Photogrammetric restitution workspaces

Requirements for this workflow are Safe Software's FME 2018 or higher as well as an active City**GRID**® license (Modules Modeler/Administrator)
To efficiently use this City**GRID**® workflow for city modelling it is essential, that our *Restitution Guidelines* are the basis for the photogrammetric restitution.
If you have diverting situations please contact office@uvmsytems.com, so we can work on a custom solution.
If you have followed our guidelines and still encounter problems with the workflow please contact support@uvmsystems.com

Please note: The included files Building.xml, Restitution Check_Warnings_List.xlsx and Template Layerdefinition.dwg have to be in the same directory as the workspaces.

00_Format and_Snap_Restitution

This workspace is used to snap the photogrammetric restituton and to subject it to a predefined layer color scheme.

Terraces are expected on a layer that bears the character string "errace" anywhere in the DGN Level Name. If terraces are restituted on another layer, they cannot be recognized and are lost in the further processing chain.

In addition to snapping the roof lines, you can also snap to the footprints. The footprints are expected in the Shape format and serve as reference data when snapping, so they are not changed. If no footprint snapping is to be carried out, a fictional path to a shape file must be transferred. The workspace recognizes if no footprints have been transferred and then does not execute the footprint snapping part.

input data 1	Photogrammetric linebased restitution according to restitution guidelines in DGN Format
Input data 2	Footprints in ESRI Shape format (optional)
Input data 3	XML-controlfile of the dwg2xml converter
result	DGN fils with error locations

Requirements for input data:

• The photogrammetric evaluation was linebased
• The layer names correspond with the spelling of the control file (upper / lower case!)

Actions:

Execute the FME workspace "00_Format_andSnap_Restitution.fmw".

Published parameters:

These parameters must be specified each time the workspace is run and usually change every time the run is run. All parameters listed here must be specified when creating a batch file.

Universal translator	batch file	Description
Project folder	`--p_Project_Dir`	Optional parameter to define repeating parts of the path.
UVM Project Number	`--p_GZ`	Optional. UVM Use only
File Name	`--p_Filename`	Optional. UVM Use only
Input DGN Restitution	`--S_DGN_Restitution`	Directory of photogrammetric restitution in DGN format.
Input Footprints shapefile	`--S_SHP_Footprints`	Directory of shapefile record with footprints that should be taken into account during snapping. If no snapping of footprints is required, a fictional path to a shapefile must be entered here. The

		workspace then recognizes that there is no footprints data and does not perform footprint snapping.
Snapping tolerance restitution	`- Tolerance restitution`	Threshold value for performing line snapping in meters. All lines that are within the tolerance are snapped together, whereby roof lines are always snapped to the eaves. Default 0.02
Snapping Tolerance Footprints	`- Tolerance footprints`	Threshold for performing floor plan snapping in meters. Footprints themselves are never changed, but only serve as a reference when snapping. Default: 0.1
Output DGN file	`-- D_DGN_Restitution_snap`	Output path of the edited dgn file. The file is snapped according to the specifications and has layers in the CityGRID standard color scheme.
FME Install Folder	`--FMEInstallDir`	Location of the FME installation directory.
Log file	`--LOG_FILE`	Directory for FME Log File

01_Restitution_Check

This workspace checks the photogrammetric line based restitution for topological and logical errors. If a problematic situation is discovered, the workspace generates an error point, assigns a description of the error and forwards the problem location into a DGN file or an error list in .xlsx format. The input file is not changed by the workspace and is not output again!

The errors found must be cleaned up by the operator/restitutor and run through the test workspace again after the correction. This loop is to be run iteratively until the area is errorfree.

Input data 1	Snapped photogrammetric restitution from the previous workspace
Input data2	Footprints in ESRI Shape (optional)
Input data 3	XML-control file of the dwg2xml converters
Input data 4	Excel list with error description/code
Result 1	DGN file with snapped lines in CityGRID layer colors
Result 2	Excel list with error locations

Requirements for input data:

- Linebased photogrammetric restitution has been complete
- The layer names correspond with the spelling of the control file (upper / lower case!)

Actions:

Execute the workspace "01_Restitution_Check.fmw"

Published parameters:

These parameters must be specified each time the workspace is run and usually change every time the run is run. All parameters listed here must be specified when creating a batch file.

Universal translator	batch file	Description
Project folder	`--p_Project_Dir`	Optional parameter to define repeating parts of the path.
UVM Project Number	`--p_GZ`	Optional. UVM Use only
File Name	`--p_Filename`	Optional. UVM Use only
Input DGN Restitution	`--S_DGN_Restitution`	Directory to the snapped (from the previous workspace) photogrammetric evaluation in DGN format.
Input SHP Footprints	`--S_SHP_Footprints`	Directory of a shapefile data record with footprints that should be taken into account during the check. If no footprints are to be included in the test, a fictional path to a shape file must be entered here. The workspace then

		recognizes that there is no floor plan data and does not carry out the checks that require footprints.
Choose your language	`--Lang`	Language of the error messages issued. You can choose from DE (German), EN (English), TR (Turkish)
Log folder	`--p_Log_Dir`	Directory of output log and error files. The files 01_Restitution_warn.dgn, the file 01_Restitution_warn.xlsx and the log file of the workspace can be found in this directory.
Destination Warnings XLS	`--D_Warning_List`	Directory of the Excel file with warning cases. Each warning contains information about the priority with which the error was given and a description of the error type. When processing the errors, the priority must be processed in ascending order, since subsequent errors can often be remedied by correcting an error with a low priority number.
Destination Warnings DGN:	`--D_Warnings`	Directory of the DGN file with the warning cases. Each warning case contains information about the priority with which the error was considered and a description of the error type as the layer name. When processing the errors, the priority must be processed in ascending order, since subsequent errors can often be remedied by correcting an error with a low priority number. The derived dgn file should be placed over the evaluation to identify and correct the errors there.

02_Conversion_DWG

This workspace separates the photogrammetric restitution into edgelines of the main roof and roof detail edgelines The separated lines are output in AutoCAD DWG 2000 format as 3D polylines in order to be processed by the dwg2XML converter. Any existing cells or blocks are removed by the workspace.

Input data 1	Linebased Photogrammetric restitution (snapped and cchecked) as DGN Linienauswertung (gesnappt und geprüft)
Input data 2	XML-control file of the dwg2xml converters
result 1	DWG file with edge lines of the main roof
Result 2	DWG file with edgelines of the roof detail

Requirements for input data:
- Linebased photogrammetric restitution has been complete
- The 01_Restitution_Check.fmw test produced an error-free test result

Actions:
Execute the FME workspace " 02_Conversion_DWG.fmw".

Published parameters
These parameters must be specified each time the workspace is run and usually change every time the run is run. All parameters listed here must be specified when creating a batch file.

Universal translator	batch file	Description
Project folder	--p_Project_Dir	Optional parameter to define repeating parts of the path.
UVM Project Number	--p_GZ	Optional. UVM Use only
File Name	--p_Filename	Optional. UVM Use only
Input DGN Restitution	--S_DGN_Restitution	Directory to the snapped and checked (from the previous workspace) photogrammetric restituton in DGN format.

Input SHP Footprints	`--S_SHP_Footprints`	Directory of a shapefile data record with footprints that should be taken into account during the check. If no footprints are to be included in the test, a fictional path to a shape file must be entered here. The workspace then recognizes that there is no floor plan data and does not carry out the checks that require footprints.
Output DWG File	`--D_ACAD`	Directory of the dwg file with the roofline sof the newly restituted buildings. The dwg file will be written in AutoCAD2000, in order to be processed with the dwg2xml converter
Output Details DWG File	`--D_ACAD_Details`	Directory of the dwg file with the rooflines of the roof details of the newly restituted buildings. The dwg file will be written in AutoCAD2000, in order to be processed with the dwg2xml converter
Log folder	`--p_Log_Dir`	Directory for FME Log File

DWG2XML converter

The main roof lines are converted from AutoCAD to CityGRID® format using the dwg2xml converter. A temporary UnitID is created from the file name and assigned to each independent eaves. The buildings generated in this way do not need to be triangulated in the dwg2XML converter, as this is performed by a downstream process in order to convert the log file into an automatically evaluable form.

The control file with which the dwg2xml converter is operated must correspond to that used in the previous workspaces. By default, the "Building.xml" is used with the workspaces, but any other control file can also be used, as long as it is used consistently in the entire workflow and the terraces are spelled with "errace" anywhere.
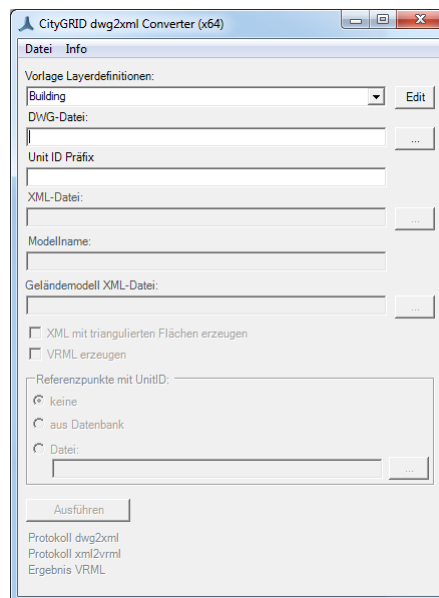
03_Triangulate_Units

The task of these workspaces is solely to triangulate the CityGRID® XML from the dwg2xml converter. Using the triangulation in FME creates a log file that can be automatically searched for triangulation warnings (see the next workspace)

Input data 1	CityGRID® XML file from the dwg2xml converter
Result data 1	Triangulated CityGRID® XML file

Requirements for input data:
- The file contains City**GRID**® Data in line structure

Actions:

Execuute the FME workspace "03_Triangulate_Units.fmw"

Published parameters

These parameters must be specified each time the workspace is run and usually change every time the run is run. All parameters listed here must be specified when creating a batch file.

Universal translator	batch file	Description
Project folder	--p_Project_Dir	Optional parameter to define repeating parts of the path.
UVM Project Number	--p_GZ	Optional. UVM Use only
File Name	--p_Filename	Optional. UVM Use only
Input CityGRID file	--S_CITYGRID	Directory of the City**GRID**®file with line structure of the main roof. The data is derived from previously executed dweg2xml converter and represent a converted linestructure of the restitution.
Log Folder	--p_Log_Dir	Directory of the logfile
Output DWG File	--D_ACAD	Directory of the dwg file with the roofline sof the newly restituted buildings. The dwg file will be written in AutoCAD2000, in order to be processed of the dwg2xml converter

Output Details DWG File	`--D_ACAD_Details`	Directory of the dwg file with the rooflines of the roof details of the newly restituted buildings. The dwg file will be written in AutoCAD2000, in order to be processed of the dwg2xml converter
Log folder	`--p_Log_Dir`	Directory for FME Log File

Analyze FME Log

This workspace analyzes the logfile of a FME process for warnings during a triangulation process The warnings occur in topological problem situations and typically indicate serious errors that can lead to the degeneracy of the building geometry.

Every error found is logged in an Excel file and provides information about the type of error and the unit concerned. With this information, the defective buildings can be loaded into the CityGRID® Modeler and corrected interactively.

Input data	log file from the process 03_Triangulate_Units
Result	Excel file with found errors and the error rate

Requirements in the input data:

• The log file is derived from a FME workspace in which a triangulated CityGRID® data record was created.

Actions:

Execute the FME workspace "Analyze FME Log.fmw".

Published parameters:

These parameters must be specified each time the workspace is run and usually change every time the run is run. All parameters listed here must be specified when creating a batch file.

Universal translator	batch file	Description
Project folder	`--p_Project_Dir`	Optional parameter to define repeating parts of the path.
UVM Project Number	`--p_GZ`	Optional. UVM Use only
File Name	`--p_Filename`	Optional. UVM Use only
Input FME logs	`--S_LOG`	Path to the FME log file with any triangulation warnings.
Analysis Excel	`--D_XLSXW`	Directory of the evaluation file in Excel. This file contains two spreadsheets that provide information about the number of units, the number of errors or error rate and list the defective units individually.
Log Folder	`--p_Log_Dir`	Directory of the logfile

04_Integration_Roof_Details

The roof details are integrated into the triangulated and modeled CityGRID® units. The roof details are separated into positive (projecting above the roof) and negative (immersed under the roof) details. Negative roof details receive a face generation type that crops the roof area of the parent roof (extrude to parent with hole). The assignment of the level of detail (LoD) can be determined via an area threshold.

The units generated are triangulated again when writing to CityGRID® XML, which is why it is advisable to use the "Analyze FME Log.fmw" workspace again.

Input data 1	CityGRID® XML with triangulated units.
Input data 2	DWG file with line evaluation of the roof details
Result data 1	CityGRID® XML file with triangulated units including roof details
Result data 2	CityGRID® XML with all unassignable roof details in one super unit.
Result data 3	CSV file with UnitIDs where problems with the roof detail integration occurred

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Requirements in the input data:

• The CityGRID® XML has been triangulated.

• In the DWG data set there are only lines and areas as geometry types.

Actions:

Execute the FME workspace "04_Integrate_Roof_Details.fmw".

Published parameters:

These parameters must be specified each time the workspace is run and usually change every time the run is run. All parameters listed here must be specified when creating a batch file.

Universal translator	batch file	Description
Project folder	`--p_Project_Dir`	Optional parameter to define repeating parts of the path.
UVM Project Number	`--p_GZ`	Optional. UVM Use only
File Name	`--p_Filename`	Optional. UVM Use only

Max. Area LoD3 Roof Detail (m²)	`--p_maxLoD3Area`	Threshold for the formation of LoD 3 roof details. If the area is below the threshold, the roof detail is declared LoD 3 detail, otherwise it is declared LoD2 detail.
Input CityGRID file	`--S_ACAD_Details`	Path to the DWG file with the line evaluation of the roof details.
Output folder	`--Output_Dir`	Output directory of the data records from this workspace..
Output DWG File	`--D_ACAD`	Directory of the dwg file with the rooflines of the newly restituted buildings. The dwg file will be written in AutoCAD2000, in order to be processed of the dwg2xml converter
Log folder	`--p_Log_Dir`	Directory in which the FME writes the log file
Model Names (separated by ';')	`--p_SourceModelNames`	List of model names to be imported. This parameter is only necessary when operating with databases, it remains empty for XML files.
Floor included	`--p_Floor_included`	Query whether there are floor lines in the roof detail lines. These must be removed if the detail sits on a building.
Offset sky lights	`--MOVE_OFFSET`	Offset value for roof windows over the associated main roof area. Setting this parameter means that the roof windows receive a uniform offset and restitution inaccuracies are avoided. The roof windows are recognized by the layer name, which must be either "roof window" or "sky-light". Default value: 0.1m

| Crop space beneath roof details: | `--p_CutMainRoof` | Parameters for controlling the face generation under detail element complexes. Valid values are "never", "LoD 2" or "always". If the parameter is set to "LoD 2" or "always", the faces of the main roof under the detail element complex is cropped, so that a maximum space is formed inside the building. In the case of LoD 2, only the detail element complexes previously classified as LoD 2 cause the parent roof to be cropped.
Roof terraces are exempt from this rule, they always cut out the relevant parts from the parent's roof. Roof terraces are recognized using the character string "errasse" or "errace" on a layer of the DWG input data record.
Default value: never |