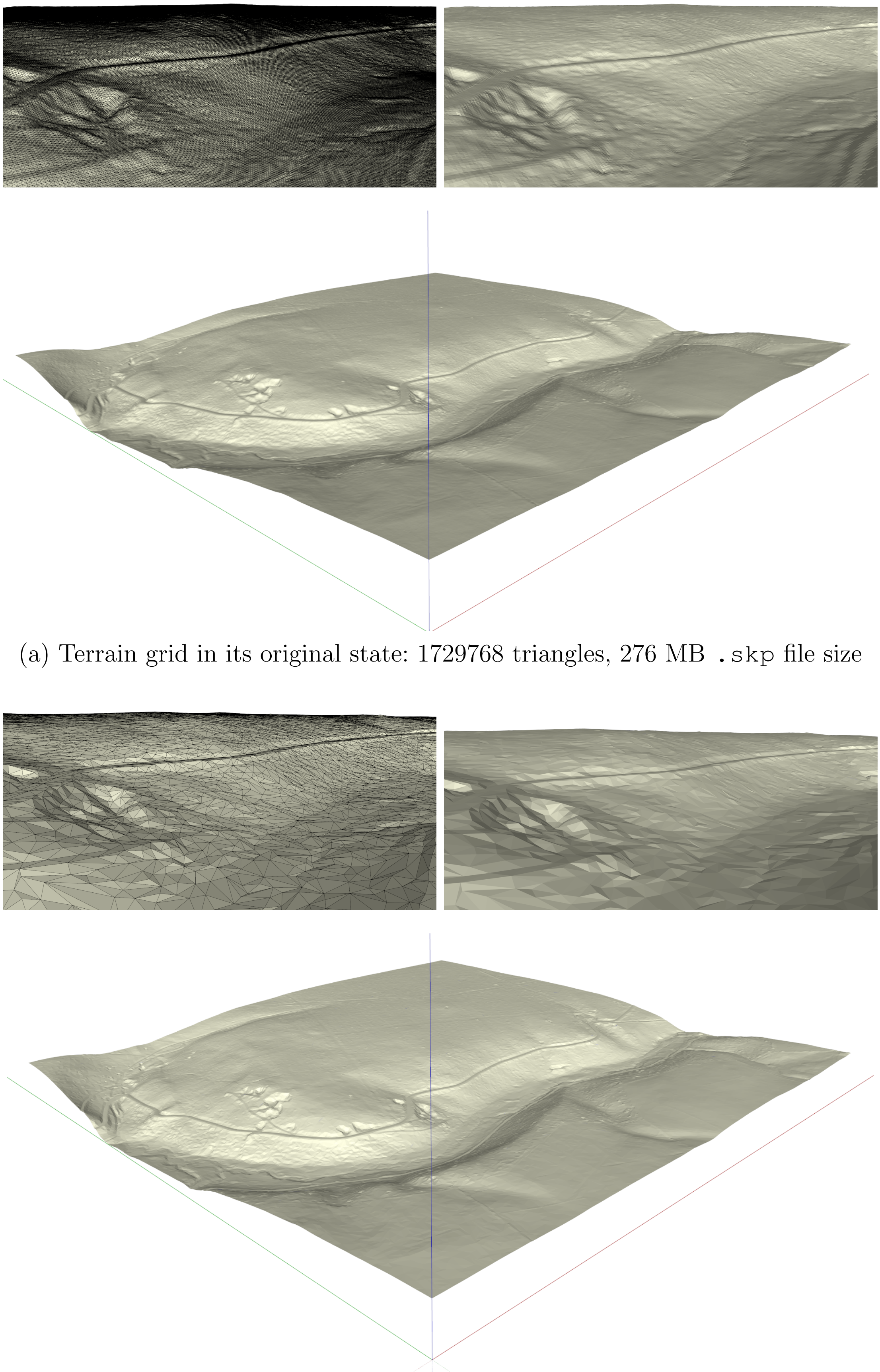
(c) Import with automatic roof texturing (ortho view)

Figure 6.10: Automatic roof texturing/coloring during CityGML import

Terrain Models

When importing terrain grids, the complexity of the imported terrain model can be scaled by setting the *grid step range* by which the grid is to be read off.

Another possibility to reduce complexity is offered by the *Terrain optimization* which can significantly simplify a terrain model while keeping the essential terrain features. The following images show an imported terrain model in the original state and in optimized form.



(a) Terrain grid in its original state: 1729768 triangles, 276 MB `.skp` file size

(b) Optimized terrain grid: 53536 triangles (ca. 3 %), 16 MB `.skp` file size

Figure 6.11: Optimization of terrain models, original data: 920m x 920m terrain grid at a grid size of 1m

When importing large-scale terrain models that are screened in detail or triangulated it is recommended to activate the *terrain optimization* if possible, in order to increase the rendering speed of the model in SketchUp. In respect of the export of the SketchUp model it is also advisable to conduct the Geländeoptimierung as the data volume of exported models will be reduced significantly which facilitates the data exchange.

Terrain Textures

If aerial images are used as terrain textures, they can be stored within SketchUp (fairly) space-saving in the JPEG format (Option *aerial image*). For map material on which vectorial information is pictured (lines, faces, text, etc.) the storing in the JPEG-format would lead to depiction artefacts. In this case the option *map* should be selected which internally stores textures in the PNG format.

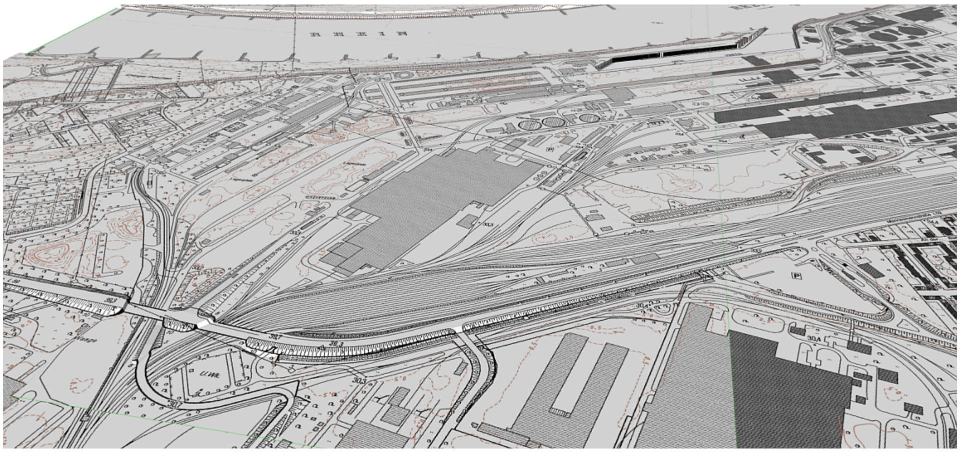


Figure 6.12: Textured terrain model

Only terrain textures with square sized pixels (horizontal resolution equals vertical resolution) can be processed by the CityEditorImporter. If multiple terrain textures are imported, all textures must have the same resolution and must form an non-overlapping grid („clean“ tile schema).

Vector Data

If a terrain model and vector data are imported within one import process, the imported vector data can be blended with the terrain. In doing so, the following options are on hand:

- None: No terrain blending will be performed.
- *Per Vertex*: Terrain blending will be performed for every vertex contained in a vector object.
- *Per Geometr*y: Terrain blending will be performed in the centroid of a vector object.

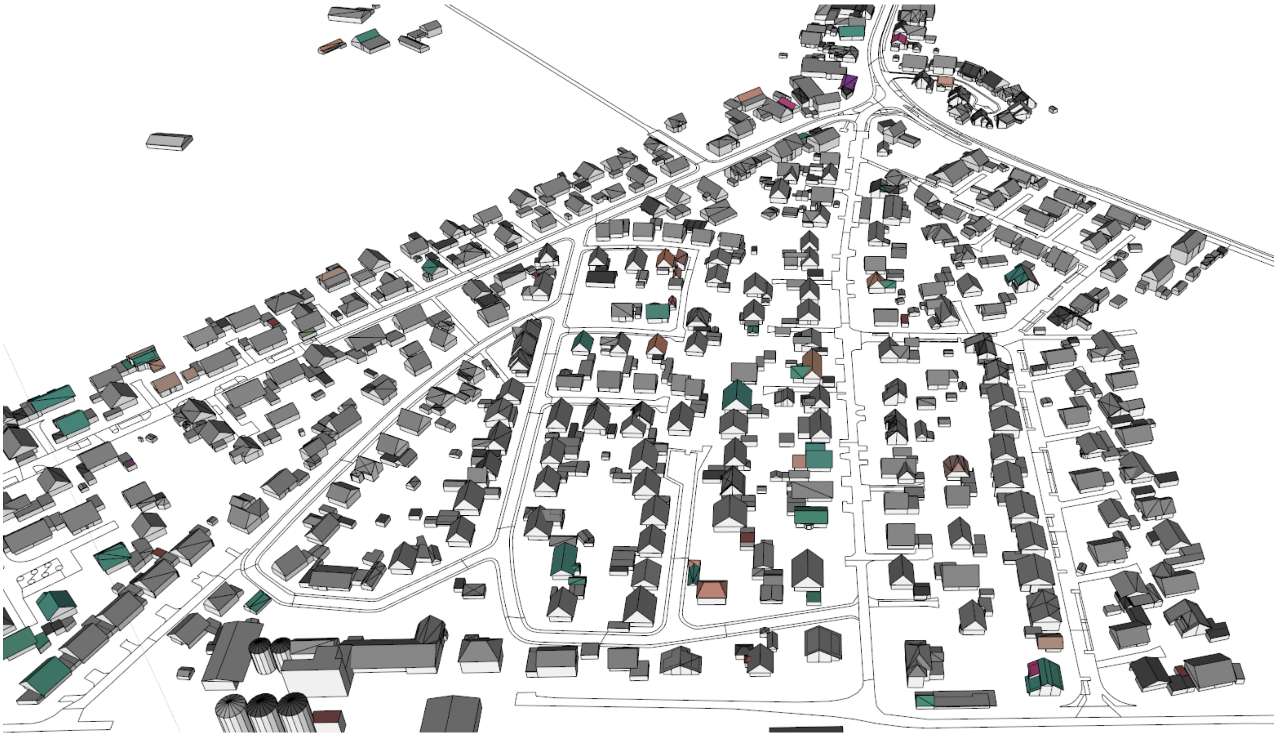
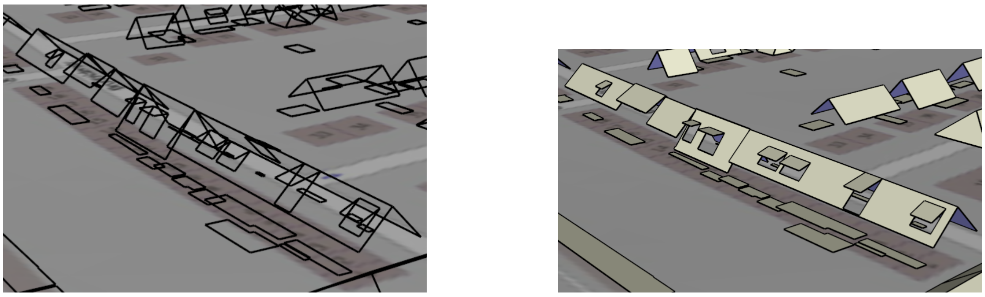


Figure 6.13: City model with underlying street cadaster

On top of that, through an additional determinable offset, vector objects can be raised or lowered relatively to their original height resp. to their height after the terrain blending.

If several vector objects are imported from one or more files, these can either be combined in a SketchUp group (still, in some circumstances starting at a certain number of objects multiple groups have to be formed) or each object can be imported as a singular group by itself.

When importing polygons the *Polygon import mode* option can be used to control whether the polygons shall be imported as rings or filled surfaces.



(a) Import as ring

(b) Import as surface

Figure 6.14: Polygon import mode

When activating the option *Geometry error correction* the program tries to correct any geometry defects (duplicated points, unclosed rings in polygon definition) prior to the import. Defect geometries that cannot be corrected will be skipped during the import.

In the process of a vector data import, not only object geometries will be taken over but also any attributes attached to an object. These attributes may be present in varying encodings and can only be imported correctly if the parameter *Encoding* has been chosen accordingly before import. If the error message

```
Invalid character sequence
```

Listing 6.2: Wrong encoding in import log

appears while processing a vector data source during the import, this indicates that the selected encoding does not match the encoding of the data source. In this case, the import should be repeated with a different choice of parameter.

Point Clouds

Since SketchUp is not equipped with an integrated depiction type for *Point representation* it will be approached by the CityEditorImporter with a cuboid or cross-shaped depiction. It's size can be determined as an import option.

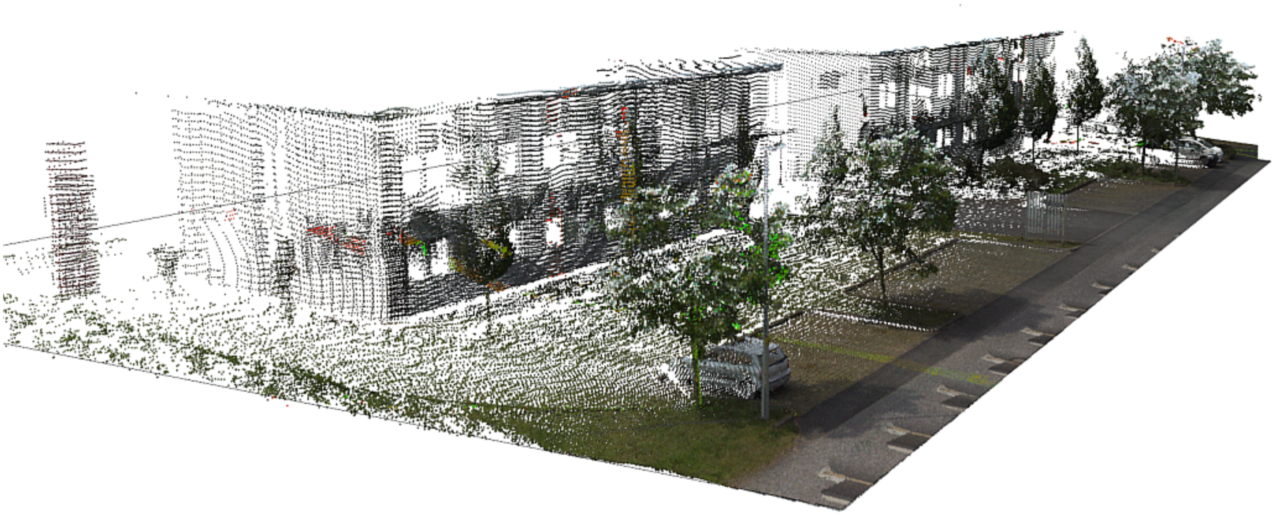


Figure 6.15: Point cloud model in SketchUp

In order to reduce the amount of points to be imported from a data source, the so called voxel grid procedure can be applied. In the course of this centroid reckoning procedure for the reduction and homogenization of the data density, the volume formed by the points meant for import is divided into cubes with fixed edge lengths. Within each of these cubes, the centroid of the point distribution is reckoned. In the calculated centroid a new point is created in the average color calculated from all the points within one cube. Afterwards, all points except for the centroid are discarded.

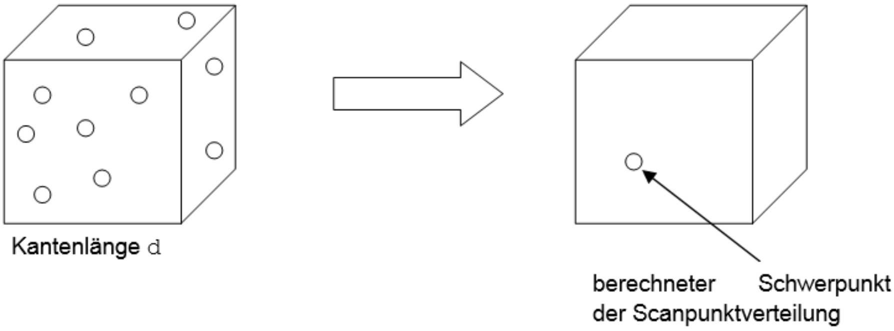


Figure 6.16: Data reduction via the voxel grid procedure

The means of depicting point clouds in SketchUp are limited. By choosing appropriate spatial restrictions and reduction parameters it should thus be attempted to keep the amount of points below 250000 to enable a sufficiently fast display.

Triangulated surface models

The CityEditorImporter subdivides triangulated surface models into a number of spatially segmented groups. The segmentation consists of multiple square model tiles, whose edge length can be controlled through the *Tile size* option.

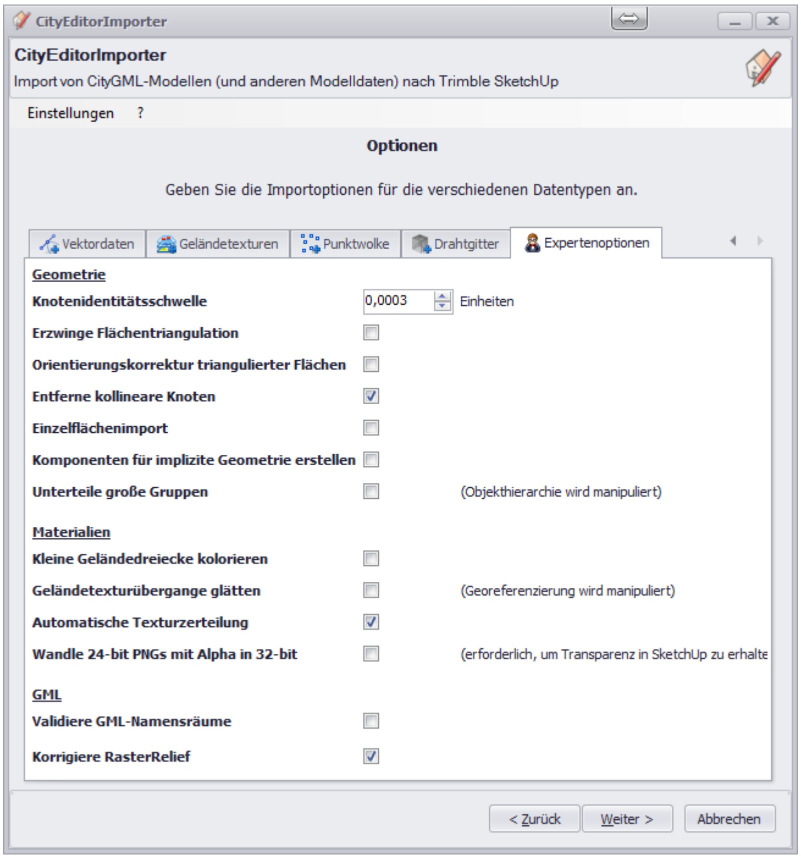
If a surface model that is to be imported consists of colored surfaces, the CityEditorImporter can reduce the number of colors and color materials created in the resulting SketchUp model. A reduction of colors and color materials can be necessary, as the rendering performance in SketchUp decreases significantly if a model contains a large number of materials. The color reduction mechanism can be controlled through the following options:

- *none*: no color reduction is performed
- *ACI* : a color reduction is performed based on a palette of 216 colors
- *4K*: a color reduction is performed based on a palette of 4096 colors

If the *Use textures* option is activated, textures contained in the imported model are imported as SketchUp materials.

> Triangulated surface models may consist of a huge number of surfaces. While working with such models it should be kept in mind, that the rendering speed of SketchUp decreases with an increasing number of surfaces. A maximum of 1500000 surfaces should therefore not be exceeded.

Expert Options



CityEditorImporter

Import von CityGML-Modellen (und anderen Modelldaten) nach Trimble SketchUp

Optionen

Geben Sie die Importoptionen für die verschiedenen Datentypen an.

Geometrie

Knotenidentitätsschwelle 0,0003 Einheiten

Erzwinge Flächentriangulation □

Orientierungskorrektur triangulierter Flächen □

Entferne kollineare Knoten ☑

Einzelflächenimport □

Komponenten für implizite Geometrie erstellen □

Unterteile große Gruppen □ (Objekthierarchie wird manipuliert)

Materialien

Kleine Geländedreiecke kolorieren □

Geländetexturübergange glätten □ (Georeferenzierung wird manipuliert)

Automatische Texturzerteilung ☑

Wandle 24-bit PNGs mit Alpha in 32-bit □ (erforderlich, um Transparenz in SketchUp zu erhalte

GML

Validiere GML-Namensräume □

Korrigiere RasterRelief ☑

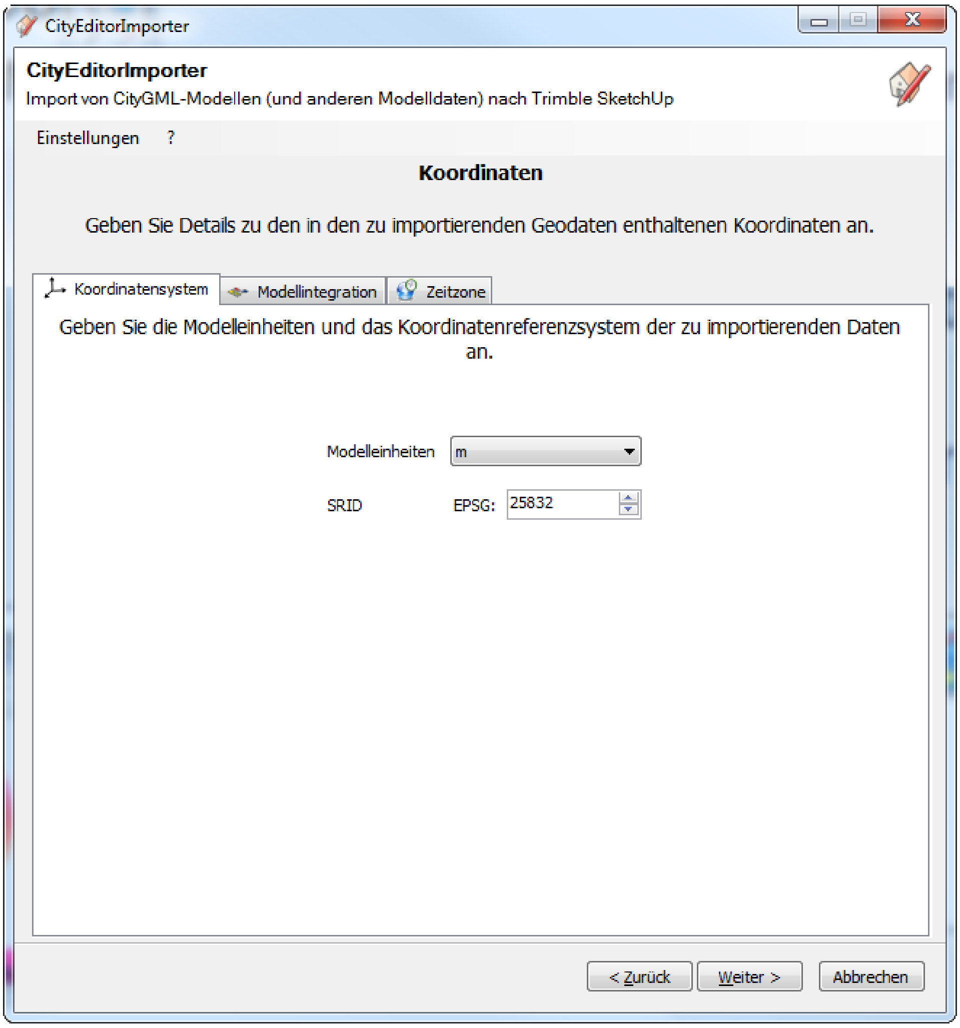
Figure 6.17: Import options for experts

Option	Beschreibung
Geometry	
Vertex identity threshold	When taking over object geometries from different import data sources, it has to be examined, whether faces and line definitions contain duplicated points as SketchUp refuses the adoption of the geometry in such cases. In the scope of this examination, two points are regarded as identical, if they exceed the threshold value specified by the *Vertex identity threshold.*
Erzwinge Flächentriangulation	Ist die Option *Erzwinge Flächentriangulation* aktiviert, werden alle Flächen vor dem Import trianguliert.
Orientierungskorrektur triangulierter Flächen	Werden triangulierte Oberflächenmodelle importiert, kann die Option *Orientierungskorrektur triangulierter Flächen* aktiviert werden, um für eine konsistene Ausrichtung von Flächennormalen nach oben zu sorgen.
Entferne kollineare Knoten	Flächendefinition, die kollinear Knoten enthalten, können bei der Texturierung in SketchUp zu Problemen führen. Wird die Option *Entferne kollineare Knoten* aktiviert, werden diese Knoten beim Import entfernt.

Einzelflächenimport	Standardmäßig versucht der CityEditorImporter, zusammenhängende Flächen gruppiert nach SketchUp zu überführen, um nach Möglichkeit daraus Volumenkörper erzeugen zu können. Werden hierbei Flächen von SketchUp als nicht hinreichend planar erkannt, müssen diese trianguliert und als Dreiecksvermaschung importiert werden. Ist bei einer Datenübernahme aus die geometrisch kongruente Übernahme von Flächen wichtiger als das entstehen von Volumenkörpern in SketchUp, kann die Option *Einzelflächenimport* aktiviert werden. Problematische Flächen werden dann einzeln importiert, wobei SketchUp i. d. R. eine höhere Akzeptanz bzgl. der Planarität von Flächen zeigt.
Komponenten für implizite Geometrien erstellen	Wird ein CityGML-Datensatz mit impliziten Geometrien importiert, kann durch Aktivierung *Komponenten für implizite Geometrien erstellen* erreicht werden, dass beim Import mehrfach instanziierbare SketchUp-Komponenten erzeugt werden. Sofern es hierbei zu Geometriefehlern kommt, sollte diese Option wieder deaktiviert werden.
Unterteile große Gruppen	Werden geometrisch komplexe, hochpolygonale Objekte importiert, kann dies einige Zeit in Anspruch nehmen. Durch Aktivierung der Option *Unterteile große Gruppen* kann der Importvorgang in solchen Fällen beschleunigt werden. Objekte mit vielen Flächen werden dabei in mehrere Objekte mit weniger Flächen unterteilt, die sich schneller importieren lassen.
Materialien	
Kleine Geländedreiecke kolorieren	Durch Aktivierung der Option *Kleine Geländedreiecke kolorieren* werden beim Import texturierter Geländemodelle sehr kleine Dreiecke nicht mit einem Texturmaterial sondern mit einer Durchschnittsfarbe belegt. Der Importvorgang kann dadurch beschleunigt werden.
Geländetexturübergänge glätten	Um beim Import texturierter Geländemodelle einen Saum zwischen Geländetexturkacheln zu vermeiden, kann die Option *Geländetexturübergänge glätten* aktiviert werden.
Automatic Texture Splitting	In order to speed up rendering, SketchUp automatically scales down large textures which might therefore appear blurry when displayed in SketchUp. It is recommended that you activate automatic texture splitting to avoid this effect.
Wandle 24-bit PNGs mit Alpha in 32-bit	Da SketchUp eine Texturtransparenz nur auf Basis von 32-bit PNG-Bildern unterstützt, müssen etwaige 24-bit PNG-Bilder, die Transparenz besitzen, vorab konvertiert werden. Ist die Option *Wandle 24-bit PNGs mit Alpha in 32-bit* wird diese Konvertierung beim Import durchgeführt.
GML	
Validiere GML-Namensräume	Durch Aktivierung der Option *Validiere GML-Namensräume* kann beim Import von CityGML-Modellen geprüft werden, ob alle verarbeiteten XML-Elementen einen gültigen Namensraum besitzen.
Korrigiere RasterRelief	Ist die Option *Korrigiere RasterRelief* aktiviert, werden aus CityGML als `RasterRelief` importierte Geländemodelle auf Ihre Gültigkeit geprüft und falls nötig korrigiert.

6.3.4 Step Coordinates

This configuration step offers the option to determine the system of units used by the data that is to be imported. The system of units of the created SketchUp model will be set according to the adjustments made at this point. Furthermore the numeric EPSG identifier of the coordinate reference system can be indicated. As the selection of an import region is offered in a following step, the declaration of an EPSG identifier is necessary to transfer the region selection into the according coordinate system.



CityEditorImporter

CityEditorImporter

Import von CityGML-Modellen (und anderen Modelldaten) nach Trimble SketchUp

Koordinaten

Geben Sie Details zu den in den zu importierenden Geodaten enthaltenen Koordinaten an.

Geben Sie die Modelleinheiten und das Koordinatenreferenzsystem der zu importierenden Daten an.

Modelleinheiten: m

SRID EPSG: 25832

Figure 6.18: Step *Coordinates*

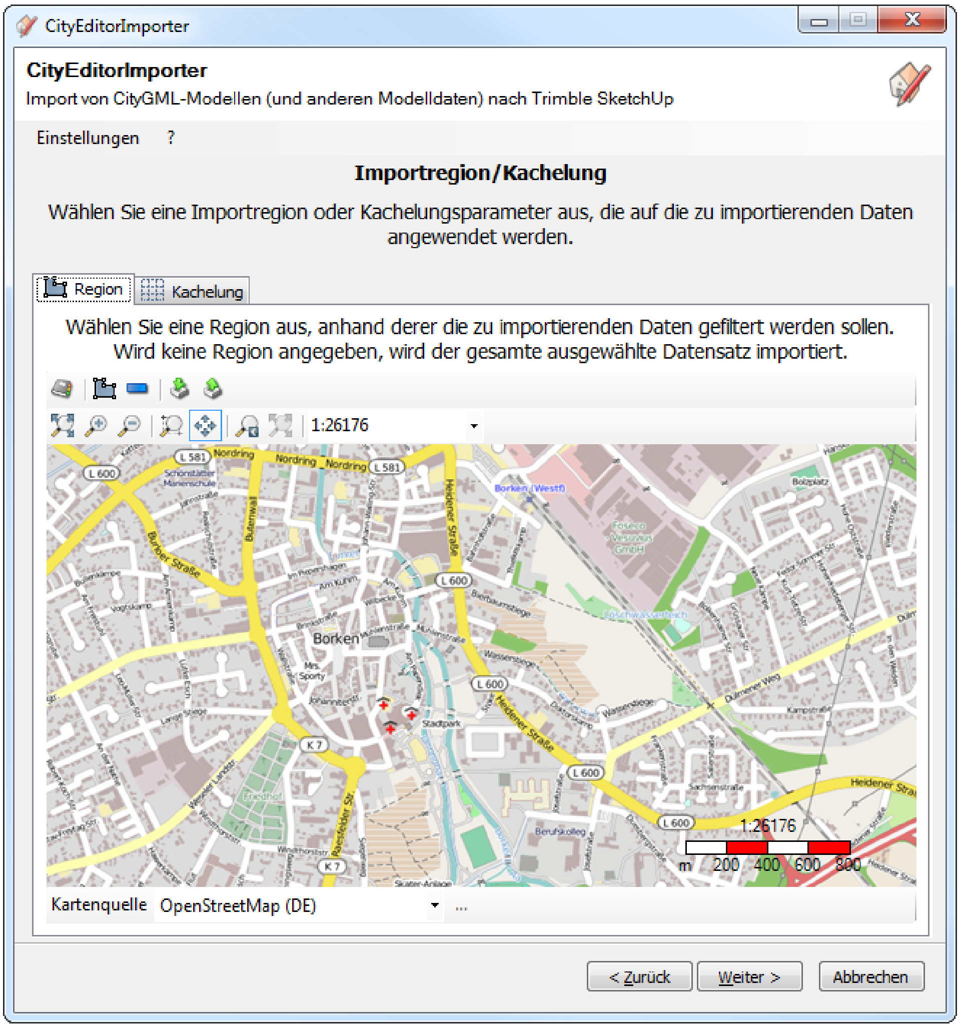
All data meant for import has to be situated in the same coordinate system before import. The CityEditorImporter does NOT perform re-projections/transformations during the import process to harmonize different coordinate systems.

If the imported data is to be integrated into an existing SketchUp model, the file path to the `.skp` file of the existing model has to be specified in this step. Details on the processing of integrating data into existing models are explained in section 6.4.

6.3.5 Step Import Region/Tiling

Importegion

The CityEditorImporter allows the regionally limited import of partial datasets. The import region needed for this can be interactively drawn into resp. removed from a map view. An integrated address search feature facilitates the navigation to the desired target area.



CityEditorImporter

CityEditorImporter

Import von CityGML-Modellen (und anderen Modelldaten) nach Trimble SketchUp

Importregion/Kachelung

Wählen Sie eine Importregion oder Kachelungsparameter aus, die auf die zu importierenden Daten angewendet werden.

Wählen Sie eine Region aus, anhand derer die zu importierenden Daten gefiltert werden sollen. Wird keine Region angegeben, wird der gesamte ausgewählte Datensatz importiert.

Kartenquelle: OpenStreetMap (DE)

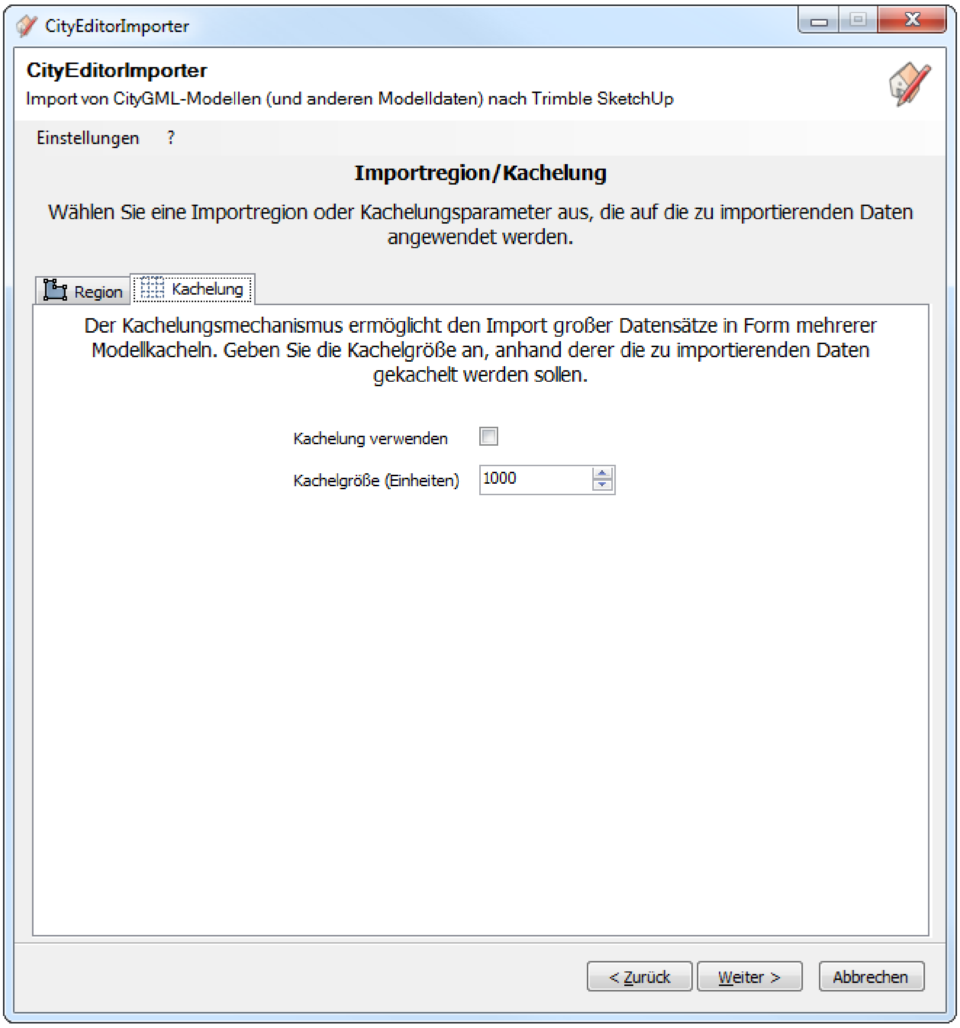
Figure 6.19: Configuration step *Import region*

The map view uses freely available map material from online data sources such as Google and OpenStreetMap for the background depiction. Through the selection list underneath the map view one can switch between available data sources.

An import region can be exported as a `.shp` file as well as imported from a `.shp` file (with contained geometry of the polygon type).

Tiling

SketchUp is not suited for editing large scale or complex models (e. g. entire city models). One possibility to process complete city models and import them into SketchUp is a tiled import. During a tiled import the CityEditorImporter creates multiple `.skp` files containing data from a squared region of defineable size. Furthermore a `.shp` file name `grid.shp` is created that contains an overview of the created model tiles.



CityEditorImporter

Import von CityGML-Modellen (und anderen Modelldaten) nach Trimble SketchUp

Importregion/Kachelung

Wählen Sie eine Importregion oder Kachelungsparameter aus, die auf die zu importierenden Daten angewendet werden.

Der Kachelungsmechanismus ermöglicht den Import großer Datensätze in Form mehrerer Modellkacheln. Geben Sie die Kachelgröße an, anhand derer die zu importierenden Daten gekachelt werden sollen.

Kachelung verwenden □

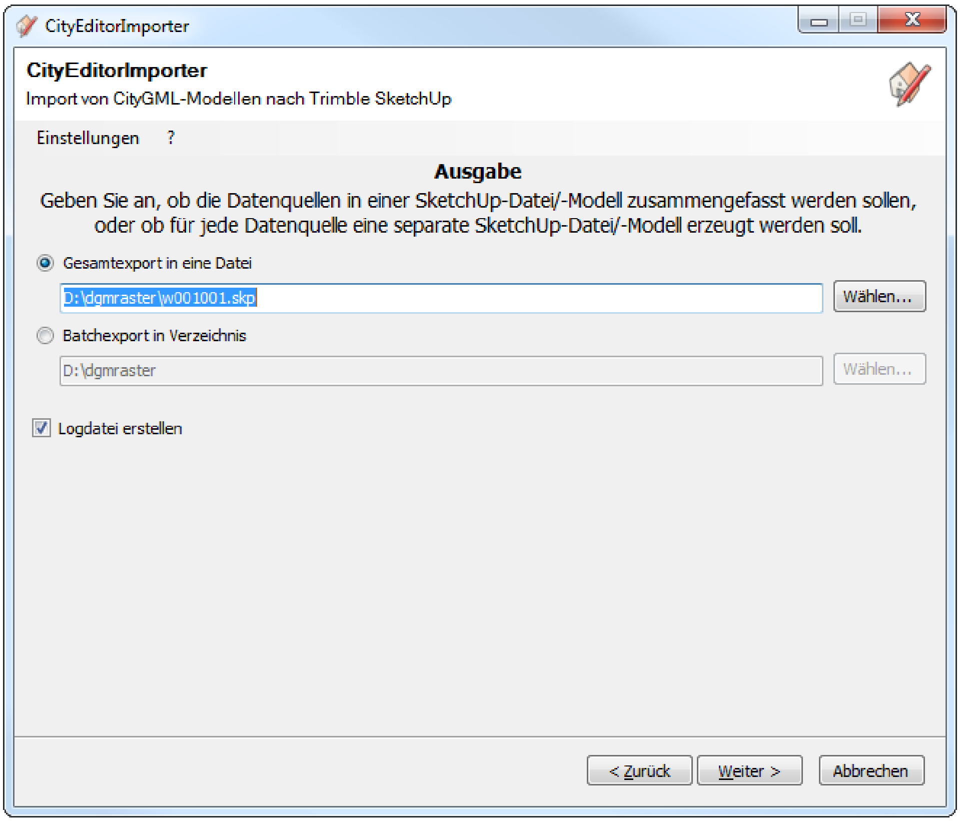
Kachelgröße (Einheiten) 1000

Figure 6.20: Configuration step *Tiling*

The processing of large scale datasets (e. g. complete city models) by the CityEditorImporter can take a considerable amount of time. Even during a tiled import or if an import region is used to limit the amount of data that is imported into SketchUp, each object and geometry needs to be tested against tile bounds or import region.

6.3.6 Step Output

The CityEditorImporter can work either in a mode for single file output or in the batch mode: In the single file output mode the file is put out as a .skpfile selected by the user. This file will subsequently be opened in SketchUp. In the batch mode in which CityGML models can be imported exclusively, each selected CityGML file or each CityGML file contained in a selected directory and its sub directories will be transferred into a separate .skp file.



CityEditorImporter

CityEditorImporter

Import von CityGML-Modellen nach Trimble SketchUp

Ausgabe

Geben Sie an, ob die Datenquellen in einer SketchUp-Datei/-Modell zusammengefasst werden sollen, oder ob für jede Datenquelle eine separate SketchUp-Datei/-Modell erzeugt werden soll.

● Gesamtexport in eine Datei

D:\dgmraster\w001001.skp

○ Batchexport in Verzeichnis

D:\dgmraster

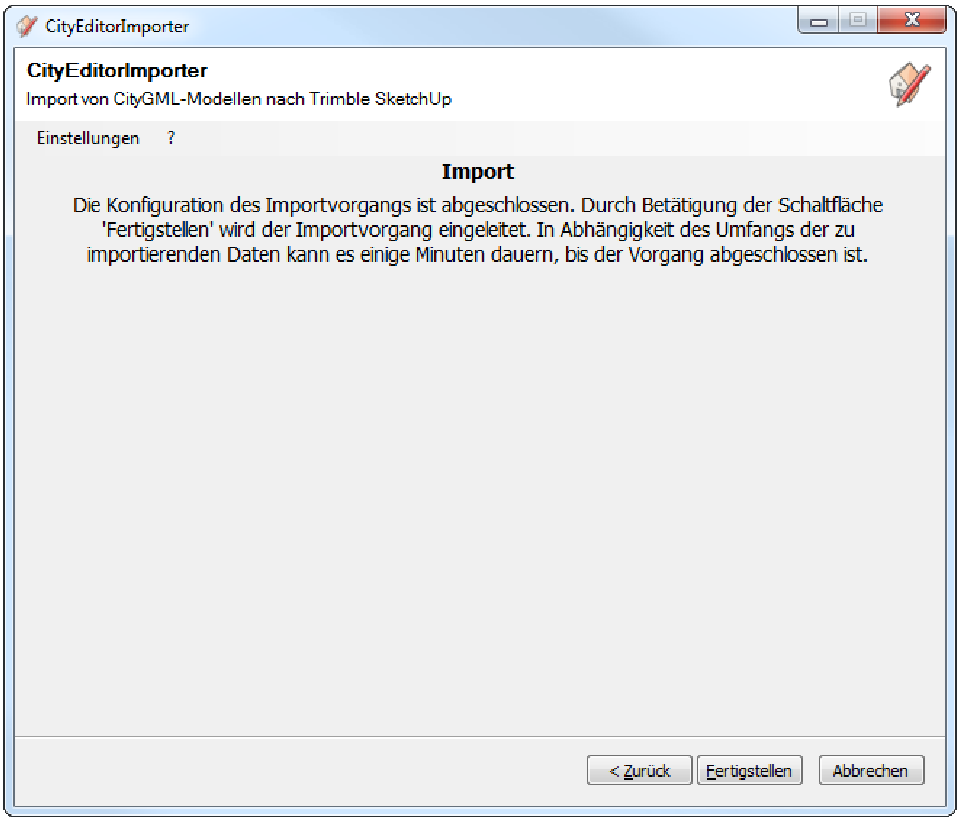
☑ Logdatei erstellen

Figure 6.21: Configuration step *Output*

If the option *Create log file* is activated during the import process an import log with problems that have emerged during the import will be created in the output directory.

6.3.7 Step Import

With the completion of this step, the configuration of the import process is complete. The import is started by clicking on *Finish*.



CityEditorImporter

Import von CityGML-Modellen nach Trimble SketchUp

Import

Die Konfiguration des Importvorgangs ist abgeschlossen. Durch Betätigung der Schaltfläche 'Fertigstellen' wird der Importvorgang eingeleitet. In Abhängigkeit des Umfangs der zu importierenden Daten kann es einige Minuten dauern, bis der Vorgang abgeschlossen ist.

Figure 6.22: Configuration step *Import*

6.4 Import into existing model

If the data selected for import is to be integrated into an existing SketchUp model, the file path to the model's `.skp` file can be specified in the *Coordinates* import step. The CityEditorImporter cannot facilitate the integration of data into an existing model directly. Instead a temporary model in a separate `.skp` file is created, that can be integrated into the final model using SketchUp's import mechansim. This process is explained using a simple example.

In the SketchUp model shown below one building has been removed, which is to be added again through the import of an additional CityGML containing the missing building.

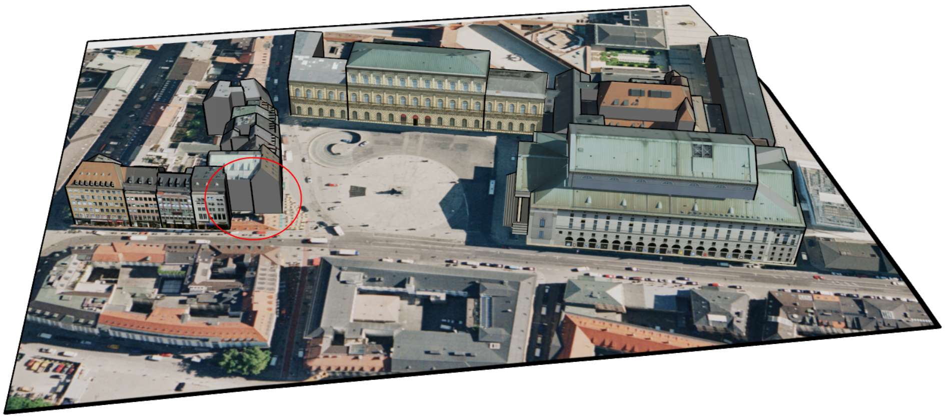


Figure 6.23: Model with missing building

The CityGML model is selected for import using the CityEditorImporter. In the Coordinates step the file path to the `.skp` file containing the final model is selected. Upon starting the import process, the CityEditorImporter will create a temporary SketchUp model with the same geo coordinate original as the final model and import the contents of the CityGML model into it.

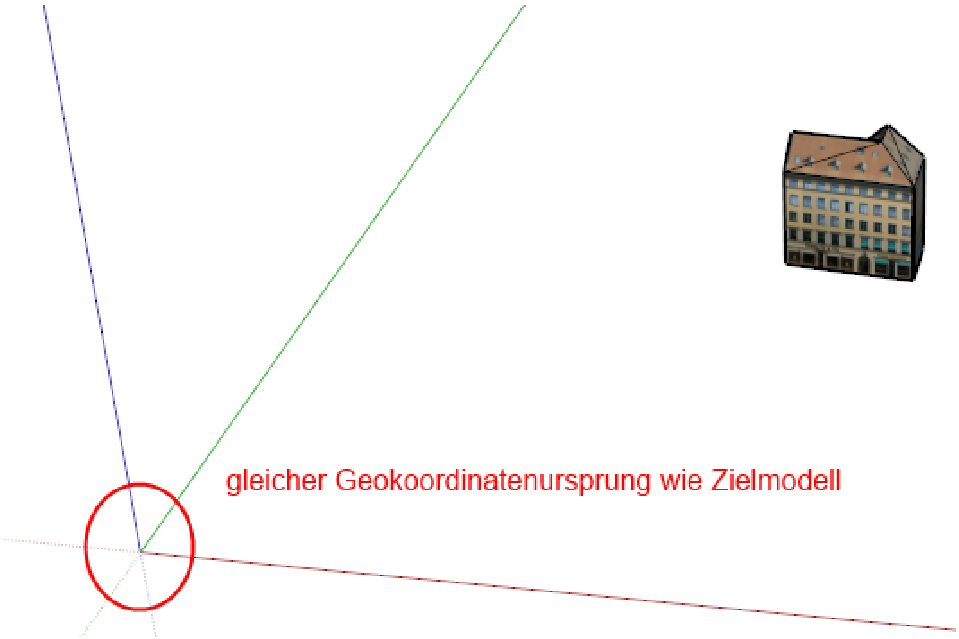


Figure 6.24: Temporary model containing missing building

Using SketchUp's integrated mechanism for combining multiple SketchUp models the temporary model can now be loaded into the final model.

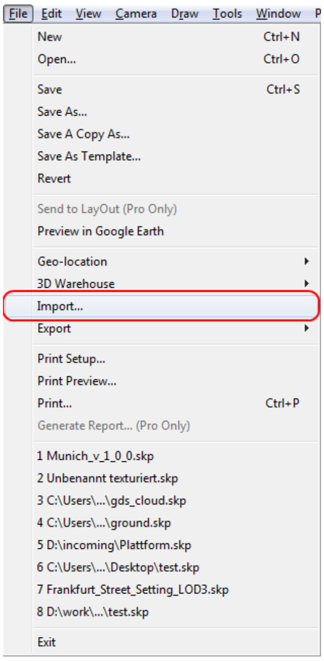


Figure 6.25: Activation of the model import process through the application menu

After choosing the file that is to be imported, the contained model is loaded into the currently opened model and put into movement mode. To correctly place the imported model, its reference point needs to placed on the model origin. Since the geo coordinate origin of both models are the same, the imported model will thus be placed correctly.

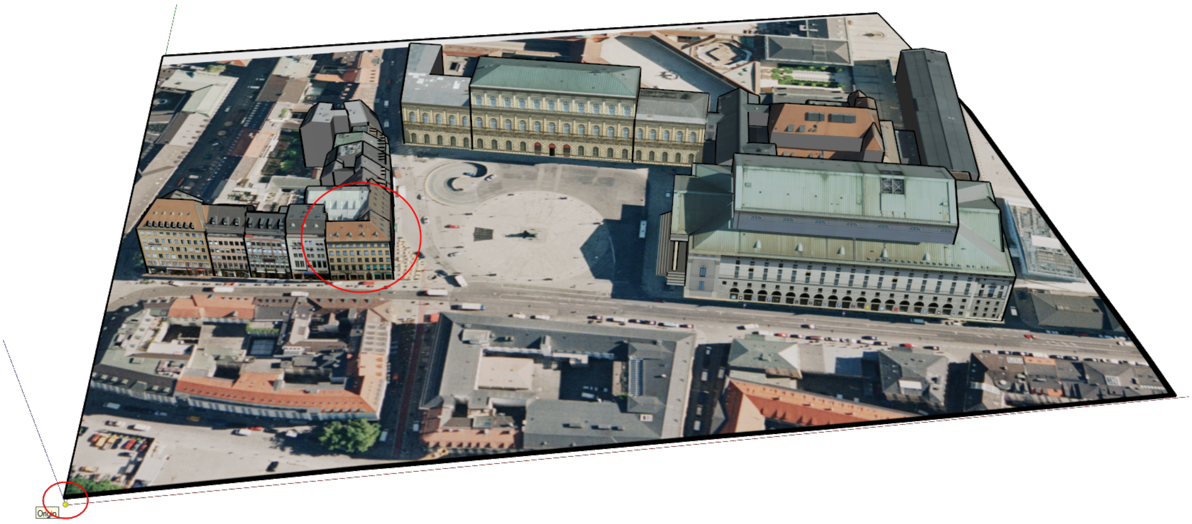


Figure 6.26: Placement of the imported model

6.5 Geo Coordinates in SketchUp

SketchUp is NOT suitable for editing models with geo coordinates. The internal display and tool logic of SketchUp works flawed at best for the large number ranges that are typical for geo coordinates. During an import process, the CityEditorImporter thus relocates a model to the origin of coordinates and saves the geo coordinate offset as a meta-datum in the imported model. If an imported model is opened, it consequently appears in the origin of the SketchUp coordinate system. The determined offset is preserved as a meta-datum attached to the model and can be viewed in the dialog *Model Info* (see paragraph 5.1.1) at any time. During the export to CityGML the offset will automatically be added to the exported coordinates.

Chapter 7

Modeling

7.1 Geometry and Materials

7.1.1 Preface

For a model to be correctly exported from SketchUp into CityGML, some details already have to be considered when modeling. In this chapter, some suggestions for proper modeling with regards to the CityGML export will be explained.

> The suggestions outlined in the following do by no means represent a thorough modeling guideline. They are rather experiences made by users of CityEditor resp. inferences made by communicating with users. Experienced SketchUp users are more than welcome to report further modeling suggestions as well as recommendations for additional SketchUp extensions. They shall be collected in this document.

7.1.2 Proper Grouping of Elements

Elements can be grouped in SketchUp. During the CityGML export, grouped faces from the uppermost grouping hierarchy have been interpreted as Building. Groups within groups are interpreted as `BuildingPart`. Thus the following modeling suggestion: elements in the uppermost level should be grouped in a way that they correspond to a `Building` in the city model. It should be avoided to group this group any further as not to destroy its assignment to `Buildings`. Moreover, any further subgrouping of faces within `Buildings` should be avoided. An exception is the deliberate and intentional modeling of `BuildingParts`. In this context, a `BuildingPart` is to be understood as a sub building and not, as the "naive" adoption of the word from the English language may suggest, the part of a building (see [SIG14]).

7.1.3 Avoiding Self-Intersecting Polygons

In some circumstances, self-intersecting polygons may occur while modeling. Those are not recognized during the export. Furthermore, self-intersecting polygons are not allowed in CityGML. For this reason, it is not predictable how they are handled in this, and other applications processing CityGML.

7.1.4 Prefer to Keep Data in the `.skp` Format

It is recommendable for all models that have originated in SketchUp and thus have not been created by importing data with CityEditor, to keep the `.skp` files as source data and to derive changes from the `.skp` source data if possible. In these `.skp` files all CityGML-based attributes added with CityEditor are (covertly) saved, such as e. g. classifications of faces, or definitions of buildings. Hence, CityGML-specifics do not get lost when saving models as .skp file.

7.1.5 No Material on Grouped Faces

It is possible in SketchUp, to “cast” material upon groups of `Faces`. It will then be visible on all faces of the group without it being data-wise copied into the according faces. But, since during the CityGML export solely materials that are directly assigned to `Faces` will be considered, such “indirectly” defined materials will be disregarded.

7.1.6 Material on Face Front/Back Sides

Materials can be imported and exported upon the front and back side of faces. In CityGML, materials on back sides are marked with the `isFront` element of a `surfaceDataMember`.

It should be considered that back sides of faces and therewith the materials located on them are not displayed in the further processing of CityGML models. Therefore, the features required for the correction of material defects are obtainable over the context menu and the menu bar.

The following correction features are currently offered:

- *Reverse Faces*: This feature takes the material off the front and back sides of the selected face(s), reverses the face(s) and puts the material back on the face(s). Thus it does not change optically, although the orientation has altered.
- *Remove Backmaterial*: Removes material from the back side of the surface.

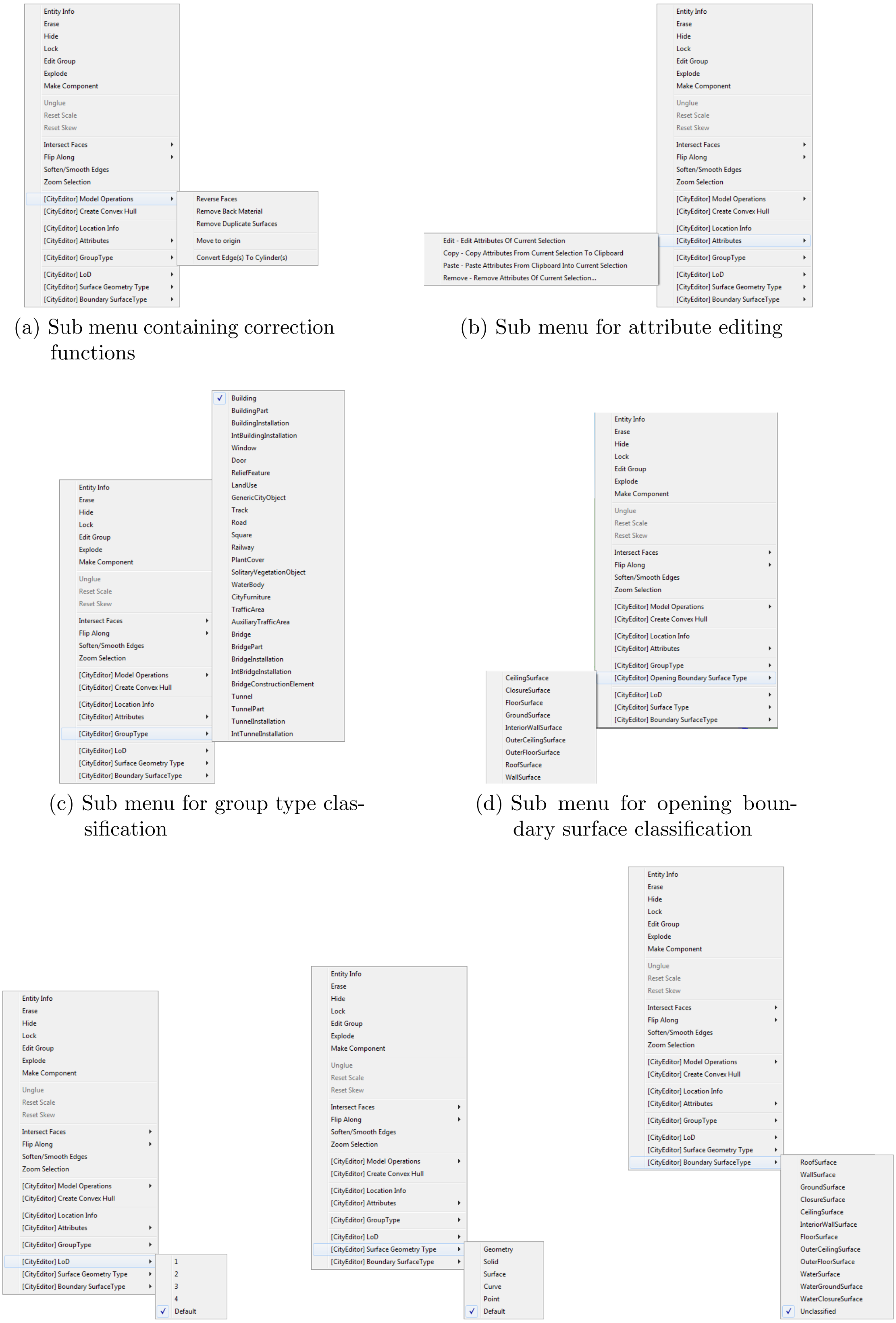
Furthermore, the feature *Select surfaces with back materials* is offered through the menu bar. It selects all surfaces that have material on their back sides.

The features outlined above affect all selected faces.

7.2 Attributes

7.2.1 CityEditor Context Menu

In the process of editing group and surface attributes the CityEditor context menu is of significant importance.



(a) Sub menu containing correction functions

(b) Sub menu for attribute editing

(c) Sub menu for group type classification

(d) Sub menu for opening boundary surface classification

(e) Sub menu for LoD classification

(f) Sub menu for surface classification

(g) Sub menu for boundary surface classification

Figure 7.1: CityEditor context menu

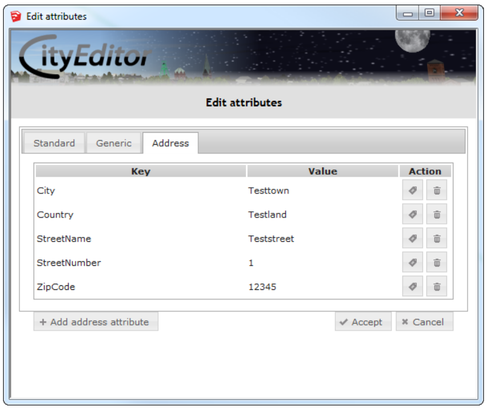
The context menu extends SketchUp's standard context menu by additional menu items that can be used to set group and surface types, open the attibute editor, etc. CityGML invalid classifications will be temporarily replaced during the export, which will result in a valid CityGML model.

The items in the context menu are explained in greater detail in the following sections.

7.2.2 Attributes for Groups and Singular Faces

The CityEditor enables the editing of attributes for grouped elements as well as for singular faces in the CityGML-specific attribute scheme. In order to edit the attributes of an element group, a group has to be selected with a right click and the menu item *CityEditor attributes* → *Edit* has to be chosen in the opening context menu. The procedure for editing the attributes of singular faces is likewise.

A dialogue appears in which all existing attributes are listed. The attributes are subdivided into the categories Standard (Attributes with special relevance in the CityGML attribute scheme), *Generic* (generic attributes of various data types) and *Address* (address attributes of a group element). They can be selected over the according tab.



Key	Value	Action
City	Testtown	🏷 🗑
Country	Testland	🏷 🗑
StreetName	Teststreet	🏷 🗑
StreetNumber	1	🏷 🗑
ZipCode	12345	🏷 🗑

Figure 7.2: Dialog for attribute editing

All changes made in the dialogue screen can be undone by closing the dialogue via the *Cancel* button. By clicking on *Accept*, all changes are saved.

Editing

To change an attribute that has already been created, the button 🏷 on the right side of the attribute has to be clicked on. An input mask opens in which the value can be changed.

Adding

If a new attribute shall be added, the button *Add attribute* has to be clicked. An input mask appears in which type, name and value of the new attribute can be determined.

When adding a *Standard attribute*, its name can be selected from a list of attributes that are predefined in the CityGML standard. The name of a new *Generic attribute* can be chosen freely with the exception of names of *Standard attributes* (regardless of upper and lower case).

Deleting

To delete an attribute, the button 🗑 has to be clicked.

7.2.3 Attribute LoD

It can be determined for each face, to which LoD representation of an object it shall be assigned. To alter the LoD of a face, the submenu *[CityEditor] LoD* of the context menu can be used. A list appears out of which one of the valid LoDs (0 - 4) can be selected.

7.2.4 Surface Type

The geometry type, which represents the object, can be determined for each face. To alter the geometry type of a face, the submenu *[CityEditor] Surface Type* of the context menu can be used. One of the following types can be selected:

- `lodXMultiSurface`
- `lodXTerrainIntersection`
- `lodXMultiCurve`
- `lodXFootPrint`
- `lodXRoofEdge`
- `lodXSolid`

The default option removes the assigned `SurfaceType`. Unclassified faces will be exported with a default type, which can be partialy modified with the export dialog.

7.2.5 Attribute `Boundary SurfaceType`

For each face, the `Boundary SurfaceType` that this face shall receive during export can be determined. To change the `SurfaceType` of a face, the submenu *[CityEditor]*

*Boundary Surface*Type of the context menu can be used. A list appears in which the user can choose between the following types:

- `RoofSurface`
- `WallSurface`
- `GroundSurface`
- `ClosureSurface`
- `CeilingSurface`
- `InteriorWallSurface`
- `FloorSurface`
- `OuterCeilingSurface`
- `OuterFloorSurface`
- `WaterSurface`
- `WaterGroundSurface`
- `WaterClosureSurface`

The currently assigned `SurfaceType` is tagged with a check mark. If there is no check mark, no `SurfaceType` is assigned. By selecting *None* the attribution of the `SurfaceType` is deleted.

7.2.6 Attribut `GroupType`

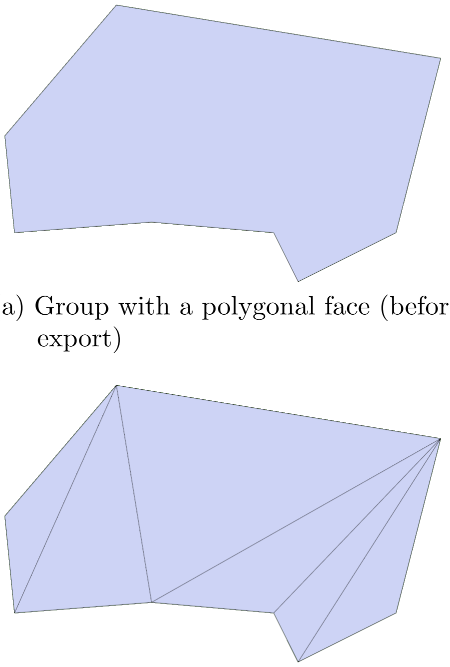
It can be determined for each group separately, which `GroupType` this group shall receive during export. To change the `GroupType` of a group, the submenu *[CityEditor] GroupType* of the context menu can be used. A list appears in which the user can choose between the following types:

- `Building`
- `BuildingPart`
- `BuildingInstallation`
- `IntBuildingInstallation`
- `Window`
- `Door`
- `ReliefFeature`
- `LandUse`

- GenericCityObject
- CityObjectGroup
- Track
- Road
- Square
- Railway
- PlantCover
- SolitaryVegetationObject
- WaterBody
- CityFurniture
- TrafficArea
- AuxiliaryTrafficArea
- Bridge
- BridgePart
- BridgeInstallation
- IntBridgeInstallation
- BridgeConstructionElement
- Tunnel
- TunnelPart
- TunnelInstallation
- IntTunnelInstallation
- Room
- BuildingFurniture
- BridgeRoom
- BridgeFurniture
- HollowSpace
- TunnelFurniture

The currently assigned GroupType is tagged with a check mark. If there is no check mark, no GroupType is assigned. By selecting *None* the attribution of the GroupType is deleted.

Faces that shall serve as a terrain model should be pooled in a group with the `GroupType ReliefFeature`. As groups of this type are exported in the terrain model version `TINRelief` during the CityGML export, all faces with more than three vertexes will be triangulated. In the course of this, a TIN is created that can be properly exported as a `TINRelief` according to the CityGML standard.



(a) Group with a polygonal face (before export)

(b) `TINRelief` in CityGML (after export)

Figure 7.3: Tranformation into `TINRelief` during Export

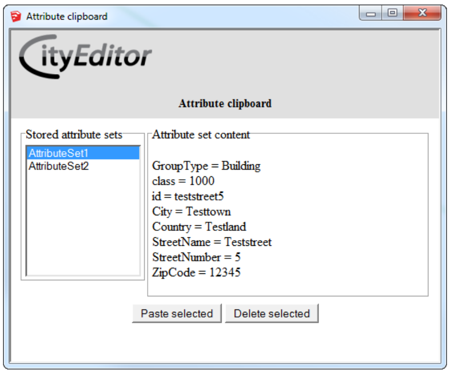
7.2.7 Modeling of Openings (Door, Window)

Two classifications are required in order to export a SketchUp group as an opening. The first one is the GroupType classification, which needs to be set to an opening type. Following this a new menu entry will appear in the context menu: *[CityEditor] Opening Boundary Surface Type*. This menu entry can be used to determine the Boundary Surface Type of the opening. The latter classification is required in order to determine the placement of the opening in the exported CityGML model.

7.2.8 Copy/Paste Attributes

When editing models, it may occur that a face has to be replaced by another face while maintaining its attributes. The attributes do not have to be entered anew. All attributes of a face or group can be transferred to another face or group with the help of the Attribute clipboard.

In order to copy its attributes into the clipboard, a face/group has to be selected with a right click. In the appearing context menu, the menu item *[CityEditor] Attributes→Copy* is to be chosen. This way, the attributes are copied into the clipboard as a so-called Attribute set. As long as SketchUp is not shut down, all Attribute sets can be pasted back into the model.



GroupType = Building
class = 1000
id = teststreet5
City = Testtown
Country = Testland
StreetName = Teststreet
StreetNumber = 5
ZipCode = 12345

Figure 7.4: Display of the Attribute sets in the clipboard

If attributes from the clipboard are to be transferred onto a group/face, it has to be selected with a right click, first. In the appearing context menu the menu item *[CityEditor] Attributes→Paste* has to be chosen. The Attribute clipboard will open and show all the Attribute sets maintained in the clipboard that match the selected element (face or group). The content of a selected Attribute set can be transferred onto the selected group/face by clicking on the button *Paste selected*.

7.3 Inspection of Models

The screenshot below shows a textured building model that seems properly modeled at first sight.

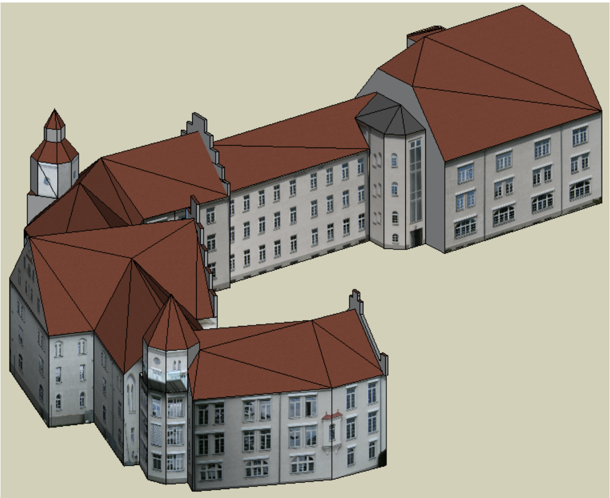


Figure 7.5: Textured building model (appears properly modeled at first glance)

In fact however, this model contains a number of falsely oriented faces. The right orientation of faces can be visually checked in SketchUp very easily by activating the face view style over the menu *View* → *Face Style* → *Monochrome*.

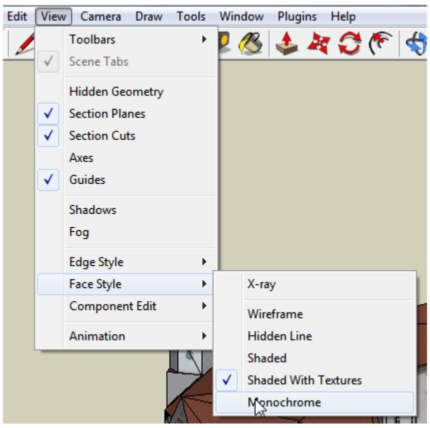
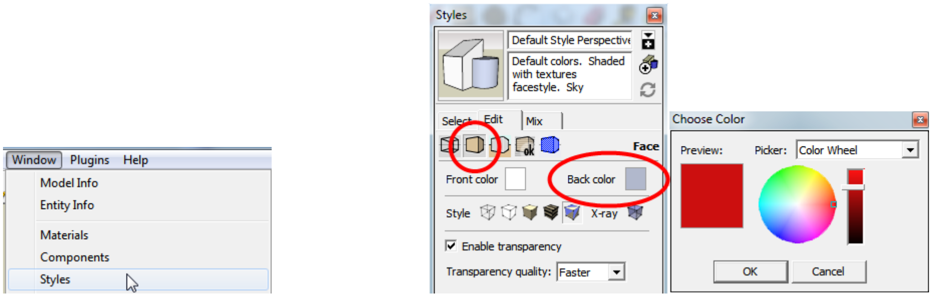


Figure 7.6: Menu option for the face view style

On top of that, the color for face back sides can be set to a distinctly recognizable color (e. g. red) via *Windows* → *Styles* → *Edit*.



(a) Opening the dialog *Styles* through the *Window* menu

(b) Color settings for face back sides in the dialog *Styles*

Figure 7.7: Modification of the color settings for face back sides.

After modifying the view options, the falsely oriented faces are clearly recognizable.

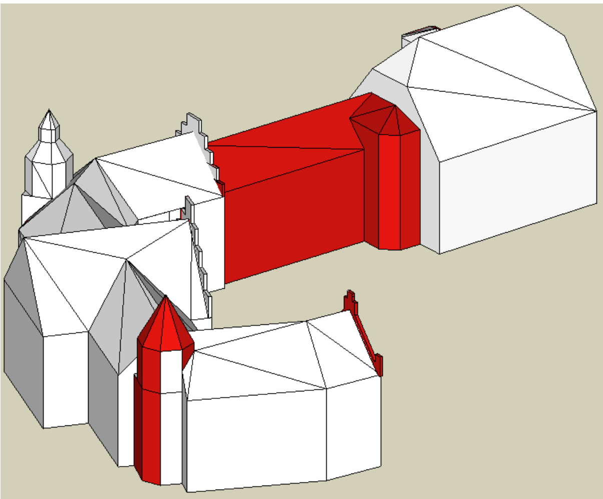


Figure 7.8: Falsely oriented faces in the monochrome mode

If possible, the inspection of face orientation should be conducted BEFORE faces are covered with material.

7.4 Additional Useful SketchUp Extensions

The following table lists some SketchUp extensions that may be of use for the creating and editing of building models. The brief descriptions have been extracted from the original English descriptions of the extensions.

Name	Description	Source
CleanUp^3	Cleans up and optimizes your SketchUp model.	WWW
ColorBySlope	This script paints faces based on their slope.	WWW
ColorByZ	ColorByZ paints faces based on their centerpoint's Z height.It uses colors selected by the user.	WWW
ExtrapolateColors	This script finds materials used within a selection of faces, and then randomly applies those same materials to all selected faces that have no material already applied.	WWW
FlattenFaces	This plugin allows the user to lay arbitrarily-oriented faces flat on the ground.	WWW
GroupByLayer	Explodes all groups and components, then regroups all entities by layer.	WWW
Instances	Select all instances of a selected component.	WWW
MakeFaces	Makefaces.rb loops through your model and creates faces where faces need to be created.	WWW
MoveToOrigin	Quickly move your whole model or the selection to the Origin	WWW
MoveToOriginAndCenter	Moves the entire selection to the axis origin, and places the models center at the origin.	WWW
OnionDomeCreator	This drawing tool allows you to enter specific values to create a complex, onion dome shape. Once thought to be impossible to create in SketchUp, this script makes it as simple as 3 clicks.	WWW
ReverseFaces	After activating the tool, a left click will reverse any face. Allows for faster management of backwards faces.	WWW
RoofPaint	Easily paint sloped or vertical faces.	WWW
SelectionToys	Provides a wide range of selection modifiers, filter out all edges, faces etc. Let you quickly select entities with similar properties such as material, layer orientation etc. Also let you select similar instances of the same Dynamic Component.	WWW
SketchyPhysics	SketchyPhysics is a physics plugin for Google Sketchup. It combines a simple and easy to use interface with the power of a fast and accurate physics library, the Newton SDK.	WWW
StrayLines	Label, Select, Delete or Show all the open-ended line segments in a drawing. This is an EXCELLENT script for assessing how much cleaning up an imported CAD drawing will need.	WWW
SuSolid	SuSolid is an extension for SketchUp that can help you prepare the model for 3D Printing.	WWW
Windowizer3	Creates storefront windows from selected faces.	WWW

The SketchUp extensions listed above are neither developed nor distributed by 3DIS. 3DIS does not assume any warranties for these extensions. On no account, 3DIS can be held liable for any damages that have or may have been caused by these extensions or emerged in direct or indirect correlation with the installation or usage of these extensions.

On the following websites whole directories of SketchUp extensions are available. Browsing for more useful extensions may be worthwhile.

Name	Description	Source
Smustard.com™ - the Companion to SketchUp™	Directory with free and fee-based SketchUp extensions	WWW

SketchUp Extension Warehouse	Official directory for SketchUp extensions	WWW
SketchUp Ruby Scripts	Collection of Ruby Plugins for SketchUp	WWW
SketchUp Plugins and Blog	Manuals and Plugins for SketchUp	WWW
ruby library depot	Extensive collection of Ruby Plugins for SketchUp	WWW

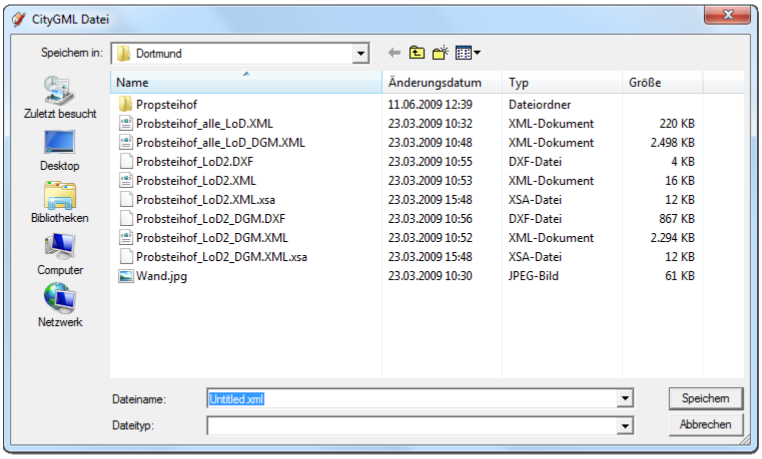
Chapter 8

8 Export

8.1 CityGML

8.1.1 Exporting the Current Model

To export the currently opened SketchUp model to CityGML, the menu item *Plugins→CityEditor→Export* has to be selected. A file dialog is opened in which the storage path for the CityGML file that is to be created has to be specified.



Speichern in: Dortmund

Name	Änderungsdatum	Typ	Größe
Propsteihof	11.06.2009 12:39	Dateiordner	
Probsteihof_alle_LoD.XML	23.03.2009 10:32	XML-Dokument	220 KB
Probsteihof_alle_LoD_DGM.XML	23.03.2009 10:48	XML-Dokument	2.498 KB
Probsteihof_LoD2.DXF	23.03.2009 10:55	DXF-Datei	4 KB
Probsteihof_LoD2.XML	23.03.2009 10:53	XML-Dokument	16 KB
Probsteihof_LoD2.XML.xsa	23.03.2009 15:48	XSA-Datei	12 KB
Probsteihof_LoD2_DGM.DXF	23.03.2009 10:56	DXF-Datei	867 KB
Probsteihof_LoD2_DGM.XML	23.03.2009 10:52	XML-Dokument	2.294 KB
Probsteihof_LoD2_DGM.XML.xsa	23.03.2009 15:48	XSA-Datei	12 KB
Wand.jpg	23.03.2009 10:30	JPEG-Bild	61 KB

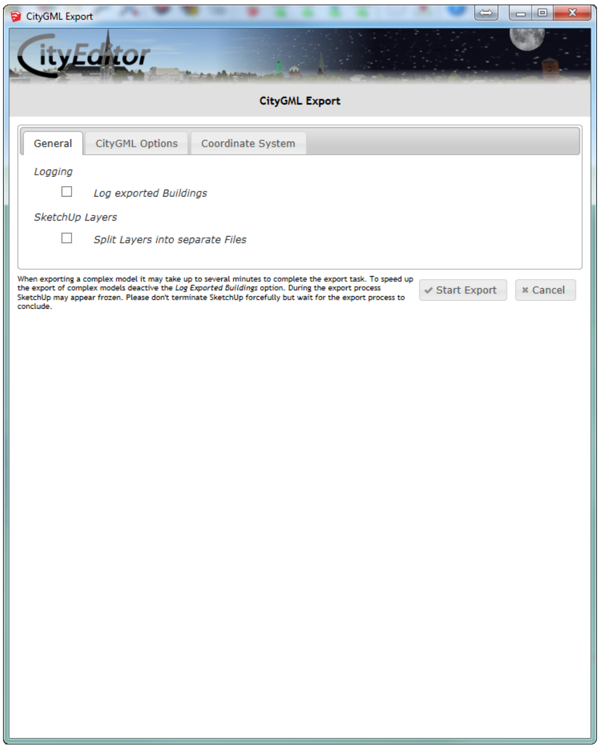
Dateiname: Untitled.xml

Dateityp:

Figure 8.1: File dialog for the export of a CityGML model

To avoid proplems during the export, the storage path for the exported file should not contain any German umlauts or special characters such as ü or ß.

After selecting the storage path, a dialog window with three tabs opens in which the CityGML model in process can be influenced by a variety of parameters.



Logging

☐ *Log exported Buildings*

SketchUp Layers

☐ *Split Layers into separate Files*

When exporting a complex model it may take up to several minutes to complete the export task. To speed up the export of complex models deactive the *Log Exported Buildings* option. During the export process SketchUp may appear frozen. Please don't terminate SketchUp forcefully but wait for the export process to conclude.

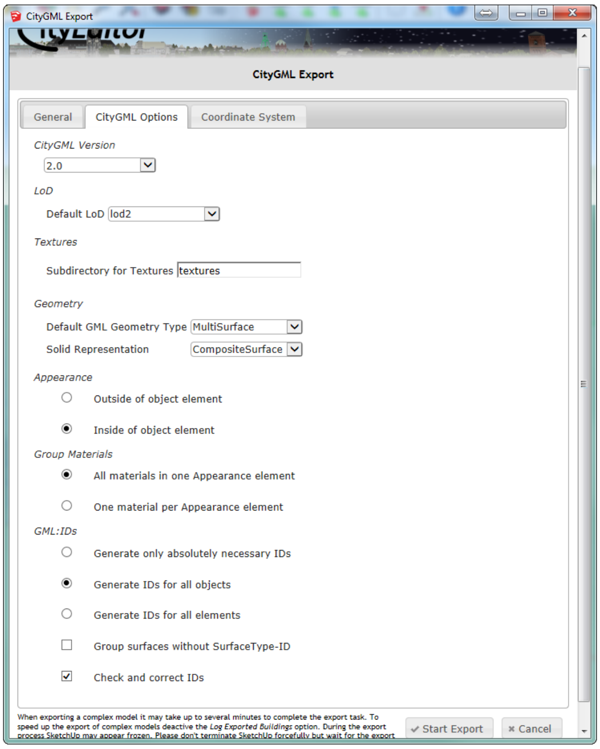
Figure 8.2: CityGML export dialog: Tab *Layer/LOD/textures*

Tab General

Log exported Buildings If this option is activated, the ID's of all exported groups will be logged in the protocol window.

Split Layers into separate Files If this option is activated, a separate `.gml` file for each layer of the current model will be created.

Tab CityGML Options



CityGML Version

2.0

LoD

Default LoD lod2

Textures

Subdirectory for Textures textures

Geometry

Default GML Geometry Type MultiSurface

Solid Representation CompositeSurface

Appearance

○ Outside of object element

● Inside of object element

Group Materials

● All materials in one Appearance element

○ One material per Appearance element

GML:IDs

○ Generate only absolutely necessary IDs

● Generate IDs for all objects

○ Generate IDs for all elements

□ Group surfaces without SurfaceType-ID

☑ Check and correct IDs

When exporting a complex model it may take up to several minutes to complete the export task. To speed up the export of complex models deactive the *Log Exported Buildings* option. During the export process SketchUp may appear frozen. Please don't terminate SketchUp forcefully but wait for the export

Figure 8.3: CityGML export dialog: Tab *Coordinate system*

CityGML Version specifies the CityGML version to be used for exporting the current model.

Default LoD determines the LoD to which all faces of the model are assigned for which no LoD has been explicitly indicated.

Subdirectory for Textures gives the subdirectory for textures to be exported, if applicable. If this input field remains empty, the textures will be exported into the same directory in which the CityGML file is created.

Default GML Geometry type determines whether the GML type `Solid` or `MultiSurface` shall be created.

Solid Representation specifies whether surfaces classified as Solid shall be exported as

- `Solid` elements containing a `CompositeSurface` element with one or more `SurfaceMember` child elements
- or as `CompositeSolid` element with one or more `SolidMember` child elements.

```
<bldg:lod2Solid>
  <gml:Solid>
    <gml:exterior>
      <gml:CompositeSurface>
        <gml:surfaceMember>
          ...
        </gml:surfaceMember>
        <gml:surfaceMember>
          ...
        </gml:surfaceMember>
        ...
      </gml:CompositeSurface>
    </gml:exterior>
  </gml:Solid>
</bldg:lod2Solid>
```

Listing 8.1: `CompositeSurface` representation (example)

```
<bldg:lod2Solid>
  <gml:CompositeSolid>
    <gml:solidMember>
      <gml:Solid>
        ...
      </gml:Solid>
    </gml:solidMember>
    <gml:solidMember>
      <gml:Solid>
        ...
      </gml:Solid>
    </gml:solidMember>
    ...
  </gml:CompositeSolid>
<bldg:lod2Solid>
```

Listing 8.2: `CompositeSolid` representation (example)

Not all software tools for processing/managing/visualizing CityGML models support reading both solid representations. When specifying this export option it should therefore be taken in consideration, which tools be used to process the exported model further and which solid representation these tools are able to process.

Appearance determines whether `Appearance` elements shall be sub elements of the corresponding object (*Inside of Building element*) or whether they shall appear behind all objects (*Outside of Building element*).

Group materials determines how materials and textures are depicted upon `Appearance` elements. *All materials in one Appearance* element means that all materials/textures are written (as a surfaceDataMember) of the corresponding object (*Appearance→Inside of object element*) or of the whole model (*Appearance→Outside of object element*) within a single Appearance element (Standard). If *One material per Appearance element* is selected, each material/each texture (i. e. each surfaceDataMember element) receives its own Appearance element.

GML:IDs influences the writing of IDs for the elements Building, Polygon, LinearRing, WallSurface, GroundSurface and RoofSurface. In this context, three possibilities exist:

- With *Generate only absolutely necessary IDs*, IDs are only generated for such elements to which a reference has to be created by textures/materials through the ID.
- With *ID for all objects*, IDs are only written for objects. In the process of writing, an ID is generated for objects that do not have an ID. All other elements are exported without an ID, even if IDs are existent.
- With *ID for all elements*, IDs are written for all elements. If no ID is available, a distinct ID is generated.

For all three varieties, the following additional restriction applies: Provided that a face in SketchUp (represented in CityGML by a SurfaceType element with all its sub elements as e.g. Polygon) holds a material and/or a texture, an ID will always be written for the Appearance element generated from it regardless of the selected mode. If no ID exists it will be created automatically as it is needed for referencing in the CityGML model.

The option *Group surfaces without SurfaceType-ID* causes that all faces that have the same SurfaceType (e. g. RoofSurface) but do not have a BoundarySurfaceTypeId (during the export this would be the ID of the SurfaceType element that is to be created) are written together within a single SurfaceType element. If this option is deactivated, each face will be exported as a separate SurfaceType element.

If *Check and correct IDs* is activated all IDs are checked for their uniqueness. If in the course of writing an ID appears that has been written before, a new, unique ID of the pattern OldID_runningIndex will be generated. If this option is not activated a duplicate ID will lead to an error message and the export process is cancelled.

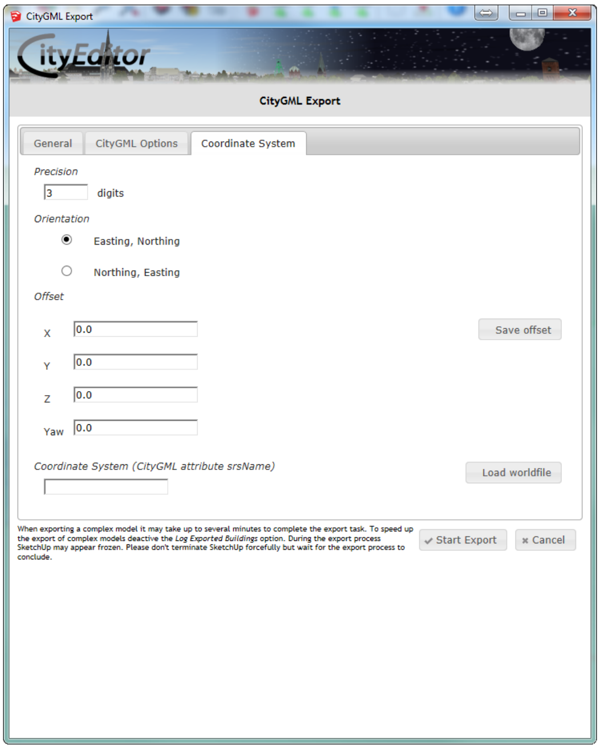
Automatically generated IDs are generated as follows:

Building _[Dateiname]_BD.[BD Laufindex]

BuildingPart _[Building_id]_BP.[BP Laufindex]

Polygon [Building_id | Buildingpart_id]_PG.[PG Laufindex]

LinearRing [Polygon_id] _LR.[LR Laufindex]



Precision

3 digits

Orientation

● Easting, Northing

○ Northing, Easting

Offset

X 0.0

Y 0.0

Z 0.0

Yaw 0.0

Coordinate System (CityGML attribute srsName)

When exporting a complex model it may take up to several minutes to complete the export task. To speed up the export of complex models deactive the *Log Exported Buildings* option. During the export process SketchUp may appear frozen. Please don't terminate SketchUp forcefully but wait for the export process to conclude.

Figure 8.4: CityGML export dialog: Tab *CityGML options*

Examples:

- automatically generated ID of a linear ring in the file `house.xml` in which the overlying elements do not have an ID either:: `_house_BD.3_PG.5_LR.2`.
- as set out above, but the building already has the ID 4711: `4711_PG.5_LR.2`.

Tab Coordinate System

Orientation determines the order of easting and northing.

Offset enables an offsett of the model along the x-, y-, and z-axis. Furthermore, an angle can be entered under *Yaw* to which extend the model can be rotated about the z-axis (in SketchUp this is the blue axis, if the standard settings are selected). These values can be changed by the user. Moreover, they can be read from a `.dxt` file via the option *Load Worldfile*. This is a text file with one line for each, x, y, z, and yaw.

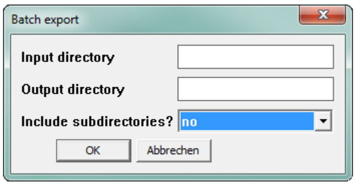
For the moment, all entries/changes made in *Offset* (x, y, z, yaw) are only valid for the current export process. If the changed *Offset* settings are to be adopted into the SketchUp model as well, the button *Save Offset* has to be clicked.

Coordinate System allows the determination of the coordinate system that is to be used. It will be entered in the CityGML file as an attribute of the GML element `MultiSurface`.

By clicking on *Start export* the export process is initiated. When the export is complete, the Log dialog opens which shows status information from the export process.

8.1.2 Batch Export

The batch export makes it possible to export all .skp files from a directory into CityGML. For this purpose, merely the file path, e. g. `D:\Modelle` has to be provided. With the activated option Include subdirectories? all .skp files of the subjacent directories will be imported as well.


Batch export

Input directory

Output directory

Include subdirectories? no

Figure 8.5: Dialog for the batch export

8.2 3D-PDF

8.2.1 Preface

The export of a SketchUp model as 3D-PDF happens via the external module CityEditorExporter which is started through the extension menu through the menu item *Export* → *3D-PDF*. The exported SketchUp model can be integrated into newly created, or into an already existing PDF document.

According to present knowledge Adobe Reader exclusively supports the display of 3D objects in PDF documents.

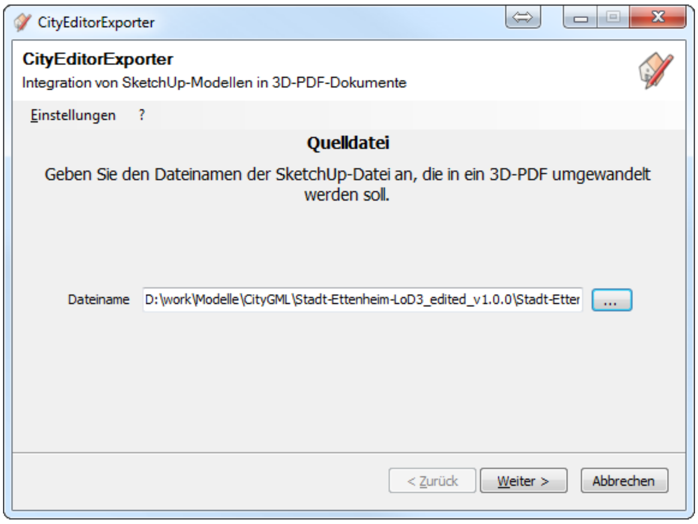
During the export as 3D-PDF solely faces are considered. Points and line objects are not taken over into the 3D-PDF. CityGML metadata attached to an object is also imported and can be viewed in the metadata tool of Adobe Reader.

An export assistant leads through the configuration of the export process. Its steps are explained in the following section.

8.2.2 Export Wizard

8.2.2.1 Step Source File

In the first step of the export assistant the `.skp` file meant for export is selected. If this file is opened in SketchUp it should be ensured that unsaved changes are saved bevor the conduction of the export process.



Quelldatei

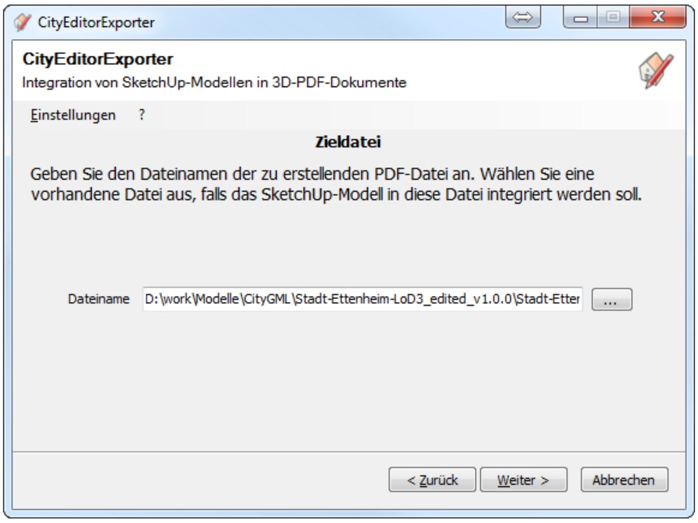
Geben Sie den Dateinamen der SketchUp-Datei an, die in ein 3D-PDF umgewandelt werden soll.

Dateiname D:\work\Modelle\CityGML\Stadt-Ettenheim-LoD3_edited_v1.0.0\Stadt-Etter

Figure 8.6: Configuration step *Source File*

8.2.2.2 Step Destination File

Either the file name of a PDF document that has to be newly created or that of an already existing one can be provided. If an existing file is selected, the page number at which a new page with the integrated SketchUp model shall be inserted into the existing document can be chosen in the next configuration step.



Zieldatei

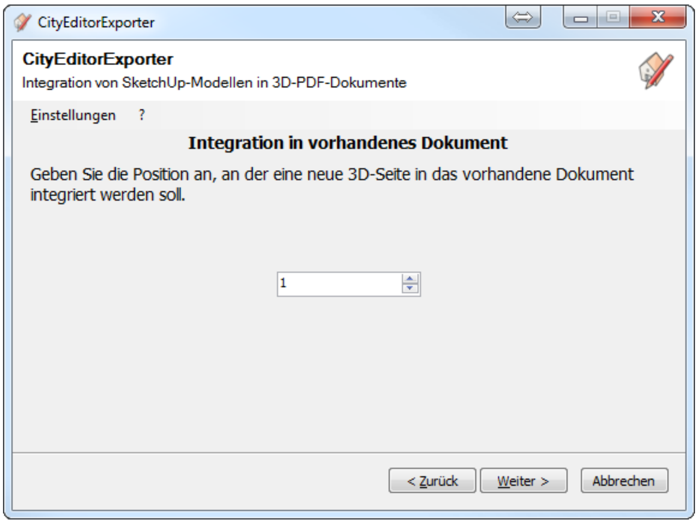
Geben Sie den Dateinamen der zu erstellenden PDF-Datei an. Wählen Sie eine vorhandene Datei aus, falls das SketchUp-Modell in diese Datei integriert werden soll.

Dateiname D:\work\Modelle\CityGML\Stadt-Ettenheim-LoD3_edited_v1.0.0\Stadt-Etter

Figure 8.7: Configuration Step *Destination File*

8.2.2.3 Step Integration into Existing Document

At this point, the page number can be chosen at which a new page with the integrated SketchUp model shall be inserted into the existing document.



Integration in vorhandenes Dokument

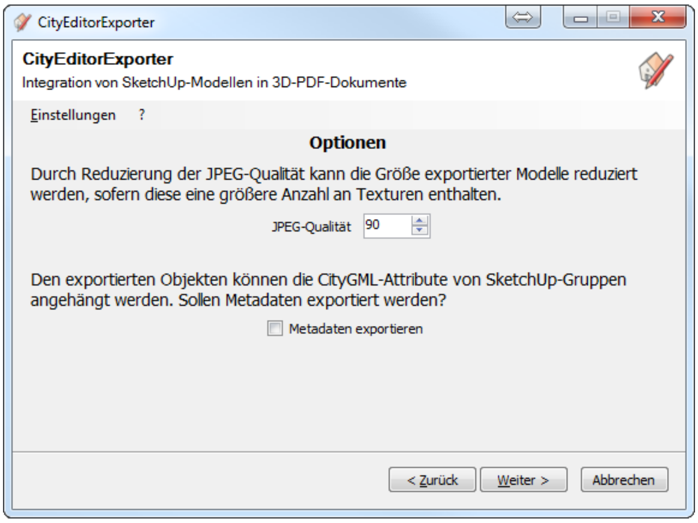
Geben Sie die Position an, an der eine neue 3D-Seite in das vorhandene Dokument integriert werden soll.

1

Figure 8.8: Configuration Step *Integration into Existing Document*

8.2.2.4 Step Options

This allows allows for additional export options to be specified.



Optionen

Durch Reduzierung der JPEG-Qualität kann die Größe exportierter Modelle reduziert werden, sofern diese eine größere Anzahl an Texturen enthalten.

JPEG-Qualität 90

Den exportierten Objekten können die CityGML-Attribute von SketchUp-Gruppen angehängt werden. Sollen Metadaten exportiert werden?

□ Metadaten exportieren

Figure 8.9: Configuration Step *Options*

JPEG Quality

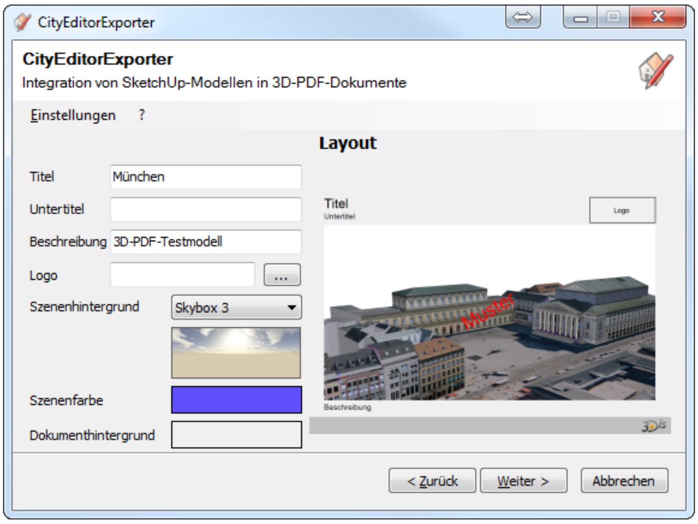
Through this option the quality and size of the textures integrated into the 3D-PDF can be controlled, provided that the SketchUp model that is to be exported contains textures in the JPEG format. A high quality setting will result in a bigger PDF file while a lower quality will reduce the file size but can cause image artefacts. A setting of 90 should produce a satisfactory result at an acceptable file size.

Export metadata

If this option is activated, the group-related CityGML attributes contained in the SketchUp model that is exported are attached to the 3D-PDF objects and thus will be displayed by the Adobe Reader's metadata tool.

8.2.2.5 Step Layout

In this step, the appearance of the document page on which the exported SketchUp model will show can be modified with the help of a range of layout options.



CityEditorExporter

CityEditorExporter

Integration von SketchUp-Modellen in 3D-PDF-Dokumente

Layout

Titel: München

Untertitel:

Beschreibung: 3D-PDF-Testmodell

Logo:

Szenenhintergrund: Skybox 3

Szenenfarbe:

Dokumenthintergrund:

Figure 8.10: Configuration Step *Layout*

With the specified layout options, a new document page based on the template pictured below is created.

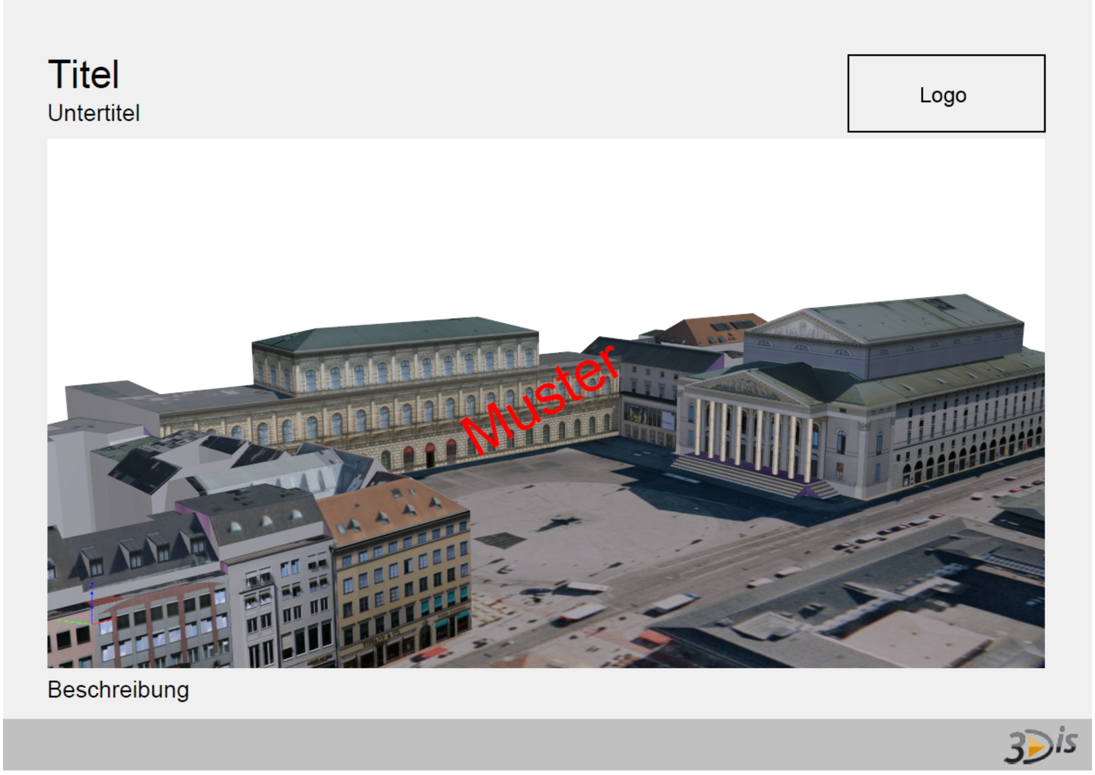
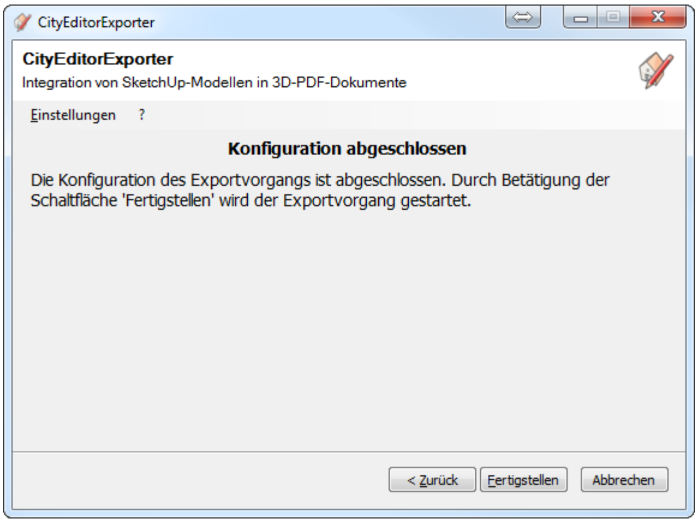


Figure 8.11: Layout template for a document page with an embedded 3D object

8.2.2.6 Step Configuration Complete

When reaching this configuration step, the configuration of the export process is complete. By clicking the button *Finish* the export process is started.



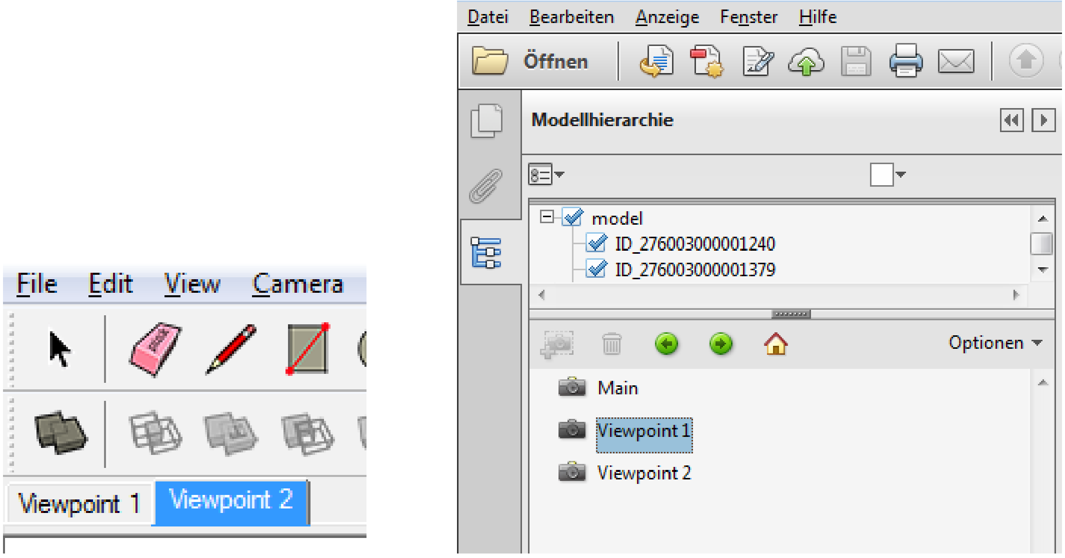
Konfiguration abgeschlossen

Die Konfiguration des Exportvorgangs ist abgeschlossen. Durch Betätigung der Schaltfläche 'Fertigstellen' wird der Exportvorgang gestartet.

Figure 8.12: Configuration Step *Configuration Complete*

8.2.3 Viewpoints

SketchUp allows for users to define multiple scenes within a model, with each scene containing a different viewpoint from which a model is displayed. During an export to a 3D-PDF these viewpoints along with the names of the scenes they belong to are integrated into the generated 3D-PDF.



(a) Scenes in SketchUp

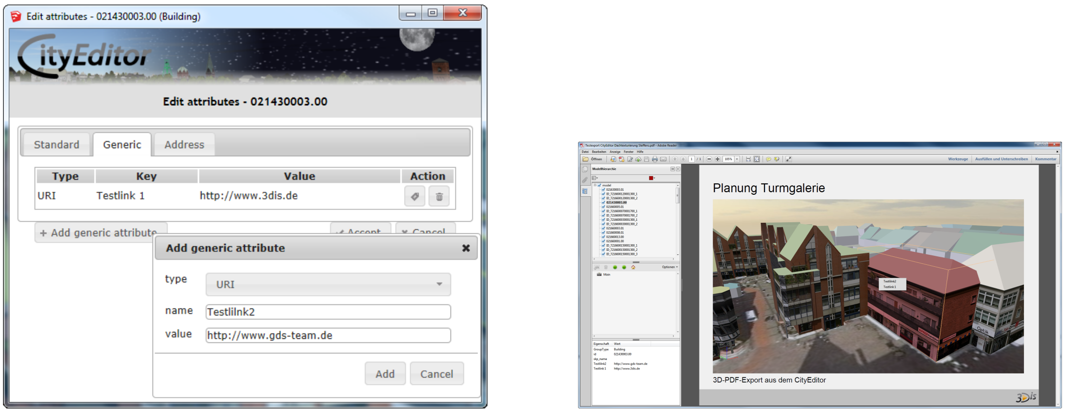
(b) Viewpoints in Adobe Reader

Figure 8.13: Scenes

The additionally generated viewpoint *Main* represents the last camera postion that has been saved in the exported model.

8.2.4 Hyperlinks

In order to add clickable hyperlinks to objects in a 3D-PDF, the CityGML attributes containing the link names and targets to the respective SketchUp groups. Link targets have to start with http. In a 3D-PDF displayed in the Adobe Reader, a context menu containing the added hyperlinks is displayed after right-clicking a selected object.



Edit attributes - 021430003.00 (Building)

Edit attributes - 021430003.00

Standard | Generic | Address

Type	Key	Value	Action
URI	Testlink 1	http://www.3dis.de	

+ Add generic attribute

Add generic attribute

type: URI

name: Testlilnk2

value: http://www.gds-team.de

Add | Cancel

(a) Creating hyperlink attributes in SketchUp (b) Hyperlink menu in Adobe Reader

Figure 8.14: Hyperlinks in 3D-PDF

8.2.5 Navigation

The following input options are available for the navigation in a 3D-PDF created by the CityEditor:

While holding the LEFT MOUSE BUTTON, the cursor can be moved horizontally or vertically across the 3D scene in order to modify the camera orientation.

While holding the RIGHT MOUSE BUTTON, the cursor can be

- horizontally moved across the 3D scene in order to modify the camera orientation on the horizontal level.
- vertically moved across the 3D scene in order to move the camera forwards and backwards.

By rolling the MOUSE WHEEL the camera is moved forwards or backwards in the direction of view.

Shift +

While pressing the SHIFT KEY and the LEFT MOUSE BUTTON at the same time, the cursor can be

- horizontally moved across the 3D scene in order to move the camera sideways.
- vertically moved across the 3D scene in order to move the camera upwards or downwards.

8.2.6 Examples

The following examples show interactive 3D objects that have been imported from CityGML into SketchUp by using the CityEditor. Afterwards they have been exported as 3D-PDFs.

Ettenheim

Figure 8.15: Integrated 3d city model Ettenheim, reference model [CGM15]

Munich

Figure 8.16: Integrated 3d city model Munich, reference model [CGM15]

Frankfurt

Figure 8.17: Integrated 3d city model Frankfurt, reference model [CGM15]

8.3 CityBrowser

8.3.1 Preface

The export of a SketchUp model as CityBrowser project happens via the external module CityEditorExporter which is started through the extension menu through the menu item *Export → CityBrowser (WebGL)*.

The exported CityBrowser project also contains the CityBrowser web application as well as additional documentation containing detailed instructions on how to deploy projects on a web server.

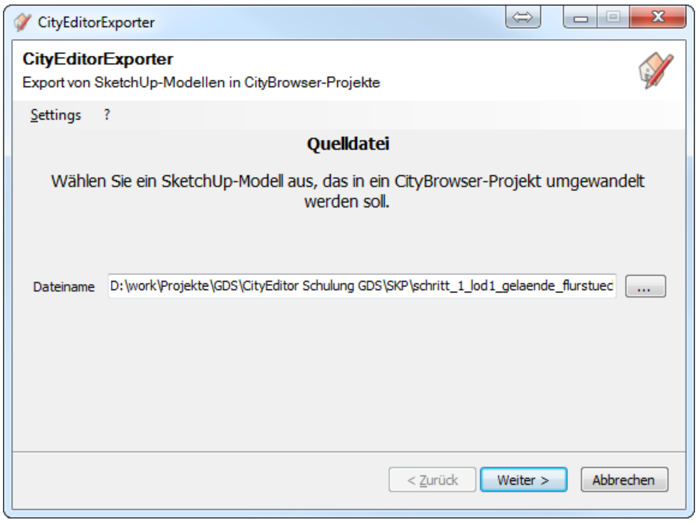
During the export as CityBrowser project solely faces are considered. Points and line objects are not taken over into the project. CityGML metadata attached to an object is also imported and can be viewed in the CityBrowser's metadata tool .

An export assistant leads through the configuration of the export process. Its steps are explained in the following section.

8.3.2 Export Wizard

8.3.2.1 Step Source File

In the first step of the export assistant the .skp file meant for export is selected. If this file is opened in SketchUp it should be ensured that unsaved changes are saved bevor the conduction of the export process.



CityEditorExporter

CityEditorExporter

Export von SketchUp-Modellen in CityBrowser-Projekte

Quelldatei

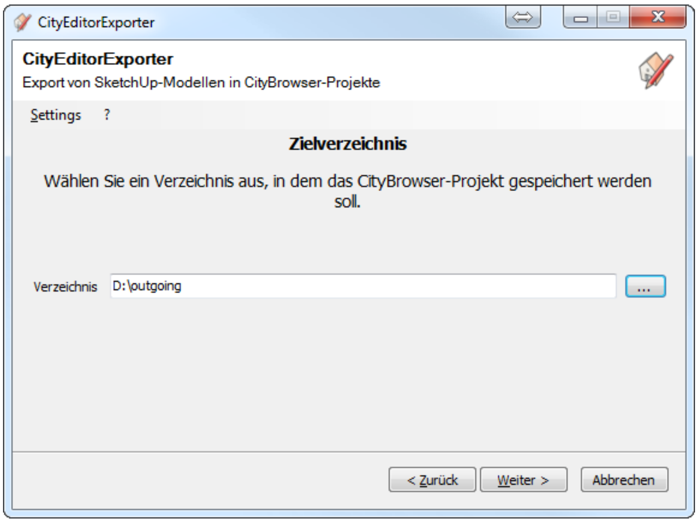
Wählen Sie ein SketchUp-Modell aus, das in ein CityBrowser-Projekt umgewandelt werden soll.

Dateiname: D:\work\Projekte\GDS\CityEditor Schulung GDS\SKP\schritt_1_lod1_gelaende_flurstuec

Figure 8.18: Configuration step *Source File*

8.3.2.2 Step Destination Directory

In this step the directory into which the CityBrowser project is exported has to be specified.



CityEditorExporter

CityEditorExporter

Export von SketchUp-Modellen in CityBrowser-Projekte

Zielverzeichnis

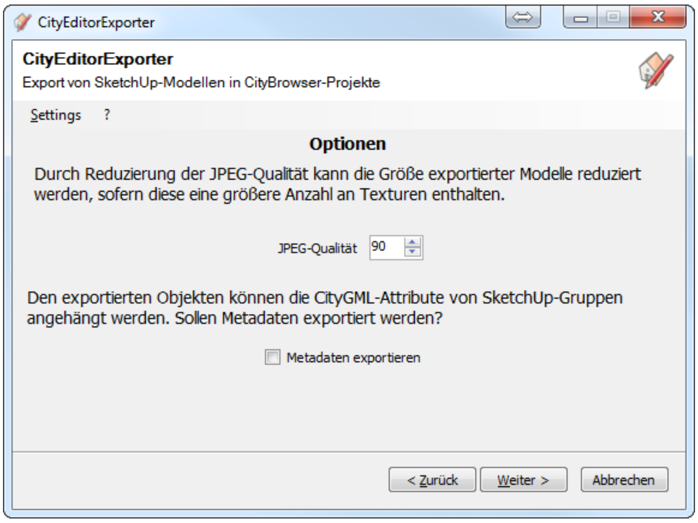
Wählen Sie ein Verzeichnis aus, in dem das CityBrowser-Projekt gespeichert werden soll.

Verzeichnis: D:\outgoing

Figure 8.19: Configuration Step *Destination File*

8.3.2.3 Step Options

This allows allows for additional export options to be specified.



CityEditorExporter

Export von SketchUp-Modellen in CityBrowser-Projekte

Optionen

Durch Reduzierung der JPEG-Qualität kann die Größe exportierter Modelle reduziert werden, sofern diese eine größere Anzahl an Texturen enthalten.

JPEG-Qualität 90

Den exportierten Objekten können die CityGML-Attribute von SketchUp-Gruppen angehängt werden. Sollen Metadaten exportiert werden?

□ Metadaten exportieren

Figure 8.20: Configuration Step *Options*

JPEG Quality

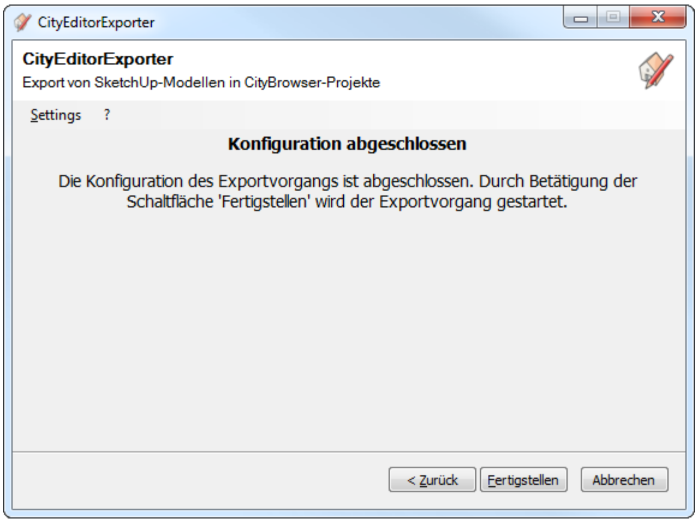
Through this option the quality and size of the textures integrated into the CityBrowser project can be controlled, provided that the SketchUp model that is to be exported contains textures in the JPEG format. A high quality setting will result in a larger project size while a lower quality will reduce the file size but can cause image artefacts. A setting of `90` should produce a satisfactory result at an acceptable file size.

Export metadata

If this option is activated, the group-related CityGML attributes contained in the SketchUp model that is exported are attached to the objects exported to the CityBrowser project and thus will be displayed by the CityBroser's metadata tool.

8.3.2.4 Step Configuration Complete

When reaching this configuration step, the configuration of the export process is complete. By clicking the button *Finish* the export process is started.



CityEditorExporter

Export von SketchUp-Modellen in CityBrowser-Projekte

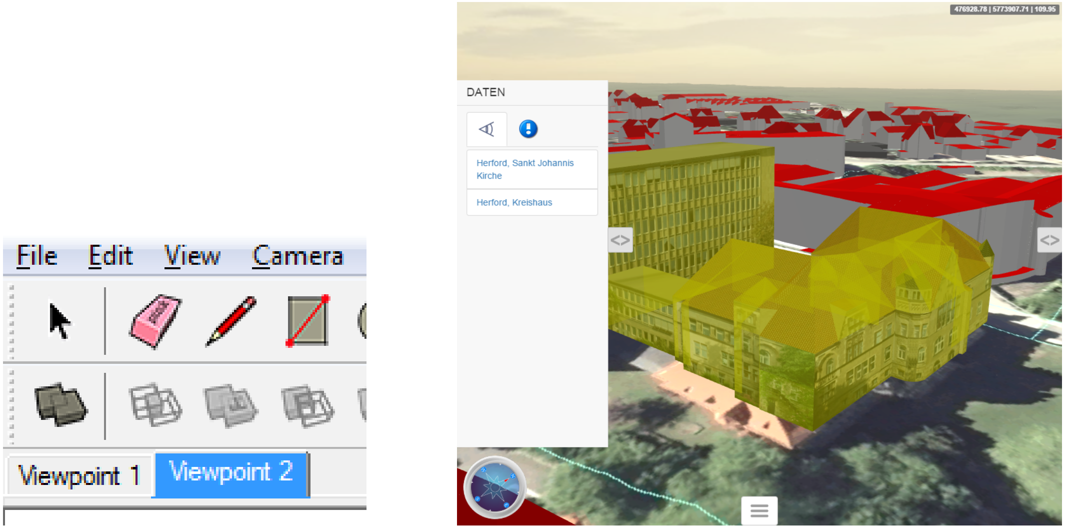
Konfiguration abgeschlossen

Die Konfiguration des Exportvorgangs ist abgeschlossen. Durch Betätigung der Schaltfläche 'Fertigstellen' wird der Exportvorgang gestartet.

Figure 8.21: Configuration Step *Configuration Complete*

8.3.3 Viewpoints

SketchUp allows for users to define multiple scenes within a model, with each scene containing a different viewpoint from which a model is displayed. During an export to a CityBrowser project these viewpoints along with the names of the scenes they belong to are integrated into the generated project.



(a) Scenes in SketchUp

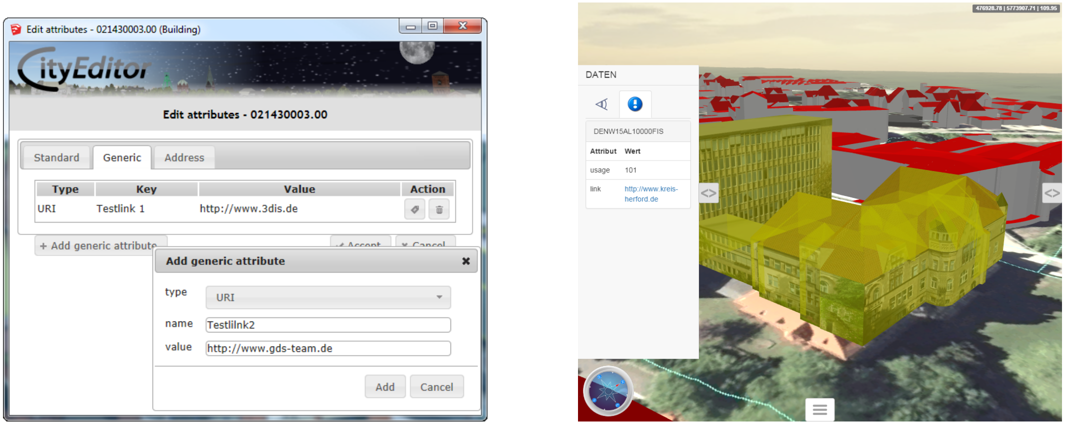
(b) Viewpoints in the CityBrowser

Figure 8.22: Scenes

The additionally generated viewpoint *Main* represents the last camera postion that has been saved in the exported model.

8.3.4 Hyperlinks

In order to add clickable hyperlinks to objects in a CityBrowser project, the CityGML attributes containing the link names and targets to the respective SketchUp groups. Link targets have to start with `http`. Hyperlinks in the CityBrowser are displayed in the metadata tool which shows attributes belonging to the currently selected object.



Edit attributes - 021430003.00 (Building)

Edit attributes - 021430003.00

Type	Key	Value	Action
URI	Testlink 1	http://www.3dis.de	

Add generic attribute

type: URI

name: Testlilnk2

value: http://www.gds-team.de

(a) Creating hyperlink attributes in SketchUp

DATEN

DENW15AL10000FIS

Attribut	Wert
usage	101
link	http://www.kreis-herford.de

(b) Hyperlinks in the CityBrowser

Figure 8.23: Hyperlinks in a CityBrowser project

8.4 Other 3D Formats

8.4.1 Preface

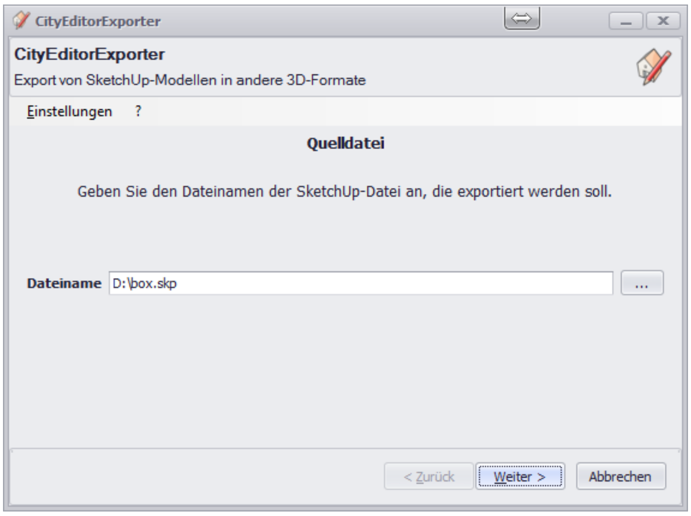
The CityEditor is capable of exporting SketchUp models to other 3D formats. Supported output formats are 3D Studio (`.3ds`), Alias Wavefront (`.obj`), OpenInventor (`.iv`), OpenSceneGraph Binary (`.ive`, `.osgb`), OpenSceneGraph ASCII (`.osg`), AC3D (`.ac`), 3D Manufacturing Format (`.3mf`) and Stereolithography (`.stl`). The export is facilitated by the external module CityEditorExporter which is started through the extension menu through the menu item *Export* → *CAD*.

An export assistant leads through the configuration of the export process. Its steps are explained in the following section.

8.4.2 Export Wizard

8.4.2.1 Step Source File

In the first step of the export assistant the `.skp` file meant for export is selected. If this file is opened in SketchUp it should be ensured that unsaved changes are saved before the export process is started.



CityEditorExporter

Export von SketchUp-Modellen in andere 3D-Formate

Quelldatei

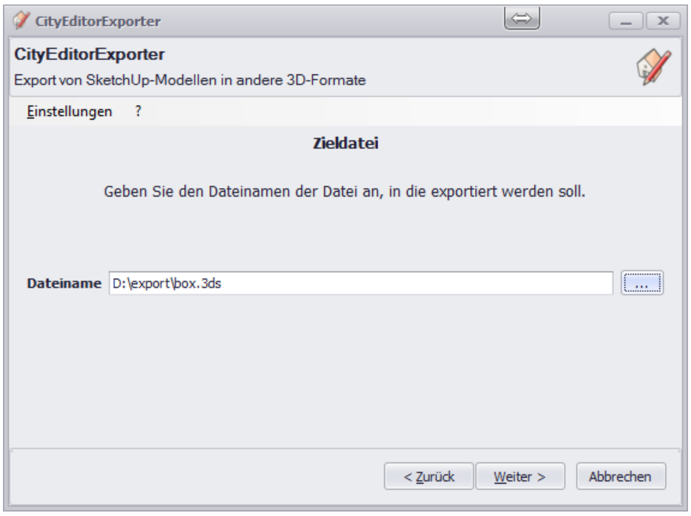
Geben Sie den Dateinamen der SketchUp-Datei an, die exportiert werden soll.

Dateiname: D:\box.skp

Figure 8.24: Configuration step *Source File*

8.4.2.2 Step Destination File

In this step the destination filename of the 3D model that is to be exported has to be specified. The target 3D format is inferred from the destination file's extension.



CityEditorExporter

Export von SketchUp-Modellen in andere 3D-Formate

Zieldatei

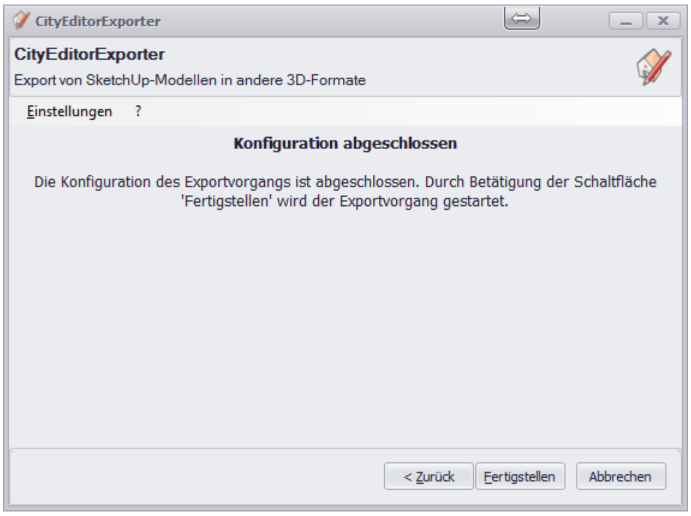
Geben Sie den Dateinamen der Datei an, in die exportiert werden soll.

Dateiname: D:\export\box.3ds

Figure 8.25: Configuration Step *Destination File*

8.4.2.3 Step Configuration Complete

When reaching this configuration step, the configuration of the export process is complete. By clicking the button *Finish* the export process is started.



Konfiguration abgeschlossen

Die Konfiguration des Exportvorgangs ist abgeschlossen. Durch Betätigung der Schaltfläche 'Fertigstellen' wird der Exportvorgang gestartet.

Figure 8.26: Configuration Step *Configuration Complete*

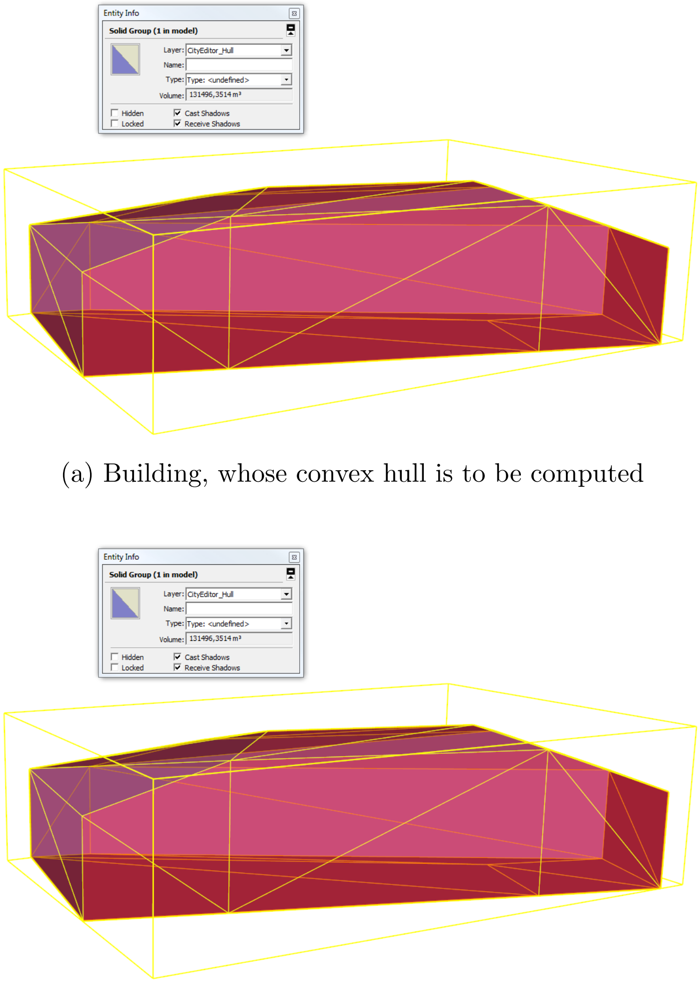
9 Chapter 9 Miscellaneous Functions

9.1 Preface

In this chapter those functions of the CityEditor are explained, which do not fall in the import, editing or export categories and therefore have not been discussed in the previous chapters.

9.2 Convex hull computation und hull volume

Via the menu item *[CityEditor] Create Convex Hull* of the CityEditor context menu a convex hull of the currently selected model elements can be computed. The computed hull geometry is inserted into the model as a new group with a semi-transparent material.



Entity Info

Solid Group (1 in model)

Layer: CityEditor_Hull

Name:

Type: Type: <undefined>

Volume: 131496,3514 m³

□ Hidden ☑ Cast Shadows

□ Locked ☑ Receive Shadows

(a) Building, whose convex hull is to be computed

Entity Info

Solid Group (1 in model)

Layer: CityEditor_Hull

Name:

Type: Type: <undefined>

Volume: 131496,3514 m³

□ Hidden ☑ Cast Shadows

□ Locked ☑ Receive Shadows

(b) Computed hull geometry

Figure 9.1: Convex hull

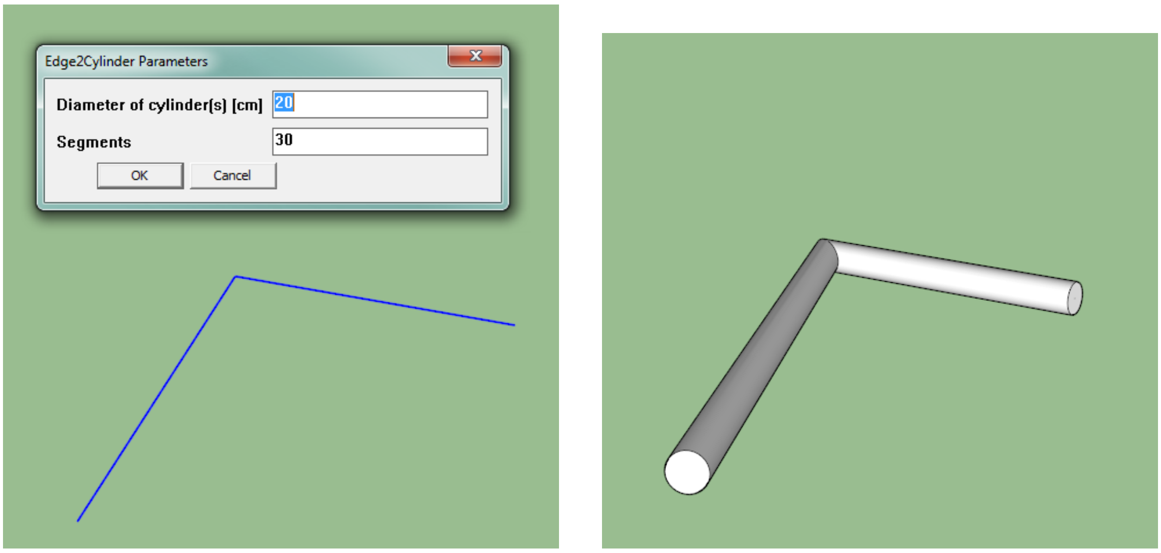
The hull geometry forms a solid group whose volume is calculated and displayed by SketchUp. Thus, the convex hull can be used to (approximately) calculate the volume of objects which originally are no solid groups.

> The hull computation is performed by an external application module that required a 64-bit operating system.

9.3 Extrusion of edges to cylinders

Via the menu item *[CityEditor] Model Operations → Convert Edge(s) To Cylinder(s)* of the CityEditor context menu as well as through the menu item *Model Operations →*

Convert Edge(s) To Cylinder(s) of the CityEditor extension menu the currently selected edges can be converted to cylinders. The conversion process can be parameterized with the cylinders diameter and the number of segments from which the circular base of the cylinder is constructred. A higher number of segments will result in a smoother cylinder geometry.



Diameter of cylinder(s) [cm] 20

Segments 30

(a) Selected edge and conversion parameters

(b) Created cylinder geometry

Figure 9.2: Conversion of edges to cylinder geometries

Training & Support

Professional Services

You need support with your first steps with the CityEditor and SketchUp or with your modeling projects? Contact us! We will be pleased to offer you an appropriate training or service and react to your specific problems and questions.

Additionally you can ask questions or discuss problems with us and other users on our forum at `forum.3dis.de`.

Figure 9.3: CityEditor partner logo

Make sure that service providers you are receiving training or support from are certified with the CityEditor partner logo. With the CityEditor partner logo 3DIS awards partners who have themselves received comprehensive training with regard to all aspects of the CityEditor and it's functionalities and tools.

Free Support

You want to get support without closing an additional service agreement? You may use the 3DIS-Forum at `forum.3dis.de` as a source of information and a platform to exchange questions and answers with other CityEditor users.

Further Information

You can find further information about the CityEditor on our website at www.3dis.de.

In case of concrete questions you may send an e-mail to

info@3dis.de

or call

+49 (0)2861 891980.

Changelog

Version	Build	Released	Changes
2.7.3	815	05/26/2017	• fixed: CityEditorExporter, fixed missing texture issue in OSG export • enhanced: CityEditorImporter, extended error messages diplayed during model analysis
2.7.2	814	05/11/2017	• enhanced: Save and restore last CityGML export settings • fixed: Minor bug fixes
2.7.1	809	05/04/2017	• fixed: Minor bug fixes
2.7.0	801	03/22/2017	• fixed: Minor bug fixes
2.7.0	785	01/30/2017	• enhanced: CityEditorImporter, optimized import region resolution • enhanced: CityEditorImporter, optimized import speed for large terrain datasets • extended: CityEditorImporter, extended list of supported file format extensions
2.6.4	780	01/18/2017	• fixed: CityEditorImporter, fixed z ordinate parsing from geometries in `.shp` files • extended: CityEditorImporter, added new option for disabling terrain texture import when automatically texturing roof surfaces

2.6.4	770	01/14/2017	- enhanced: Translations, added german translation to UI module - extended: CityEditorImporter, added support for parsing `lodXMultiCurve`, `NoiseCityFurnitureSegment`, `NoiseRoadSegment`, `NoiseRailwaySegment` elements - extended: CityGML export, added exporting capabilities for `BreaklineRelief` and curve elements - extended: CityEditorExporter, added support for exporting models in `.osgb` format
2.6.3	740	01/02/2017	- enhanced: CityEditorImporter, converted terrain optimizer to 64-bit module - enhanced: CityEditorExporter, converted 3D-PDF converter to 64-bit module - extended: CityEditorImporter, added support for parsing `OrientableSurface` elements - extended: CityEditorImporter, added support for parsing `BreaklineRelief` elements - extended: CityGML export, added appearance theme, name, description and bounding box to export options - fixed: CityGML export, fixed export of back materials on entire groups - extended: Model Explorer, added hierarchical display of component instances
2.6.2	727	12/16/2016	- extended: CityEditorImporter, added attribute ID mapping for vector objects imported from `.shp` files - enhanced: CityEditorImporter, optimized terrain analysis speed - extended: CityEditorImporter, added terrain grid spacing estimation algorithm - fixed: Model operations, fixed automated terrain intersection mechanism
2.6.1	720	12/07/2016	- extended: CityEditorImporter, added support for importing buildings from `.shp` files
2.6.0	715	11/16/2016	- extended: CityEditorImporter, added support for parsing measurement units on relevant elements

2.6.0	711	11/11/2016	• extended: Processor Architecture, added support for 64-bit architecture in separate extension version
			Beginning with version 2.6.0 the CityEditor is available in a 32-bit as well as a 64-bit version. Users updating from a previous version might want to remove any previous CityEditor version prior to installing version 2.6.0 as some major changes regarding the extension's directory structure have been made and choose to go on with the CityEditor version that fits their CPU architecture.
2.5.0	700	11/02/2016	• extended: Export, added support for exporting group types CityObjectGroup to CityGML • extended: Import, added support for importing group types CityObjectGroup from CityGML
2.4.6	690	11/01/2016	• enhanced: Export, optimized export speed for textures • fixed: CityEditorImporter, fixed vertex format for import of ply meshes • enhanced: CityBrowser, updated integrated CityBrowser
2.4.5	678	09/29/2016	• fixed: Export dialog, styling fixed • added: Export dialog, inherits the specified model SRID • added: Model position, can now be inherited from the given SU model georeference • fixed: Export, ensure boundary surface type IDs are unique
2.4.4	672	09/21/2016	• added: CityEditorImporter, add new source data analysis step to import wizard
2.4.3	668	08/29/2016	• fixed: Export, corrected texture coordinates for projected textures
2.4.3	664	08/16/2016	• fixed: Attribute Editor, missing ruby string method fixed for SketchUp <= 2014

2.4.3	650	08/08/2016	• extended: CityGML import, added support for parsing ExternalReference objects • extended: CityGML import, added support for parsing multiple Address objects • enhanced: CityGML import, assigning random colors to generated layers • extended: Attribute Editor, added support for editing external references • extended: Attribute Editor, added support for editing multiple Address objects
2.4.2	643	07/29/2016	• fixed: CityGML export, exporting colorized textures
2.4.1	641	07/27/2016	• extended: CityGML import, added support for parsing ThouroughfareNumberSuffix elements
2.4.1	640	07/18/2016	• extended: CityGML import, added support for parsing GenericCityObject features with CompositeSurface elements • extended: 3D-PDF export, added export option for disabling texture optimization
2.4.0	636	07/08/2016	• extended: CityGML export, added export option for specifying texture unprojection threshold • extended: Attribute Manager, added additional functions for editing, importing and exporting attributes • extended: Surface Classifier, added support for saving and restoring classification rules • fixed: 3D-PDF export, fixed texture coordinate resolution for projected textures
2.3.3	626	06/24/2016	• added: CityEditorImporter, added new module for importing vector data from WFS • fixed: External service invocation, fixed encoding detection for calling external application modules

2.3.2	622	06/17/2016	• fixed: CityGML-Export, fixed erroneous texture coordinates for group textures • enhanced: Application Settings, added warning on activated automatic model validation
2.3.1	615	06/11/2016	• fixed: 3D-PDF export, fixed alpha value conversion • fixed: 3D-PDF export, fixed texture scaling for group textures
2.3.1	613	05/31/2016	• enhanced: CityGML export, solid export as `CompositeSurface` added
2.3.1	600	05/17/2016	• enhanced: CityGML export, optimized texture export in SketchUp 2016 • enhanced: CityEditorImporter, separate material processing for different input sources implemented • extended: CityGML batch export, added option for specifying different export directory • enhanced: CityEditorImporter, optimized cleaning of texture coordinates
2.3.0	577	05/02/2016	• enhanced: CityBrowser, updated integrated CityBrowser to version 1.2.0 • extended: CityEditorImporter, added support for importing models from 3d Manufacturing Format (`.3mf`) and Stereolithography (`.stl`) • extended: CityEditorExporter, added support for exporting models from 3d Manufacturing Format (`.3mf`) and Stereolithography (`.stl`) • extended: Attribute Editor, added support for editing generic attributes attached on boundary surfaces • extended: CityGML export, added export of generic attributes attached to boundary surfaces • enhanced: External service invocation, switched invocation of external applications to spawn method

2.2.0	550	04/01/2016	• added: MbTiler, added new tool for creating local map databases for offline map viewing • extended: Seat license, added new license version with reduced functionality • enhanced: File size, removed redundant dependencies and reduced extension file size • extended: Pointcloud, added new buttons for resizing pointcloud to toolbar
2.0.4	545	03/22/2016	• added: System Requirements, added module for checking for required software environment • enhanced: CityEditorImporter, optimized processing of models with appearance themes
2.0.3	542	03/15/2016	• fixed: CityGML export, round coordinates
2.0.2	540	03/14/2016	• extended: added new option for specifying the number of digits to be written out on CityGML export • extended: added line objects to 3D-PDF and CityBrowser export
2.0.1	530	03/04/2016	• enhanced: CityEditorImporter, switched remaining UI components to DevExpress • fixed: CityEditorImporter, added missing Tao reference for creating texture atlasses on mesh import • enhanced: UI, updated CityEditor toolbar icons • enhanced: CityEditorImporter/CityEditorExporter, merged importer and exporter assemblies
			Users updating from a previous version might want to remove any previous CityEditor version prior to installing version 2.0.1 as some major changes regarding the extension's directory structure have been made.

2.0.0	525	02/19/2016	• enhanced: CityBrowser, updated integrated CityBrowser to version 1.1.1 • extended: Export, added additional export formats 3D Studio (`.3ds`), Alias Wavefront (`.obj`), OpenInventor (`.iv`) • enhanced: UI, migrated import and exporter UI to DevExpress • fixed: Export, processing of PSD textures on PDF and CityBrowser export fixed
1.9.7	521	02/05/2016	• enhanced: CityBrowser, updated integrated CityBrowser to version 1.1.0 • extended: Editing, added additional context menu item for setting the BoundarySurfaceType of groups classified as `Opening` • fixed: Export, fixed CityGML export of `Room` and `Opening` elements
1.9.7	520	02/02.2016	• extended: Export, added support for exporting group types `Room`, `BuildingFurniture`, `BridgeRoom` and `BridgeFurniture` to CityGML • extended: Import, added support for importing group types `Room`, `BuildingFurniture`, `BridgeRoom` and `BridgeFurniture` from CityGML
1.9.6	510	01/26/2016	• fixed: Export, texture extraction of group materials fixed in 3D-PDF and CityBrowser export • fixed: Export, export of CityGML attributes attached to component instances fixed
1.9.6	500	01/19/2016	• added: Import, added smoothing option for terrain models generated from laserscan points
1.9.5	500	01/01/2016	• added: Import, added support for importing triangulated surface models from Wavefront OBJ models (`.obj`) • enhanced: Import, added mesh importer file type support to SketchUp import dialog

1.9.4	480	12/23/2015	• added: Import, added separate import option for triangulated surface models in the Polygon File Format/Stanford Triangle Format (`.ply`) • enhanced: Import, optimized speed of terrain texture import and automatic roof texturing • enhanced: CityBrowser, updated integrated CityBrowser to version 1.0.6
1.9.3	465	12/16/2015	• extended: Import, added option for disabling import of implicit geometries as component instances • extended: Import, added option for converting 24-bit PNG images to 32-bit for preserving transparency effect • fixed: Import, fixed texture filename collision check in material creation • added: Editing, added additional surface parameter for specifying surface type • fixed: Export, fixed output texture creation on CityGML export
1.9.2	453	12/10/2015	• extended: Import, added support for parsing `lodXGeometry` with `CompositeSurface` elements • added: Edge extrusion, added mechanism for converting selected edges into tubes with variable diameter
1.9.1	450	11/30/2015	• enhanced: CityBrowser, updated integrated CityBrowser to version 1.0.5
1.9.1	445	11/07/2015	• enhanced: CityBrowser, optimized loading of visible model tiles • extended: CityBrowser, added new configuration options for modifying navigation speed
1.9.0	430	10/26/2015	• enhanced: CityBrowser, added new configuration options for navigation mode modification • fixed: Manual, updated download paths for user manual documents

1.9.0	420	10/23/2015	• added: Export, added new exporter for creating CityBrowser projects from SketchUp models
1.8.10	408	10/08/2015	• added: AttributeManager, new tool for removing CityGML attributes from an entire model • enhanced: Export, optimized ID generation in CityGML export • extended: Export, added warning for ungrouped faces in CityGML export dialog
1.8.9	395	09/30/2015	• fixed: AttributeEditor, attributes containing backslash • extended: Import, added automatic integration into current model
1.8.8	388	09/28/2015	• enhanced: Import, optimized implicit geometry import • enhanced: Export, optimized performance in CityGML export • extended: Import, added expert option for splitting large groups into multiple subgroups
1.8.7	375	09/17/2015	• fixed: Import, added warning on assignment of multiple textures to surface target • enhanced: Import, modified algorithm for elimination of collinear points • fixed: Export, corrected surface texture assignment
1.8.6	361	08/17/2015	• enhanced: Import, modified algorithm for elimination of identical points to avoid invalid geometries • enhanced: Import, modified map view to allow region import when map view is inactive
1.8.5	360	08/10/2015	• extended: Import, added support for importing Polygon File Format/Stanford Triangle Formats (`.ply`) files • enhanced: Import, modified time zone resolution standard

1.8.4	355	07/27/2015	• extended: Import, added support for importing CompactCityOverlays (`.cco`) files
1.8.3	350	07/20/2015	• added: Convex hull, added function for computing convex hull of selected model elements • enhanced: Import, implemented parser for adaptive terrain grid size processing
1.8.2	343	07/08/2015	• extended: Export, added export option for creating one `.gml` file for each exported SketchUp layer • fixed: External applications, fixed asynchronous invoking mechanism for external applications • fixed: Export, removed redundant CityEditor metadata attributes from exported groups
1.8.1	337	07/01/2015	• Export, fixed NullPointerException on CityGML export in 'Color By Layer' mode
1.8.1	335	06/26/2015	• added: Object Inspector, added new tool for displaying object hierarchy • extended: Import, added CityEditorImporter interface to SketchUp import dialog
1.8.0	320	06/10/2015	• extended: Import, added expert import option for coloring small terrain triangles • extended: Import, added expert import option for removing collinear vertices from surface definitions • extended: Import, added expert import option for single surface import • fixed: Import, layer assignment for inner edges fixed • enhanced: Import, optimized shadow settings for imported terrain • fixed: Context menu, modified entity traversal on surface type resolution to avoid deadlocks

1.8.0	315	06/01/2015	• enhanced: Import, optimized memory management allows for import of larger datasets • added: Compass, new tool displaying the camera orientation as a compass image added • added: Import, added new import source for terrain textures downloaded from OSM or WMS sources • enhanced: Import, added support for generating terrain from digital surface models
1.7.1	305	05/21/2015	• enhanced: Import, optimized terrain import speed and memory usage • fixed: Import, fixed worldfile path resolution for georeferenced tif images • fixed: Import, fixed texture coordinate calculation for faces with collinear vertices • enhanced: Export, optimized logging on CityGML export
1.7.0	297	05/07/2015	• enhanced: Import, implemented double-sided application for transparent materials
1.7.0	295	04/28/2015	• added: GeoCursor, new tool for querying geo coordinates added
1.6.0	292	04/14/2015	• enhanced, Export, added 'clickable' hyperlink attributes to 3D-PDF export
1.6.0	290	04/04/2015	• added: Map, added map dialog for display of current camera position on OSM map • enhanced: Changelog, moved to HTML dialog • enhanced: Import, added mechanism for automatically texturing/coloring roof surfaces with orthophotos • fixed: Import, changed UI layout to avoid display errors in Windows 8

1.5.4	280	03/30/2015	• extended: Import, added restoration mechansim for SketchUp layers when importing CityGML models • enhanced: Import, optimized memory usage for import of large datasets • extended: Import, added additional import parameter for terrain grid cell size • fixed: Import, fixed setting of unit formatting on import
1.5.3	270	03/24/2015	• extended: Import, added support for appearance theme selection on import • extended: Import, added tiled import mode for processing large datasets
1.5.2	265	03/09/2015	• extended: Export, added additional metadata on 3D-PDF export • extended: Import, added support for importing `BridgePart`, `TunnelPart`, `IntBridgeInstallation`, `IntTunnelInstallation` elements • enhanced: Export, added navigation coefficients for navigation in 3D-PDF
1.5.1	258	03/03/2015	• extended: Export, added export of SketchUp groups with additional layer attribute to CityGML • extended: Export, added option for including CityGML attributes in 3D-PDF objects • extended: Export, added option for choosing JPEG quality for 3D-PDF export • extended: Export, added option for choosing scene backgrounds for 3D-PDF export
1.5.0	250	02/23/2015	• fixed: Import, fixed parsing of special characters in CityGML models • added: Import, added Drag&Drop mechanism for adding import files • added: Export, added CityEditorExporter module for 3D-PDF export • added: Import, added point cloud import mechanism • enhanced: Import, optimized surface triangulation

1.4.0	230	02/05/2015	• extended: Object typification, added group type `BuildingPart` • extended: Import, added support for parsing CityGML models with `BuildingPart` elements outsid of `Building` elements
1.4.0	222	01/31/2015	• enhanced: Import, added support for importing terrain models from irregular terrain points • enhanced: Import, optimized import speed of terrain grids • enhanced: Import, optimized terrain texture tiling
1.3.4	220	01/28/2015	• extended: Import, added warning dialog when importing from paths with special characters • extended: Import, added support for import of CityGML models with implicit geometries
1.3.4	215	01/22/2015	• extended: Import, added import mechanism for terrain textures
1.3.3	210	01/20/2015	• extended: Import, added option for deactivation of GML namespace validation • enhanced: Import, optimized speed of complex geometry import • enhanced: Import, optimized memoery usage of geometry processor • extended: Model Info, added display of model's coordinate system
1.3.2	204	01/15/2015	• extended: Import, added support for DXF objects with rudimentary 3d geometry as buildings • extended: Import, added support for vector data from MapInfo `.tab`, `.json`, `.geojson` and `.gml` files

1.3.1	195	01/11/2015	• added: ModelExplorer, added new tool for displaying the CityGML object hierarchy • extended: Import, added coordinate transformation mechanism for import region • extended: Import, added export function for import region • extended: Import, added import of vector data attributes • fixed: Export, corrected calculation of cascaded group transformations
1.3.0	177	12/06/2014	• enhanced: LicenseClient, added client hash check • enhanced: Import, added `CityObject`-specific standard attribute import • extended: Import, added import mechanism for import region from shapefile
1.3.0	169	12/01/2014	• fixed: Export, suppressed export of empty typed surface definitions • enhanced: Plugin path, added support for umlauts and special characters in plugin path
1.3.0	160	11/24/2014	• extended: Import, added support for parsing `RasterRelief` elements containing terrain grids as `QuantityList` • extended: Import, added support for group type `SolitaryVegetationObject` • extended: Import, added filter options for LoD filtering • enhanced: Import, optimized homolographic import of geometries • extended: Surface typification, added `WaterGroundSurface` and `WaterClosureSurface` surface types • extended: Object typification, added `SolitaryVegetationObject` group type • added: Message log, added log dialog displaying messages generated by the CityEditor modules

1.2.0	146	11/12/2014	• extended: Compatibility, added support for SketchUp 2015 • enhanced: Import, switched to new wizard style for importer • extended: Import, added map-based region filter including address search • enhanced: Import, optimized index and vertex buffer of imported objects to facilitate solid group creation
1.1.0	128	10/27/2014	• extended: Compatibility, added support for SketchUp 8
1.1.0	120	10/23/2014	• enhanced: Import, moved type-specific import options into separate tabs • fixed: Import, added support for name collision of object attributes • extended: Export, added support for layer-based coloring in CityGML export in SketchUp 2014
1.1.0	111	10/17/2014	• enhanced: Surface typification, added typification of edges connected to surface on manual typification • added: Export, added message dialog to display status message after export
1.1.0	102	10/10/2014	• extended: Import, added terrain intersection mechanism for vector data • added: Import, added support for import of terrain models from gridded and triangulated input data • enhanced: Import, optimized processing speed of triangulated input data
1.0.0	42	09/22/2014	• initial release

Glossary

appearance theme CityGML language construct used to implement multiple material and texture variants within a CityGML model.

CityGML City Geography Markup Language; XML-based internationally recognized standard of the OGC for the description of semantic city models.

EPSG European Petroleum Survey Group Geodesy; workgroup of the European oil and gas exploration companies. In this document used in the context of the globally unique code numbers for geodesic datasets such as coordinate reference systems, reference ellipsoids, and projections specified by the company (EPSG codes).

LoD Level of Detail; five-step level of detail (0 - 4) of the geometry of a city model.

OGC Open Geospatial Consortium; nonprofit organization aiming at the development of open standards for the processing and exchange of geo data.

TIN Triangulated Irregular Network; a possibility for the modeling of surfaces in which a surface is replicated by a net-structure of triangular faces.

WebCF Web City Format; a special file format developed by 3DIS that is optimized for highly compressed, streamable 3d city models

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