URBAN VISUALISATION & MANAGEMENT GMBH

UVM SYSTEMS

CityGRID® 2024

MANUAL

Scout

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1 Overview: CityGRID® Scout

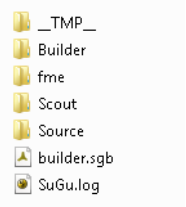
The CityGRID® Scout is the 3D visualization module of the CityGRID® product line and serves as display format for interactive 3D virtual reality projects. Based on the Unity - 3D Gaming Engine (https://unity3d.com/de/unity) the Scout is capable of presenting 3D scenes offline and online. The trendsetting Unity Gaming Engine enables analysis such as shadows or collision as well as general information queries. The connection with mobile devices (tablet and mobile phone) through their own apps is implemented and equally the linking to VR - glasses (Oculus Rift and HTC Vive).

2 Starting a CityGRID® Scout

The CityGRID® Scout is the visualization software of the CityGRID® software suite. Scout projects offer an interactive and free navigation and allow viewing the project from every possible angle. The 3D scenes require a special data structure for a performant representation, which is provided by the CityGRID® Builder Control Center (see Manual of the CityGRID® Builder). An installed Scout project can be opened via the Windows Start menu.

2.1 Opening optimized Scout projects

When a Scout project has been optimized in the Builder, the project will be physically produced in the "Scout" - folder of the Builder's project-directory. It contains the file "Scout.exe" through which the Scout gets started.

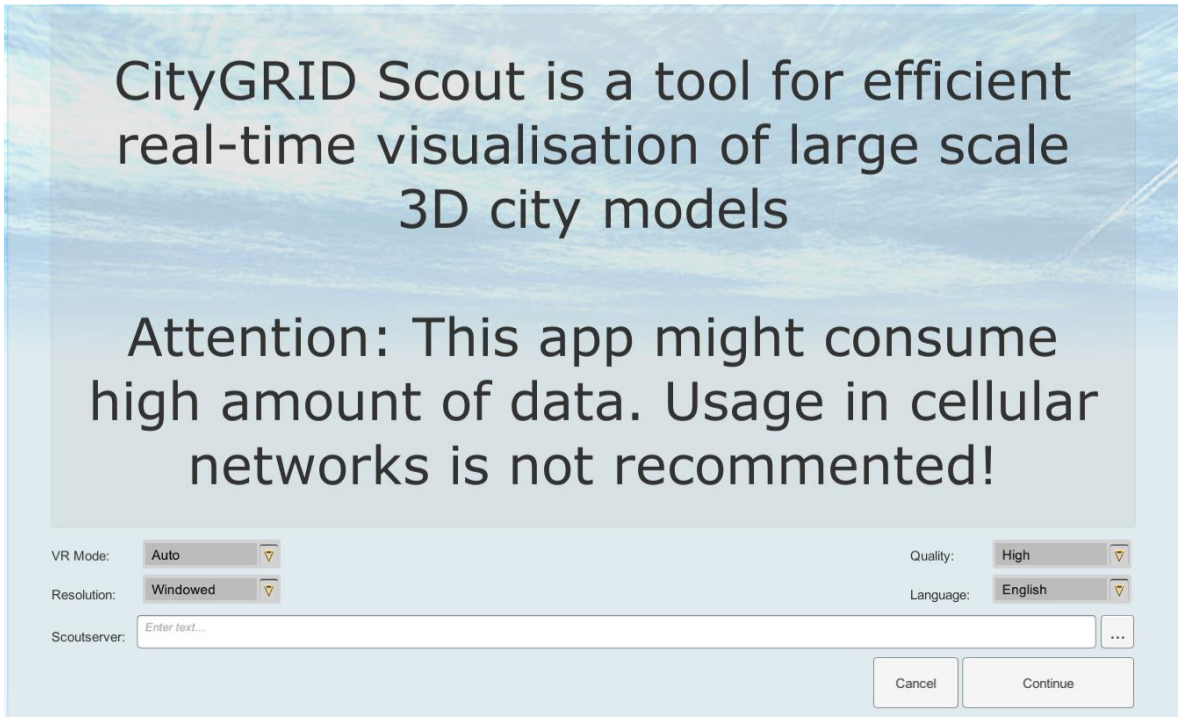


Note: When Scout projects are opened through the Scout.exe file, an already installed Scout instance is a precondition as long as the Scout has not been published (see Manual of the CityGRID® Builder.). Furthermore, this instance must have access to the CodeMeter system of CityGRID® and must be able to obtain a free network license of the Scout.

Scout projects that should provide access to a wider audience can be "published" in the Builder Control Center (cf. Manual of the CityGRID® Builder). These Scout projects differ from non-published projects by the fact that all the necessary program data of the CityGRID® Scout are attached to the project data and can thus be operated autonomously.

Note: The direct opening of files such as CityGRID® XML or CityGML is currently not possible in the Scout. Any form of data needs to be optimized for the Scout in advance by the Builder Control Center.

When starting a Scout, a start screen opens initially. At this point, some display options and control options of the 3D project can be set.



- *Resolution:*

  Defines the resolution of the Scout. If the window mode is enabled, the Scout will work in this window mode, otherwise in the fullscreen mode.

- *Quality:*

  Defines the representation of the of 3D contents in the Scout, such as the sight distance, shadows, texture quality.

- *Language:*

  Regulates the language of the Scout Menu. German, English and Turkish are currently supported. The proposed language is determined by the operating system.

- *Scout Server:*

  Contains the path to the local Scout or the URL to the Scout Web Server. If no path is specified, an empty scout project is opened.

Clicking the tab

starts the Scout.

Note: If several different Scout projects shell operate at the same time, a selection menu can be created on the base of which the Scouts can be started. Contact UVM Systems for support of a corresponding installation.

3 Controlling a Scout Project

The CityGRID® Scout can be displayed on different devices and accordingly different are the control options. Depending on the terminal and the existing equipment, the following control options are available.

3.1 Keyboard

Operating a Scout Project with the keyboard follows a WASD control, as common in 3D games. The following keys are reserved by default:

Moving	
W	Moving forward
A	Moving backward
S	Moving left
D	Moving right
R	Vertical rise
F	Vertical drop
+	Increase movement speed
-	Decrease movement speed
↑	Direction of view up
↓	Direction of view down
←	Direction of view left
→	Direction of view right

Function Keys	
F1	Open / Close quick help
F2	Open / Close menu
F3	Hide / Show overview map
F4	Hide / Show control console
F5	Switch between variants
F6	Change predefined transparent data packets
F7	Enable / Disable double-sided surface representation
F8	Change light settings
F9	Change camera mode
F10	Change collision detection

F11	Enable camera animations
F12	Call viewpoints

Menu Navigation	
F2	Open / Close menu
↑	Menu item up
↓	Menu item down
↵	Menu level down / Select submenu
←	Menu level up

Miscellaneous	
B	Change season of trees
Esc	Close Scout
K	Enable / Disable Microsoft Kinect

3.2 Mouse

Operating the CityGRID® Scout is usually done by using the mouse as this control mode enables the application of most operations. Depending on the selected camera mode, the controlling varies and is optimized for certain investigations of the model. The following operating modes are currently available for mouse control.

Note: The mouse has both tasks, to execute a movement in the 3D scene and to allow the interacting with the menu or the edge equipment of the Scout (e.g. the overview map.). Movements without a pressed mouse button never affect the 3D contents, but only move the mouse cursor. To vary the 3D cutout, the mouse button must be held down.

Note: The airspeed is always depending on the altitude above a terrain model. The higher the position above it, the higher the airspeed. When approaching the area, the speed reduces automatically.

tip: Most settings of the camera modes, such as altitude, takeoff speed, etc. can be regulated via the "Config" page of the Builder Control Center. (See Manual of the CityGRID® Builder)

3.2.1 Automatic Mode

Automatic mode is a mixture between helicopter mode and map mode. The flight altitude always remains constant when moving with the left mouse button. During a flight, all viewing directions can be taken freely. In this mode, collision detection is activated by default for all objects. The WASD keys or the arrow keys activate the drone flight, while the altitude remains constant.

Move	Rotation	Altitude/Speed
The 3D scene is moved by pressing the left mouse button and simultaneously moving the mouse (click-drag movement).	By pressing the right mouse button and moving the mouse at the same time, the section is rotated at the current location, without moving forward or changing the height.	Scrolling the mouse wheel zooms the scene.

3.2.2 Focus Mode

In Focus mode, a building is selected, which then becomes the focus and pivot point of the scene. Moving through the scene is only possible if another building is selected, which becomes the new focus point.

Move	Rotation	Altitude/Speed
The pressed Ctrl key and left mouse button selects a CityGRID building in the scene and creates a focus point.	Holding down the right mouse button and moving the mouse at the same time causes a rotation at the current location, without forward movement or height change.	Rolling the mouse wheel zooms the scene.

3.2.3 Teleport Mode

Teleport mode was created specifically for VR applications to prevent motion sickness.

Move	Rotation	Altitude/Speed

Clicking the left mouse button on the terrain will jump in that direction. In this mode, this is the only way to move.

Holding down the right mouse button and moving the mouse at the same time will cause a rotation at the current location, without forward movement or height change.

Rolling the mouse wheel changes the height of the viewpoint.

3.2.4 Helicopter Mode

The helicopter mode imitates a drone flight. The altitude remains constant while moving through the 3D world. During the flight, all viewpoints can be taken freely. In this mode, the collision detection for all objects is enabled by default.

Move

The left mouse button is held down to fly in viewing direction. Moving the mouse while holding down the left mouse button changes the flight direction, but not the altitude.

Rotation

Holding down the right mouse button while moving the mouse simultaneously results in turning around at the current position, without moving forward or changing the altitude.

Altitude/Speed

By pressing the mouse wheel and moving the mouse forward or backward, the altitude can be regulated.

Rolling the mouse wheel causes acceleration / deceleration of all flight movements.

3.2.5 2D Mode 2D

The 2D mode allows an overview of the scene in 2D and controlled movement without rotation around the Z-axis.

Move

Rotation

Altitude/Speed

The left mouse button moves the scene.	Holding down the right mouse button and moving the mouse at the same time causes a rotation at the current location, without forward movement or height change.	Rolling the mouse wheel zooms the scene.

3.2.6 Walking Mode

The walking mode shifts the current focus to a pedestrian position at an eye level of 1.8m as default value. Locomotion happens with this consistent preset level above the ground and results in a terrain-following mode whereby the 3D scene can be viewed from the pedestrian perspective. If necessary, the altitude can be adapted by the user. In this mode, the collision detection for all objects is enabled by default.

Move	Rotation	Altitude/Speed
The left mouse button is held down to move in viewing direction. The altitude follows the ground surface and keeps the preset distance constant.	Holding down the right mouse button while moving the mouse simultaneously results in turning around at the current position, without moving forward or changing the altitude.	By pressing the mouse wheel and moving the mouse forward or backward, the altitude can be regulated. Rolling the mouse wheel causes acceleration / deceleration of all movements.

3.2.7 Aircraft Mode

The aircraft mode imitates a simplified aircraft control and allows varying altitudes by intentionally pulling or pushing the line of sight. The flight direction is always oriented in direction of the current screen-center. Thus, a continuous change of altitude occurs while moving forward if the flight direction is not perfectly horizontal. Hence, in this mode it is not possible to look toward the ground / sky without simultaneously moving in this direction. In this mode, the collision detection for all objects is disabled by default.

Move	Rotation	Altitude/Speed
The left mouse button is held down to fly in viewing	Holding down the right mouse button while moving the mouse	By pressing the mouse wheel and moving the mouse forward

direction. The altitude adjusts continuously and orients itself toward the current screen-center.

simultaneously results in turning around at the current position without moving forward or changing the altitude.

or backward, the altitude can be regulated.

Rolling the mouse wheel causes acceleration / deceleration of all flight movements.

3.2.8 Map Mode

In the map mode, the control is based on the model of internet maps. Through clicking and simultaneously pulling or pushing a certain section into a desired direction, the shown section will be adapted. The speed of movement depends on the intensity of the mouse movement. In this mode, it is possible to perform very fine movements and a micro-control as it is advantageous for the inspection of objects. The altitude remains constant at every movement and changes only by a corresponding action of the user. In this mode, the collision detection for all objects is enabled by default.

Move

Moving the 3D section happens by pressing the left mouse button while moving the mouse simultaneously (click - drag gesture). The process might be optionally repeated several times for the bridging of greater distances. The strength of the displacement is depending on the preset airspeed.

Rotation

Holding down the right mouse button while moving the mouse simultaneously results in turning around at the current position without moving forward or changing the altitude.

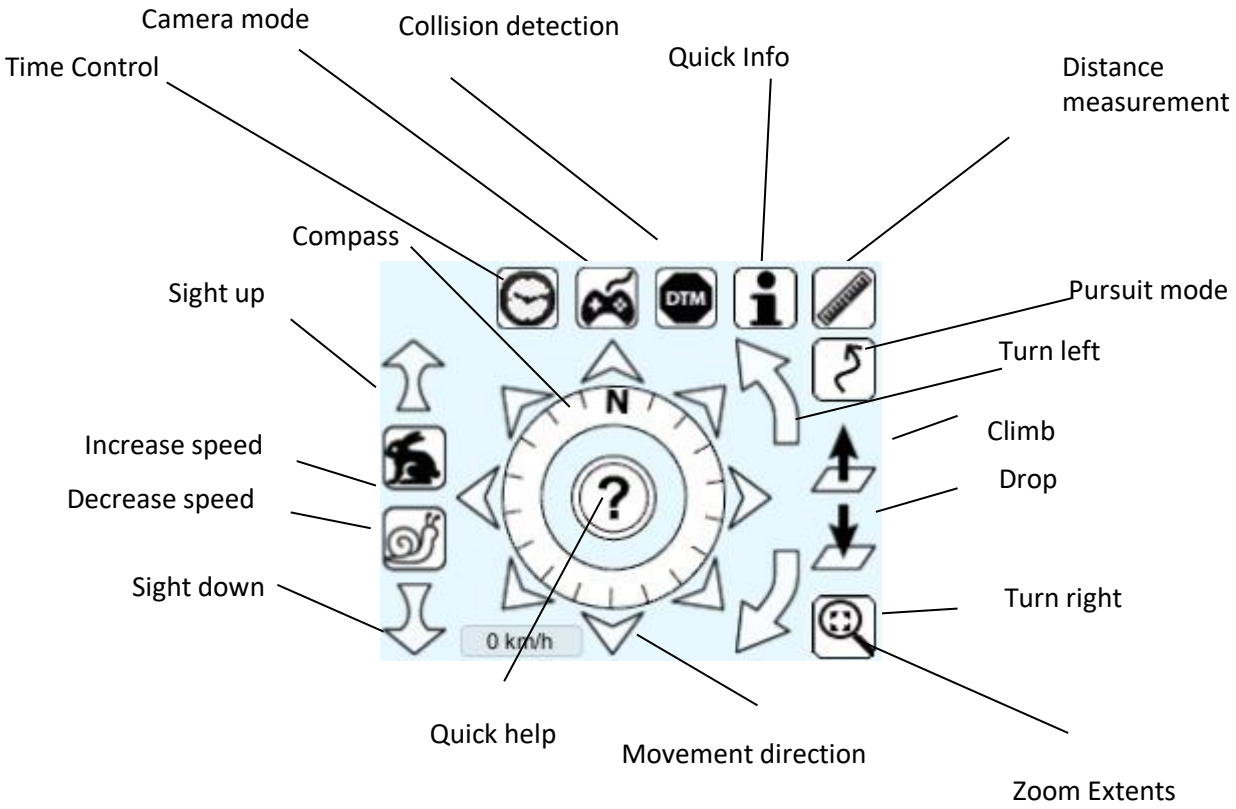
Altitude/Speed

By pressing the mouse wheel and moving the mouse forward or backward, the altitude can be regulated.

Rolling the mouse wheel affects the strength of the shift of the 3D cutout together with a click-drag gesture with the left mouse button. The slower the movement is set, the finer the navigation can be done.

3.3 Control Panel

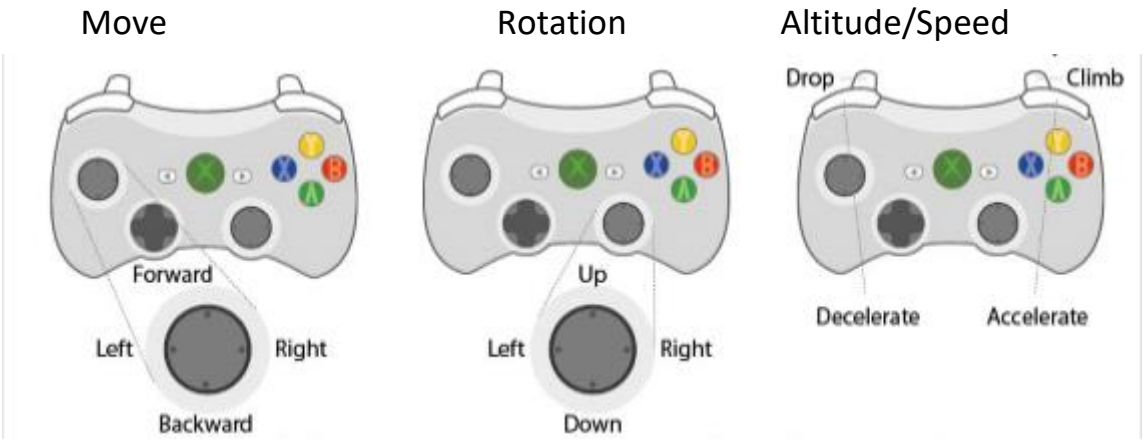
To depict the operation of the Scout clearly, there is a control panel in the bottom right corner. This allows the free navigation in the 3D scene by clicking the appropriate button. In addition to the movement, the control panel provides options to change or call up the collision detection, the camera mode, the airspeed and the quick help. These options affect all control options.



3.4 Gamepad (XBox 360 Controller)

Beside the mouse, the XBox 360 gamepad can be used to control the CityGRID® Scout. Particularly in connection with VR glasses (Oculus Rift or HTC Vive) the controller serves to perform a forward movement.

The following figure shows the standard key assignment on the XBox 360 Controller. The XBox 360 Controller (for Windows) is currently the only gamepad supported by the CityGRID® Scout.



Note: The mouse has both tasks, to execute a movement in the 3D scene and to allow the interaction with the menu or the edge equipment of the Scout (e.g. an overview map). Movements without a pressed button never affect the 3D contents, but only move the mouse pointer. To vary the 3D cutout, the mouse button must be held down.

Note: The presented camera modes under 3.2 are not available for the controlling with the gamepad, the controlling with the gamepad acts identical for each camera mode.

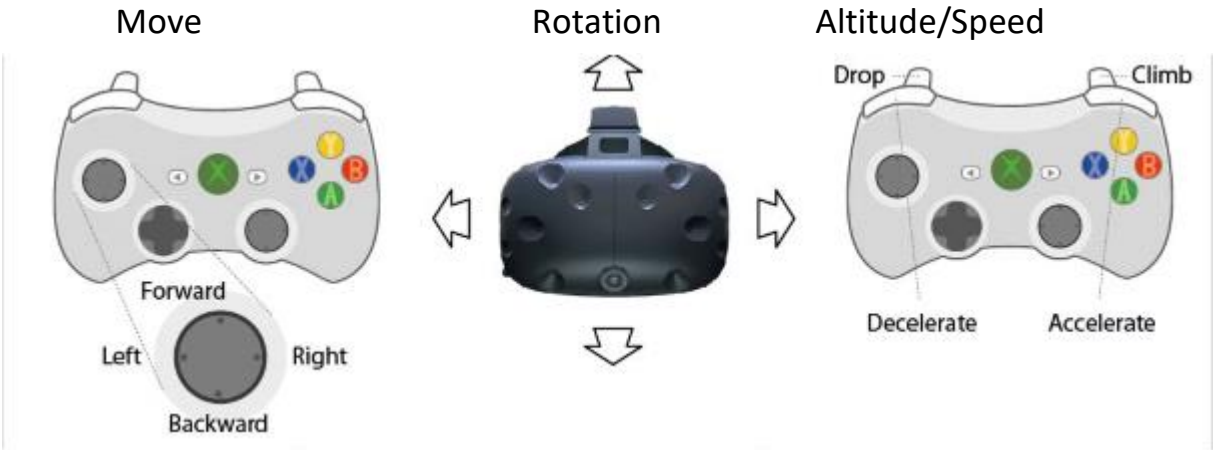
3.5 VR Glasses and Gamepad

The CityGRID® Scout can be used with the VR glasses Oculus Rift and HTC Vive. The 3D scene fades into the VR glasses, giving the impression of being right inside the VR-world (immersive virtual reality). Every movement of the glasses is directly transmitted to the Scout as a change of direction. Consequently, it's the user who determines the viewing direction in the Scout by rotation of the head or rotation of the body on the spot.

Tip: For inexperienced VR users, it is advised to take a seat on a swivel chair and to execute the rotations in a sitting position! Experienced users can navigate through the Scout scene in a standing position.

The gamepad takes on the movement as well as the interaction with the control devices of the Scout. Given that the view of this device is not possible while wearing the glasses, a user should make himself familiar with the controlling before dipping into the 3D scene!

Note: In order to operate a Scout with VR glasses, the Scout must be started via the corresponding .exe file (Scout_Rift.exe or Scout_Vive.exe). This file can be generated via the Builder Control Center in the course of publishing (see Manual of the CityGRID® Builder) if VR Scouts are licensed under CityGRID®. In addition to that the setup of the glasses on the computer must be completed and its correct operating therefore guaranteed!



The movement in the Scout is always oriented towards the center of the current 3D section and the altitude remains constant. To prevent or minimize the possible feeling of dizziness while wearing the glasses (Motion Sickness) lateral flight movements are disabled. A reverse flight, however, is permitted and occurs against the current viewing direction.

The viewing direction of the 3D scene depends on the 3D position of the VR glasses. Rotations towards all three axial directions are permitted and they can be combined with each other. To perform a complete rotation, the player himself must conduct a proper rotation on the spot. Simply by turning the head, it is not possible to look in all directions.

Changes of the altitude are achieved by pressing the two trigger buttons. In this case, the change of altitude happens infinitely as long as one button is held down.

Using the shoulder buttons offers an increase or decrease of the speed of the movements.

3.6 Gesture Control via Microsoft Kinect

To facilitate the interaction with the Scout, without having to use peripherals like mouse, keyboard, etc., the CityGRID® Scout is connected to the Microsoft Kinect gesture control system. Here, control signals are transmitted through preset gestures. The Kinect detects the position of the arms in the space and converts the movements into control signals for the Scout. Each CityGRID® Scout is prepared for a Microsoft Kinect gesture control 2.0.

Note: Every published Scout can be controlled with a Microsoft Kinect, no special facility or CityGRID® license is necessary. The only requirement is the correct installation of the Kinect.

The implemented movement scheme uses an imaginary steering wheel. Like driving a vehicle, both hands must remain on the imaginary steering wheel in order that the Kinect-controlling works. As soon as at least one player is in the search field of the Kinect and the Kinect can detect the position of both hands, that person is declared the active player and the Scout hands over the control. If several people are in the visual field, there is still only one of them considered an active player and all the others are ignored by the Kinect. But it is possible to hand the control over to another player when the active player hides his hands in front of the Kinect. This can be done by putting the hands into the trouser pockets or place them behind the back.

Tip: By default, the Kinect expects the active player at a distance of about 2 meters from the sensor. Once the sensor has detected the person, the person is allowed to move further away from the sensor.

The Scout indicates the search field and the players located in it in a schematic representation below the general map icon. Once the Scout detects a Kinect-system, this image appears. The active player is indicated as a green dot, all remaining people as red dots. As shown through this representation it is always clear who has just taken control, and where this player is moving within the search field.

Note: The control signals of the Kinect can always be (de-)activated by pressing the K *button. When the Kinect is aligned, but disabled right now, the representation of the search field is shown grayed out.*

The following gestures are currently stored:

Triggering the tracking

In order that the Kinect system can interpret the commands of the user, the active player must be identified. This is done by taking the starting position. Both hands are easily bent and put in front of the chest. Then clench a fist and imitate the position as if holding a steering wheel.

Changing the sight

Once the tracking is completed, the position of both hands must be changed as if rotating the steering wheel. Turning the steering wheel changes the viewpoint in the Scout accordingly. The distance between the two hands should remain constant.

Raising the steering wheel towards the head increases the flight altitude. Lowering the steering wheel in direction of the waist decreases the altitude. When the steering wheel is kept at chest level, there is no change of altitude.

Changing the airspeed

The airspeed depends on the distance of both hands from the chest of the user.

Moving the hands away from the body increases the speed. Approaching the hands decreases the speed.

The movement can be completely stopped near the chest, so that a rotation on the spot is possible.

If you move your hands even closer to the body, a backward movement starts.

3.7 Control on Mobile Devices

The CityGRID® Scout is available as app for mobile devices like cell phones and tablets. To support the smooth operation scheme of using touch screen input, the Scout also provides corresponding input commands.

Note: To provide Scouts using the Scout app, please feel free to contact UVM Systems GmbH.

The menu, as well as its sub-items are accessible with a single tap of a finger. It should be noted that not every menu item that is available in the offline mode is also available in mobile versions. In particular functions that need a following saving (e.g. the recording of a path) are not available.

Move	Rotation	Altitude
The movement in the Scout largely follows the card mode (see. 3.2.8). Locomotion in the 3D world happens by touching the screen with a finger and pulling the section in the favored direction.	For a rotation, two fingers need to be put on the screen side by side and the section can then be turned in the favored direction.	A change of altitude is performed by placing three fingers next to each other and shifting the picture content vertically. A variation of the speed is not provided on mobile devices.

4 Overview map

To simplify the navigation over larger areas and to enable the positioning over selected local sites, the CityGRID® Scout is equipped with the function of an overview map. The map window, located in the upper right corner of the 3D window, can be folded (default value) or unfolded via the Builder Control Center right at the start of the CityGRID® Scout (see Manual of the CityGRID® Builder). The map window pops up by clicking on the map icon or is minimized by pressing the X Button.

The contents of the map section are linked to the 3D position of the Scout. The indication of the position reference system in the Builder Control Center is obligatory so that the map is perfectly synchronized with the Scout data.

Note: If the coordinates of the input data have been modified by attaching a local offset such that no EPSG code can be assigned, the overview map cannot be applied. In this case, the input data with the corresponding offset values are to be shifted before they are introduced into the Builder Control Center,

By default, the map contents are integrated as Open Street Map WMTS service. This assumes that a working internet connection is guaranteed at the runtime of the Scout and that no firewall prevents the download of the required map section. The conversion of the projected coordinates into geographic coordinates as well happens via internet connection. In addition to the OSM data all other map data that are available as WMTS service can be used. This also applies particularly to basic city maps. The display of offline map data is equally possible and customized cards can be used.

Note: However, when using offline map data an internet connection is still necessary, because the conversion of the configured local coordinates into geographic coordinates is achieved via a Web service!

Note: To install an alternative map, please contact your UVM Systems supervisor.

The current position in the 3D environment as well as the viewing direction are represented by the direction indicator. The zoom level within the map display can be zoomed in and out in the map window by using the mouse wheel. Moving map sections is possible by clicking and dragging. A double-click in the map view defines a new position and places the view of the 3D window exactly above this new position.

tip: If you want to look at a very certain point on the map, the new selected position should be slightly off this point because the 3D view is kept exactly where the double-click was set. For a panorama view however, the new position is to be defined precisely at the selected point.

5 Main Menu

Various actions and queries in the 3D scene can be made via the main menu. The button ☰ opens the menu. Navigation is possible via mouse, keyboard and gamepad. The following items of the menu are optional, and they will only appear if the Scout has the appropriate data available.

5.1 Views

Under the menu item “Views” all preset views of the Scout are callable. These can be static views or dynamic camera animations.

5.1.1 Viewpoints

Viewpoints are fixed predefined visual foci in the 3D scene that quickly bring into focus specific contents. Each Scout starts with at least one view which determines the starting viewpoint. If required, any number of views can be defined directly out of the Scout (see 5.3.4) or predefined via the Builder Control Center (see Manual of the CityGRID® Builder).

Note: Viewpoints out of running Scouts can only be created in offline Scouts. Online Scouts do not allow a saving of the view and therefore can only head for predefined viewpoints.

5.1.2 Animations

Unlike viewpoints, animations are moving camera flights by the Scout. These flights have a preset speed and flight direction and qualify for putting the Scout into a kind of movie mode. The flights are defined by the 3D Studio Builder (see the Manual of the CityGRID® Builder) or directly in the Scout (see 5.3.4). When a flight is started, the viewing direction can be influenced individually (right mouse button, cursor keys etc.), but as soon as the individual control is completed the animation returns to the preset viewing direction.

The animations start together with the Scout and run steady in the background. By activating an animation via the menu or the

button, the view jumps right to the current position of the ongoing animation and continues with this view until a new view is selected via the menu or the

button. By leaving the animation it is not stopped but proceeds the prescribed flight path in the blanked state. Each Scout can have any number of animations, but only one animation can be active at a time!

tip: An existing animation can be started via the Builder Control Center after a specified period of inactivity in the Scout. This option can be enabled via the Config page of the Build tab (see Manual of the CityGRID® Builder).

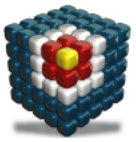
5.2 Content

Content summarizes all the menu items that can change the appearance of the 3D scene. The listed entries must already have been prepared by the Builder Control Center at the time of preparation of the Scout. Via this submenu, the data combinations can be called up in real time.

5.2.1 Variants

To be able to switch between different (planning) states in the 3D scene in real time, so-called variants can be called up. These variants include various distinct states of the represented data, like planned construction projects, architectural designs, thematically mapped building models, etc. Each variant has been considered in the preparation of the Scout and is accordingly configured (see Manual of the CityGRID® Builder) so that an easygoing switchover at the runtime of the Scout is possible without complex calculations. Each variant holds a freely selectable name.

5.2.2 Transparencies



Similar to the variants data packets, such packets can also be combined in the case of transparencies, but with the difference that the data contents remain the same (3D geometry) and only the transparency changes. With this mechanism, a building with interior design can for example be represented in such a way that the outer walls seem transparent or completely hidden to provide an entire free view into the interior. Analogous to the variants, the transparent data must be predefined via the Builder Control Center. A switching between the prepared states can then happen in real time at the runtime of the Scout.

5.2.3 Simulations

Once a simulation has been recorded with the *Vissim* interface, this function appears under *Contents*. A recorded simulation can be started here. If the playback is to be stopped, *None* must be selected. These simulations are included in a free project when a scout is published.

When a simulation is selected for playback, it takes some time, depending on the size of the simulation, for the Vissim library objects to be loaded.

*Tipp*Pursuit mode is also available in a simulation.

5.2.4 Points of Interest (POI)

POIs are available under Content only if they have been set beforehand in interaction with the Builder Control Center. Setting is only possible if ONE Scout project and ONE instance of the Builder Control Center are open with the same project loaded. For this, it must be activated in Scout under *Settings* > *Allow external communication*. At the beginning, a viewpoint of the future POI must be recorded under *Tools* > *Record Path* > *View*point, which must be given the same name as the POI later. Then the Builder Control Center is opened and the settings for the POI are made. (see Builder manual chap. 5.3.2.)

5.3 Tools

The submenu summarizes various functions for interaction and query with the 3D data of the Scout.

5.3.1 Info

The query system “Info” facilitates the delivery of attribute information and meta information of 3D objects. Once the mode is activated, the following information about any object indicated by the mouse cursor is delivered, if available:

Position

- *X / Y / Z:* 3D coordinates in the position reference system of the input data
- *H:* Current viewing height above the ground (only with Static terrain data class)

Object Info

- *Scene Name*: Identification of the data packet from the preceding Scout preparation (see Manual of the CityGRID® Builder)
- *Model*: Name of the CityGRID® model where the units come from
- *ID*: UnitID of the CityGRID® Unit

Attributes

- Possibly existing CityGRID® attributes of Units.

A recording of clicked units can also be made by this Info mode. These recordings can subsequently be imported into the CityGRID® Modeler, as a list in the warning window. In this way building models can be tested efficiently within a model by Scouts. If a building must be delivered for an interactive correction in the Modeler, it will be entered in the Info list by clicking and then loaded in the Modeler for the subsequent correction.

The button starts the recording mode. Once this mode is running, the image section of the 3D scene cannot be changed anymore, because the mouse cursor is now exclusively needed to identify the building models. interrupts the recording of the list and allows a change of the 3D viewpoint. Another click on continues the recording. To stop the recording, click the button again. The adjacent text box allows setting a comment for an easier and better identification of the clicked point in the Modeler. The text can be adjusted at any time to certain particular requirements and is effective immediately at the next recorded point.

Recorded points are stored per started recording in the directory of the Scout under the path Content\Data\SuGu and always carry the designation "Info_current date/time" (e. g. Info_2018-05-28_03-31-14.xml). In case of multiple records, each record gets an individual XML file, while pausing a recording means, that all the following points are still written into the same descendant XML until the recording itself is stopped.

5.3.2 Shadow

In each CityGRID® Scout scene there can be introduced an active light source to perform shading studies. By default, the scout starts with the so-called ambient light, which ensures that all the surfaces of 3D objects are evenly illuminated. 3D objects begin to interact with the light source and to change their appearance by activating the light system. Lighted areas appear brighter, while shaded areas are shown as dark.

Note: To determine the position of the sun, the geographical coordinates have to be specified through the Builder Control Center, by means of the Config page. Ideally, the center of the entire project area is used as reference point. If the specification of the geographic coordinates remains undone the shadow simulation cannot provide accurate results because the default position is that of Vienna.

The selection list *Mode* allows the specification of the type of light source and the associated type of shading:

- *None*:

  Disables all light sources except for the ambient light. The surfaces of the 3D bodies appear evenly lighted and equal from all sides. This does of course not include texture images that already contain a shading in the image content!

- *Shaded*:

  There is introduced a light source in the 3D scene and aligned in accordance with the specified geographical coordinates. Lighted areas appear brighter, the far sides darkened. By this setting, the contrast is intensified, whereby the depth impression of the shown model is improved.

- *Soft*:

Operates analogously to *Shaded* but the 3D bodies also cast drop shadows in the 3D scene now. Of course, the shadow also takes into account all the included 3D scene objects and is reproduced according to their forms. The drop shadows are made semi-transparent in this *Soft* mode and are not reproduced with sharp shadow edges.

- *Hard*:

  Operates analogously to *Soft* with the difference that the shadows are much darker and the shadow edge is drawn as a hard line. In this mode, the contrast between light and dark areas is the strongest of all possible light-settings.

The exact time of shading can be specified via the input fields *Date* and *Time*. The format for the date follows the pattern day - month - year, the format for the time is hours - minutes. The button opens a calendar, the button sets the time on the current system time of the computer. The time is also infinitely variable using the slider.

The checkbox *Daylight Saving Time* indicates whether the one-hour shift at the specified date needs to be taken into account or not.

5.3.3 Measure

Measure starts a tool that allows the retrieval of coordinates, distances, angles and areas in the 3D world. The measurements can be recorded and output as an XML file.

To start a measurement, click at any point in the 3D scene to define the starting point.
The tip of the mouse cursor is the respective endpoint of the measurement. Depending on the measurement mode at the runtime, ratios of the measurement are released directly in the 3D window and in the output window of the measuring tools respectively. A double click ends the current measurement. A right-click facilitates the deletion of all measurement results in the 3D window.

tip: Using the left shift button activates a snapping mode which only allows the selection of triangle vertices. The pressed Y button restricts the object snap to triangle edges.

While the running measuring tool, the Scout highlights every hit building area (triangle) to provide the user with feedback about the currently active 3D object. It should be noted that only objects with a predefined distance to the current position in the 3D space are included in a measurement. Too far away objects are excluded from the measurement.

tip: In order to nevertheless include distant objects in the measurement, the 3D cutout can be changed in the opened measuring tool.

- *Measurement Mode*:

  Defines the type of measurement. The following modes are to choose:

  - *Point:* (P)

    Outputs the current position of the mouse cursor. Clicking the current position adds it to the measurement list. If a terrain model is present in the Scout, the parameter "h" informs about the relative height above ground.

  - *Distance:* (D)

    Determines the Euclidean distance between two measuring points. The first click specifies the start point, the second defines the target point. The distance between the points will be immediately issued and registered in the measurement list.

  - *Angle:* (A)

    Allows the measurement of angles in a triangle spanned by three clicks. The angles are output in degrees and immediately displayed at each triangle point.

- *Path:* (G)

  Allows the determination of distances, including intermediate points. With each click, the measured distance gets extended and both the total length and the length of the respective segment are displayed. A double click ends the distance measurement.

- *Area:* (F)

  Provides the facility to measure 2D surfaces. With each click, the measured area gets extended. A double click ends the range measurement.

- *Marker*:

  The width of the measurement lines and the diameter of the ball at the measurement position can be determined with the slider.

- *Tag*:

  The text box allows the setting of an arbitrary label for the measurement. The registered name is set in the XML file and can serve as an identifier of the measurement.

- *Lock camera movement*:

  Freezes the current 3D cutout and prevents an inadvertent shifting. This option must always be turned off in the measuring-tool before a change of view.

tip: When closing or opening the measuring-tool, this option is also disabled.

- *Use Terrain Data Only:*

  Restricts the measuring strictly to terrain models (data of the class static terrain) and ignores all other 3D objects in the Scout project.

Button	Functionality
	Save Stores the completed measurement and identifies it with the name in the entry field. New measurements are automatically stored in the file as long as no new file name has been set.
	Discard Deletes the entire measurement. This has no effect on already stored measurement results in XML.

5.3.4 Digitizer (Path Recording)

The 3D scene in the CityGRID® Scout can be controlled individually by the user and allows viewing the 3D virtual world from arbitrary angles. But sometimes it is also necessary to take pre-defined routes to put the attention on different aspects of the shown contents. Such an animation can also be used when the 3D scene is not being recorded interactively right now and the impression of a static image should be avoided. The menu item *Digitizer* offers the possibility to define such camera animations or fixed viewpoints.

The menu offers several options to set camera animations. The selection of the applied creation method is defined via the selection list *Recording Mode*. The following modes are available:

- *Manually:*

  From a series of sequentially flown views of the Scout, key images (key frames) are created and automatically connected by means of the smoothed path. The key frames can be set completely individually and the animation time between the keys can be specified via the menu.

- *Rotation:*

  Based on the current 3D position in the Scout a rotation is performed on the spot. The duration of the rotation can be adjusted.

- *Around:*

  By specifying a focus point (target) and the actual camera position, a round trip around the target point is framed. The specification of the time for one round determines the airspeed.

- *Real Time:*

  The camera animation records the current movement in the 3D world, thus allowing the recording of a real-time flight.

Note: The recording modes for camera animations can also be interconnected to create complex motion sequences. For this, the appropriate recording mode and the time duration have to be selected during the creation of the animation and the necessary keys must also be set. The Scout automatically adds these determined sequences to a homogeneous animation.

- *Viewpoint*:

  The current view is saved as a focal point and can be called up again anytime.

After the recording mode has been set, the definition of the animation itself happens via the recording parameters. As mentioned before the animation is framed by using key images (key frames or keys). The procedure here is always:

1. Approaching the desired position in the Scout
2. Aligning the angle of view
3. Clicking the button to add / change the keyframe.

To set keys, the following buttons are available:

Button	Functionality	Recording Mode
	Add The active viewpoint is added to the end of the existing animation.	Manually, Rotation, Around
	Insert The active viewpoint is inserted after the set key image on the slider *Keys* (see below).	Manually
	Replace The active viewpoint replaces the set key image on the slider *Keys* (see below).	Manually
	Clear The set key image on the slider *Keys* (see below) is removed.	Manually
	Start The recording of the flight path in real time is started.	Real Time
	Target The current 3D position of the Scout is defined as the focal point for the round trip.	Around

Beside the key images, the time sequence thereof and the indication of the total time duration of the animation sequence respectively, is of crucial importance for the success of the camera flight. The time span between the keys is determined via the input field *Time (s)*. Depending on the selected recording

mode, the labeling of this parameter varies, as well as the predetermined time value. The recording length can be specified explicitly for the modes *Rotation* and *Around*, but in the case of the mode *Manually* predefined time interval and the covered distance in the Scout are crucial for the airspeed.

tip: Only increasing the time interval does not necessarily result in a slower flight, as the interval just defines the margin between adjacent key images. Even if the keys lie far apart, a fast flight may still be necessary in order to complete the course within the predefined time.

Note: The time interval can be set manually in the recording mode, individually for each key image. In the other modes, predefined times always count for the entire shooting sequence.

In the case of manually recorded paths or a real-time recording, a connection of the last key image with the start-up image can be inserted automatically by setting the option *Close animation path*. Thus, the animation can run in a loop without visible bounding at a further pass.

Note: Close animation path also uses the specified time interval to come back to the starting frame. If starting point and target point are far apart a sufficient time period is to ensure.

The controls for the command-group *Keys* give conclusion on the currently displayed key image, or allow access to certain key frames. Using the slider allows heading sequentially for all existing key frames. This facilitates changes of the time interval, or shifts in position via the recording buttons (see above). In the text boxes below the slider the currently active key image (*Active Key*) is cited, as well as the animation time (runtime) to this key image. *Animation Length* determines how long the entire animation will actually last. A change of time affects all key images proportionally.

Note: By using this parameter the user can influence the global playing time, and thus the animation speed. Increasing the animation time provides a slower airspeed, a shortened duration provokes faster flights.

Button	Functionality
	Preview The current animation will be played in preview mode. The path is not saved yet, and is typically being processed right now.
	Save Saves the created animation and labels it with the specified name in the entry field. If the name is already taken, the current time is appended: Around_2018-05-28_03-31-14 ". Renaming is currently only possible via the Builder Control Center, on the *Config* page. (see Manual of the City**GRID**® Builder)
	Discard Deletes the entire animation with all its key images.

5.3.5 Renderer

The 3D Scene of the CityGRID® Scout can be released in the form of still images or a series of frames for a downstream film production. The corresponding functions are bundled in the menu item *Renderer*. A precondition for the output of individual images, which even can be summarized as a film if desired, is the existence of a camera animation. The Scout does the path once and completely and generates 25 frames per second, in the desired image dimension.

Via the group *Contents* it can be determined which parts of the 3D scene shell be output as (individual) images. The selection list *Image Sequence* lists all existing camera animations defined earlier via the menu item *Digitizer* (see 5.3.4) or the 3D Studio Builder (see Manual of the City**GRID**® Builder). *Single Image*, however, displays all viewpoints that are set in the Scout project. In addition to that, the entry *Current View* is present as the first list entry in order to render still images even without explicitly placed viewpoint.

Note: If exactly the same view should be rendered more than once, for example to show different planning conditions, setting a viewpoint is advised, because otherwise it won't be possible to adjust exactly the same view again.

The *Rendering* mode provides different methods to save the previously specified contents as an image.

- *Preview*:

  The default calculation of the camera animation is an image per second. This mode is intended for a quick test run of the rendering process to detect possible incorrect settings prior to a time-consuming full rendering. The output is not suitable for a continuing video production!

- *Normal*:

  Generates 25 frames per second of the preset camera flight. Here, the reloading happens exactly the same way as in the Scout, and is therefore also visible in the video.

- *Detailed*:

  In this mode, the Scout arranges that all data are loaded in the 3D window regardless of their distance before the image is rendered. Hence, no reloading effect is visible in the video. This mode provides the highest possible quality level of the image output, but also requires the most time.

Note: In order to ensure the highest possible image quality and flexibility of the rendered video, the Scout produces a series of individual images, which can then be further processed into high-quality videos with the appropriate editing software. When rendering, it is deliberately avoided to display logos or labels, as these objects can be integrated as part of the post-processing of the rendering.

Note: While the rendering process, the Scout must remain in focus (as active application), otherwise the rendering will be stopped. For a time-consuming rendering, it is therefore advised to use a separate computer on which no further work is carried out.

The list *Picture Size* provides some common image dimensions as default, but also allows a user-defined setting of the image resolution by specifying the pixel values for image height and image width. In the predefined image sizes these values are not changeable.

Under the heading *Other* optional features are listed that can be taken into account when rendering, if necessary.

- *360°*:

  The rendered frames are views of the shooting position in all directions (equirectangular projection). Composed to a video, a clear 360 ° view is offered during the ongoing film. A particularly intense impression of such a video can be achieved by using VR glasses.

  Note: Rendering of 360 ° videos is only possible with video cards that offer a VR support.

- *Stereo:*

  Generates a second slightly offset frame of every 360 °-frame to produce a stereoscopic impression at the runtime. Resultant films have even better 3D impression. For the preparation of such videos the used editing software must of course be able to process such data. In addition to that, the preparation time is higher than with conventional 360 ° rendering.

5.3.6 CityGRID

Diese Funktion ist nur bei lizenzierten Scouts verfügbar. Sie erlaubt das Hinzufügen von CityGRID xml Dateien, CityGML Dateien oder Gebäuden einer CityGRID Datenbank Verbindung

- *Source:*

  Erwartet die Auswahl einer Datei oder einer Datenbankverbindung.

- *Dataset:*

  Ermöglicht die Auswahl eines von mehreren geladenen Dateien, oder eines von mehreren Modellen in einer CityGRID Datenbank

- *Data to load:*

  Ermöglicht die Filterung der zu ladenden Daten

  - Building: *alle Gebäude werden geladen*
    - Roof only: *nur die Dächer aller Gebäude werden geladen*
  - Terrain: *nur das Terrain wird geladen*
  - Reset: *Die Daten werden entladen*

  Über den Button *Load CityGRID Data*, werden die Gebäude dem Projekt hinzugefügt

5.3.7 Vissim

The Vissim interface for traffic simulations is started under *Tools > PTV Vissim*. Prerequisite is an active Vissim license.

- *PTV Vissim Project:*

  Specify the path to the Vissim project to be connected to open Scout (.inpx file).

- *Vissim Version:*

  Only the last three Vissim versions are supported.

- *Connect:*

  Connects the Scout to the Vissim project. The Vissim application is started, and the selected project is loaded into Vissim. Also, the data from the Vissim project is loaded into Scout.

  Normal road axes have link numbers <10,000 in Vissim, connectors >= 10,000. Connectors always have a start and end position on the road axes that are connected by this piece. The adjacent points cannot be changed in Scout and are displayed in red.

  In Scout, segment points of the road axes can be moved with the mouse, by clicking on a segment, all points of the axis can be moved together, except for the end points of the connector shown in red. With the *Send changes* button, the new information is transferred to the Vissim project.

- *Mode:*

  - Edit
    Here, edits can be made to the road axes and signal systems in the Vissim project and transferred to Scout with Get Changes. Road axes can also be edited in Scout and transferred to the Vissim project with Send changes. Traffic lights can also be moved in their position with a mouse drag at their base.
    When points are changed in Scout, they are automatically readjusted to the terrain. In Vissim, this elevation information is not used.
  - Simulate
    When all editing steps are completed, the *Simulate* option can be selected. The editable road axes are hidden. *The Start simulation* button changes the scene in the Vissim project so that all elevation information from Scout is temporarily used. The *Reset* button lets the started simulation start again from the beginning.
    Set models to terrain at runtime: If this option is set, all objects will be set to the terrain at live time, even if the road axes do not always fit the terrain exactly. This can be very computationally intensive depending on the density of the terrain mesh.
    Record Simulation: This option can be set to record the active simulation to be able to distribute it without a Vissim license. The potential delay due to models placed on the terrain at runtime no longer applies to recorded simulations. When it is set, the following parameters are no longer changeable, the simulation is calculated with the best possible values.
    Simulation calculations per second: How many times per second should Vissim calculate simulation changes. Corresponds to the frame rate in Scout. Vissim itself offers a maximum of 20 calculations per second, default is 10 calculations per second.
    Simulation speed: Run speed with time-lapse effect. Default is 1

Enable fast mode: Suppresses all output in the Vissim 2D window, speeding up simulation processes.

Interacting in the simulation: With the *pursuit mode* the user can set the viewpoint in a vehicle during runtime. To do this, pause, select vehicle with a mouse click when *pursuit mode* is active, and change the camera position by turning the mouse wheel (pursuit position, driver position with the vehicle model, driver position without vehicle model). Each of the moving models is suitable for this, including pedestrians.

❖ Playback

- In the Playback section, a recorded simulation can be played back, renamed, or deleted using the corresponding buttons.
  - *Recorded simulations:* shows a list of all recorded simulations in this project.
  - *Playback speed:* speeds up or slows down the playback of a recorded simulation.

5.4 Settings

5.4.1 Properties

The submenu *Properties* lists various settings and parameters of the Scout itself, the used computer and the network. Primarily this window serves the debugging and development by UVM Systems GmbH.

5.4.2 Performance

This menu allows parameters to affect the appearance of the Scout scene.

- *Resolution:*

  Lists various dimensions in which the Scout can be displayed. The contents of the list are depending on the supported resolution of the graphic card and the chosen display device. With the exception of the *Window Mode*, that starts the Scout as a free-floating Windows-application, each selected resolution starts the Scout in fullscreen mode.

- *Quality Distance*:

  Determines the distance up to which the Scout data can be presented in the best possible quality. The higher this value is set, the farther away from the current focus of the Scout project 3D data are visible. However, this also increases the memory requirements. If the value is too high, the Scout recognizes this and reduces the setting automatically to a reasonable level. The start value of the quality range can be set via the *Config* page in the Builder Control Center (see Manual of the City**GRID**® Builder).

  tip: When rendering videos, the quality range should be set to the maximum tolerated value of the computer. Under these conditions, a video can be created using the mode "Normal", in which the reloading processes are virtually imperceptible (see 0), but that can be created significantly faster in contrast to the mode "Detail".

- *Texture Quality*:

  Determines at which level of quality (LoD) the textures are presented. The lower the setting, the lower the texture quality and also the amount of data to be transferred in the Scout. This parameter has a primary impact in online Scouts where it is about creating a balance between data transmission and display quality. At the start of the Scout an optimal setting is ascertained, but if required this setting can still be varied by using the slider. The values range from low (0) to medium (1), high (2) and fantastic (3).

  tip: The texture quality can also be determined at the start of a Scout by means of the parameter "Quality" (see 2.1).

- *Anti-aliasing:*

  Controls the quality of the anti-aliasing algorithm to avoid the sawtooth effect in vector space. The higher the value is set, the sharper the edges seem. But a high smoothing value also requires a high processing power of the graphic card, which is noticeable in a decreasing repetition sequence of the rendered images (FPS, see 5.4.1) noticeable. A good balance between parameters is important therefore.

- *Texture Filter*

  Determines the quality of the anisotropic texture filter, which is used by the graphic card.

- *Shadow Quality:*

  Affects the sharpness of the object's shadow in the Scout project. The higher the value, the sharper the shadow edge, but also the higher the processing power. Excessive shade quality influences the repetition frequency of rendered images (FPS, see 5.4.1) and thus the performance of the Scout project.

- *Shadow Distance:*

  Sets the range in which shadows of 3D objects are calculated at the runtime. The value is interpreted as a radius, starting from the current camera position in the 3D window. High values generate the shadow also from more distant objects, but reduce the performance due to the increased computational demands on the graphic card.

- *Vertical Synchronization:*

  Regulates the type of image structure on the display unit. The slider represents different modes, but says nothing about the quality of synchronization! For the fine tuning of a Scout the vertical synchronization of every display unit is to be set individually!

5.4.3 Point cloud

To adjust the point cloud representation in the Scout is the task of this submenu. Various methods for point size representation are summarized here. In order to display the point cloud data in the Scout, each point is represented as a geometry object (square), which is always oriented parallel to the image plane.

- *Point Size:*

  Adjusts the overall edge length of the square. The value can be set continuously variable in the range of 1 – 25 via slider. The values correspond roughly to pixel values.

- *Use adaptive point size:*

  Activates a mode that varies the size of the points, depending on the distance of the current camera point of the 3D scene. Distant points are displayed smaller and close to the camera position located points are bigger.

  - *Adaptive point size (far):* Point size distant from the camera point.
  - *Adaptive point size (close):* Point size close to the camera point

Note: The general point size also affects the settings of the adaptive point cloud representation. The values of "far" and "near" thus regulate the relative size change to each other, the general point size on the contrary regulates the overall appearance.

- *Invert Direction:*

  Inverts the default setting of the adaptive point size representation. When this option is enabled, remote points are represented proportionally increased and near points accordingly decreased.

5.4.4 Engine

General functions and parameters of the current Scout application are summarized here.

- *Startup Settings*

  Determines how the Scout is to be configured at subsequent launches.

  - *Allow streaming in cellular networks:*

    Defines whether an online Scout may retrieve data from the internet when connected via a mobile network from any provider (phone contract or prepaid card). Since the streamed data can account for large amounts of data very quickly, it is recommended to use online Scouts only via Wi-Fi or wired internet, when the internet connection is based on fair use basis or unlimited data.

  - *Scout pauses in background:*

    Instructs the application not to load data if the program is put in the background. This setting has particular impact on the use on mobile devices such as mobile phone or tablet.

  - *Streaming alert every 25 mb:*

    Displays a message on the Scout window as soon as 25 MB of data have been transmitted. The user is thereby informed of the resulting transfer volume, particularly on mobile devices (mobile phones and tablets).

- *Show on Startup:*

  Announces all the information regarding these parameters described here every time the Scout is started. The user could thus explicitly set certain parameters to allow a conscious and one-time streaming on mobile networks. If this option is disabled, the Scout starts with the preset options without asking the user explicitly.

  Note: To make the parameters appear again at the start, this box is to be set again.

- *Device:*

  Allows switching between different viewing devices. The list shows all devices that are ready-to-operate on the computer and are supported by the Scout.

- *GUI - Size:*

  Allows to regulate the space requirement of the menu. All control surfaces as well as the font reduce the size in accordance with the selected setting.

- *Communication:*

  Allows the exchange of data between the Scout application and other programs.

  - *Allowing External Communication:*

    This option is currently used in the Builder Control Center to take over current views as fixed viewpoints directly from a running Scout. Once this option is active, the Scout makes its position information available to other programs every second.

    Note: As the query and transmission of Scout data results in a loss of performance in the 3D window, this option should only be enabled if necessary. By default, it is disabled for this reason.

- *Library Data*

  Provides settings for Unity-based library objects that can be contained in the Scout.

  - *Show Model Animation:*

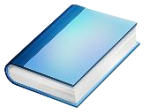
    Activates any possible movement pattern in the used library objects. For example, movements of the human-library can be prohibited.

    Note: "Show animations" has no effect on explicitly defined movements of the 3D Studio Builder, but is only effective for specially prepared library objects, which themselves already have animations.

- *Transparency:*

  Provides a slider by means of which the transparency (see 5.2.2) of all objects that have been defined through the Builder Control Center and the Config page is set (see Manual of the CityGRID® Builder). The values can be set continuously variable from 10 to 90. The higher the value, the more transparent the 3D objects appear.

5.4.5 Documentation



Calls a link to the CityGRID® Scout Manual. The manual is provided as PDF on the homepage of UVM Systems GmbH. An internet connection is required to access the manual.

5.4.6 About…

Provides general information about the Scout application, such as the version number.

6 Error Processing

The CityGRID® software is developed, tested and serviced by UVM Systems GmbH with the pursuit of accuracy. However, we cannot completely exclude errors during processing.

If you want to send an error report, please include the following information / data:

1. Description of the actions that led to the error.
2. SuGu.log log file: you can find the log file under Scout\Content\Data\Sugu in your Scout project.

Note: Please save this file immediately after the crash, as a renewed program start can lead to an overwriting of this file.

Please send the error reports to: support@uvmsystems.com

7 Contact

UVM Systems GmbH

www.citygrid.at

www.uvmsystems.com