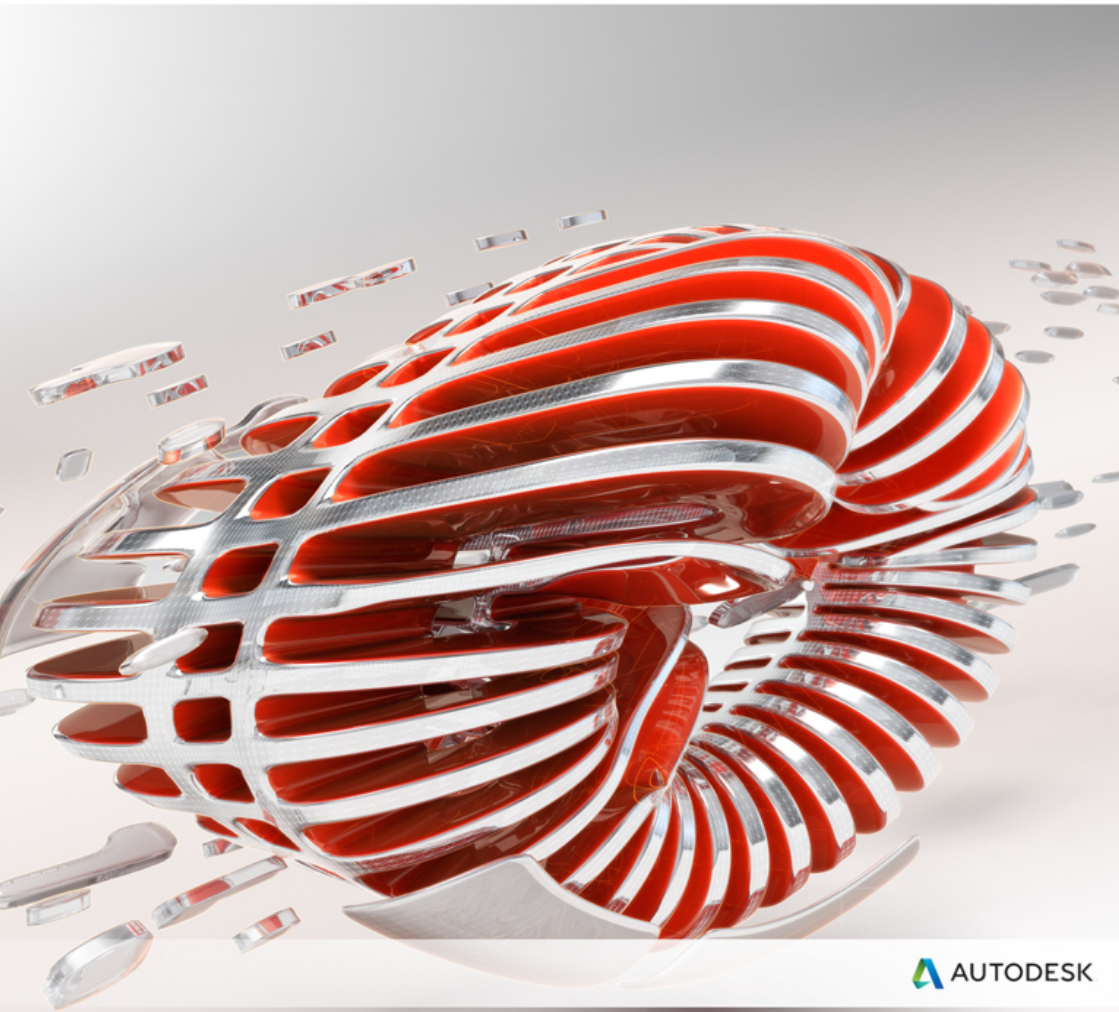
AUTODESK® VRED™

Documentation

884F1-05Z0BR-P500E



AUTODESK

»AUTODESK VRED 2014 Documentation

March 8, 2013

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Getting Started

1 GETTING STARTED

This topic provides information about the new features in this release as well as the system requirements of VRED and information about the installation process.

1.1 What's New

» **Data Input / Tesselation** Industry-quality CAD import supporting:

- » CATIA V4: *.model, *.mdl, *.session, *.exp, *.dlv, *.dlv3, *.dlv4
- » CATIA V5: *.catpart, *.catproduct, *.cgr
- » Autocad: *.dxf, *.dwg
- » ProE/Granite: *.prt, *.asm, *.neu, *.g
- » IGES: *.igs, *.iges
- » STEP: *.stp, *.step
- » Inventor: *.ip, *.iam
- » OpenInventor: *.iv
- » Studio: *.wire
- » SolidWorks: *.sldprt, *.sldasm)
- » NX: *.prt

» **Raytracing Performance Improvements** Raytracing performance has been improved by approximate 20%

» **Additional Renderpasses for offline rendering** Additional passes allow even more creative flexibility for composition

- » Diffuse, Glossy, Specular und Translucency Color
- » Diffuse IBL, Light und Indirect Illumination
- » Glossy IBL, Light und Indirect Illumination
- » Translucency IBL, Light und Indirect Illumination

- Specular Indirect Illumination
- Mask Pass
- World Position Pass
- World View Pass

» Usability

- Allow mathematical expressions for numerical input fields (supports mathematical operators +, -, *, /, e.g. 10*0.5 or 20+100, as well as +=, -=, *=, /=, e.g. +=50 to add 50 to the current value).
- Allow international characters in nearly all parts of the user interface.
- Multiple nodes can be transformed at once with the transform manipulator or transform module GUI.
- Drag and drop of textures (image files from file browser) directly onto materials, including environment materials, in the render window.
- Undo/Redo support for Animation Module

1.2 System Requirements

» Hardware Requirements

- (64-bit) Intel® processor with Intel® EM64T-capable or AMD® Athlon 64™, AMD Opteron® processor
- 1GB RAM
- DVD drive or Internet connection
- Ethernet card (required for licensing VRED uniquely to your machine)
- Three-button mouse with mouse driver software
- A qualified hardware-accelerated OpenGL® graphics card (overlay plane capability is recommended)
- VRED takes about 485 MB for a full installation. This approximate disk space requirement is based on the NTFS disk format. If you have a FAT disk format, expect slightly larger file sizes.

» Software Requirements

- Windows XP Professional 64Bit (SP1 or higher), Windows Vista 64Bit, Windows7 64Bit
- TCP/IP network protocol software (for running VRED network rendering and other features)
- A graphics card driver. Driver software is available from the manufacturer's web site.
- Appropriate driver software for optional hardware
- Adobe® Acrobat® Reader is required to view the PDF documentation provided on the VRED DVD or as online documentation. You can obtain Acrobat Reader from www.adobe.com.
- Mozilla Firefox, Apple Safari, Google Chrome and Internet Explorer 8 web browsers have been qualified to view the VRED Help.

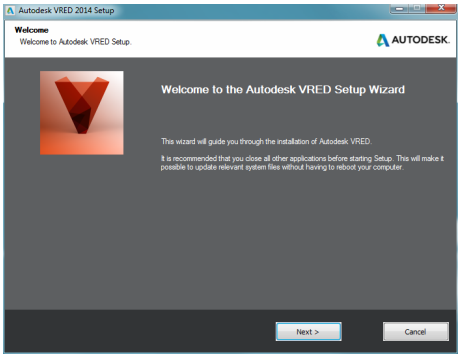
1 GETTING STARTED

» **Optional Hardware**

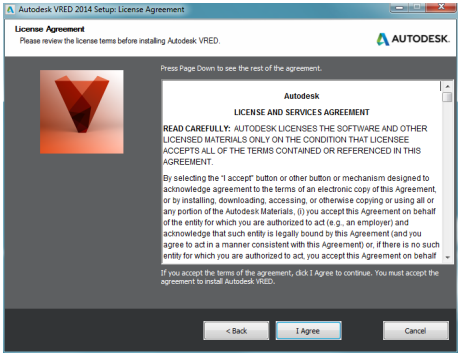
» Space Mouse: Make sure you install the latest Space Mouse driver software.

1.3 Installation using Windows

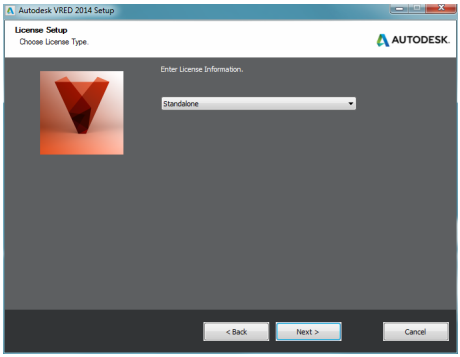
1. Download the latest version of VRED. Start the installation process by opening the file provided. To start the file directly after downloading, select "Run".
   The VRED Installation Wizard appears. The Installation Wizard directs you through the installation process. Click "Next" to proceed or cancel to stop the installation process.



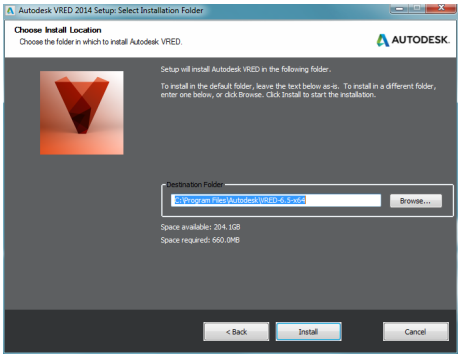
2. The Autodesk Software License Agreement appears. This agreement requires your acceptance for the VRED software installation to continue. To continue, click "I Agree".



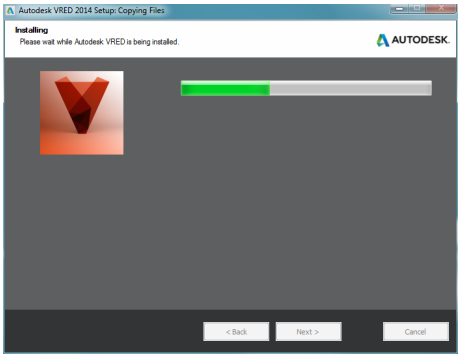
3. Specify the licensing system to install and proceed with "Next".



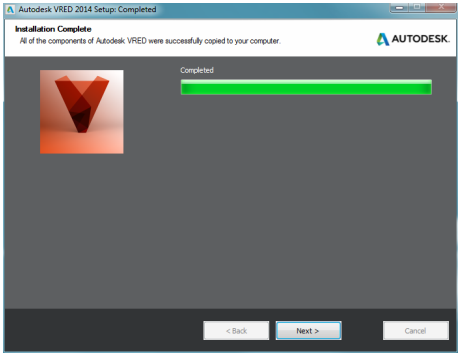
4. Specify the installation directory and proceed.



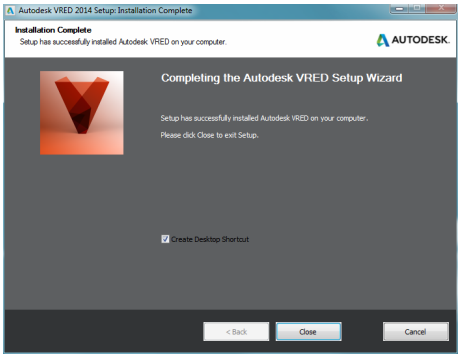
5. The installer now begins to copy all necessary data to your computer.



6. Once the installation is done, click ”Next” to proceed.

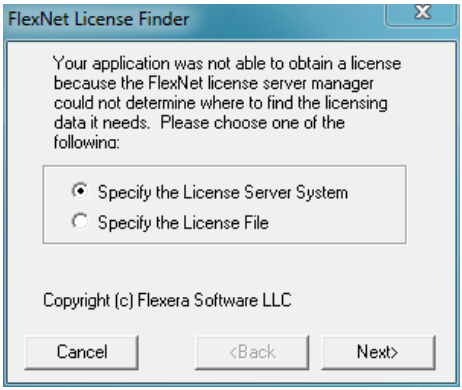


7. Select whether you want to place a shortcut to VRED on your desktop or not and click "Close" to conclude the installation process.



1.4 Licensing using a network license

1. When VRED is starting for the first time, you are presented with the following screen. Click on "Specify the License Server System" and proceed with "Next".

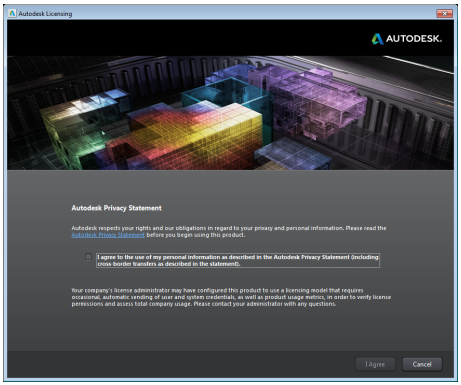


2. You will be prompted to type in the location of your network license server. Click "Next" to proceed.

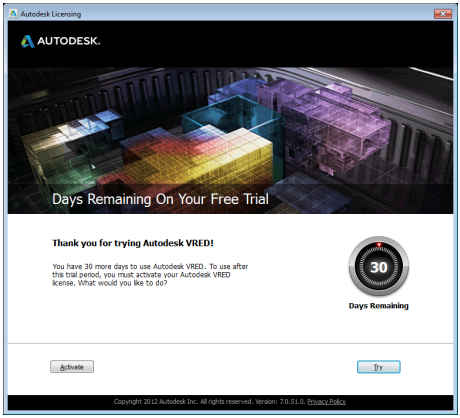
3. When the search for the server was successfull, you will be prompted by the following screen. Click "Finish" to conclude the licensing procedure.

1.5 Licensing using a standalone license

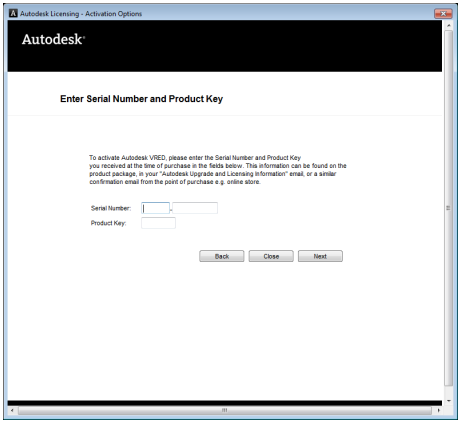
1. When VRED is starting for the first time, you are presented with the following screen. Before you proceed, you have to agree to the Autodesk Privacy Statement first. Click "I Agree" to proceed.



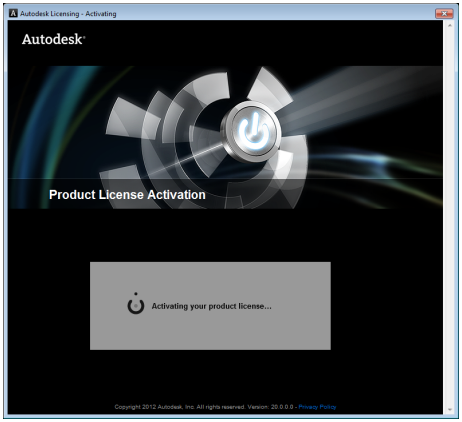
2. If you want to evaluate VRED, please click "Try". If you own a valid license, click "Activate".



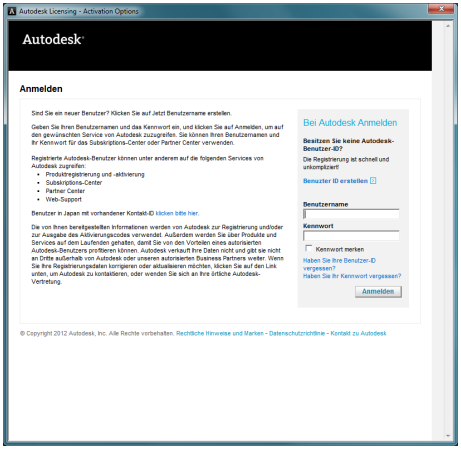
3. Please enter the Serial Number and the Product Key and click "Next".



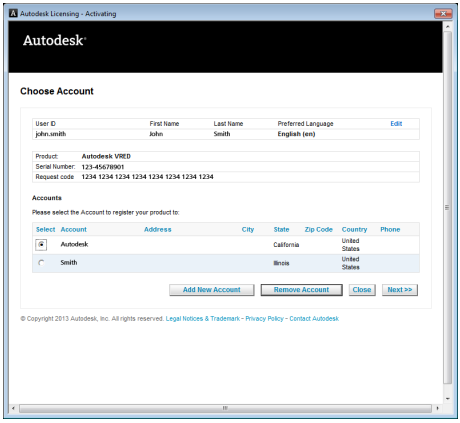
4. Please be patient while the product license is being activated.



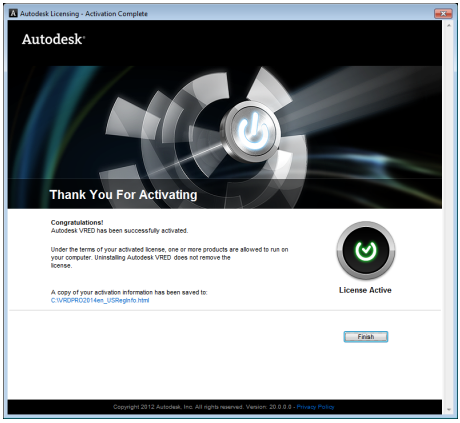
5. After successfully activating your license, you will be prompted to log in into the Autodesk network. If you do not have an account at Autodesk, "Create User ID".



6. Please choose an existing account to bind the license to and click "Next" to proceed.



7. If your license has been accepted, the following screen appears. Click "Finish" to conclude the licensing process.

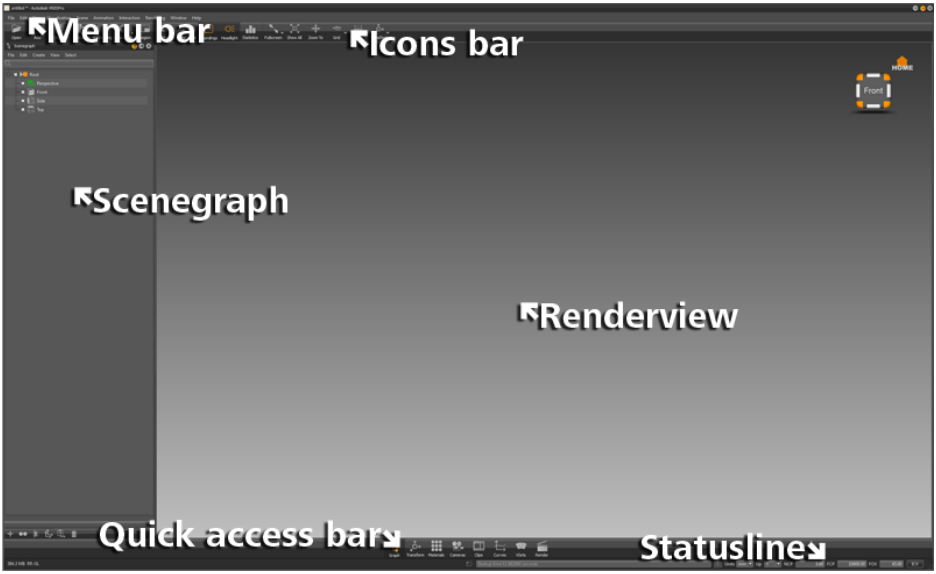


Using VRED

2 USING VRED

This chapter contains basic information regarding the general appearance of the graphical user interface. It provides an overview and introductory summary of how to navigate, select, manipulate objects, and set up the preferences.

2.1 Interface



» **Menu Bar** The Menu bar includes all main functions for creating and editing content in VRED. It provides access to the different modules available in VRED and enables basic file actions like saving or opening files.

» **Icons Bar** The Icons bar provides shortcuts to access common features such as saving the scene or toggling still frame antialiasing.

» **Scenegraph** The Scenegraph lists all nodes the current scene consists of.

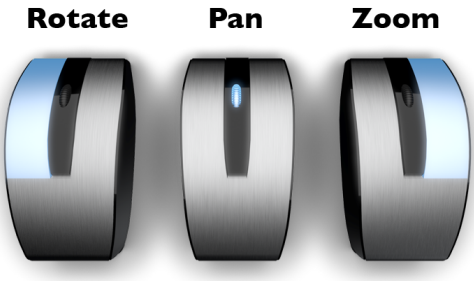
» **Renderview** The Renderview displays the whole scene. It allows to change the view as well as to select and modify objects directly.

» **Quick Access Bar** The Quick access bar provides easy and fast access to main functions such as the Material Editor.

» **Statusline** The Statusline provides information about the memory usage and allows to change the up vector as well as near and far clip planes and the field of view. It also integrates the Terminal.

2.2 Navigation in Renderview

The renderview visualizes all render settings according to the selected render mode. By default, you can use the mouse to navigate through the renderview.



2.3 Selection

» **Shift + Click LMB** in the Renderview to select an object.

2.3 Selection

» **Shift + Click RMB** to deselect selected object.

» **Shift + Drag LMB** from top left to bottom right to select only objects fully enclosed in selection frame.

» **Shift + Drag LMB** from bottom right to top left to select objects fully and partially enclosed in selection frame.

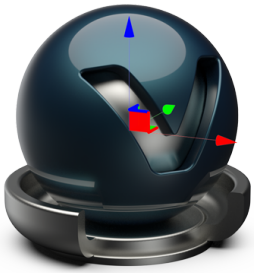
» **Shift + Drag RMB** to deselect objects in selection frame.

» **Shift + Crtl LMB** to add selected object to selection.

» **Shift + Click RMB** into empty space to deselect all selected objects.

2.4 Transform Tool

Click the Transform Tool icon in the Icons bar to toggle the display of the Transform Tool in the Renderview. A total of three transformation modes are available:



Translate
SHIFT + W

Rotate
SHIFT + E

Scale
SHIFT + R

Menus and Toolbars

3 MENUS AND TOOLBARS

This chapter provides information about the use of the Menu bar, Toolbars and the Status bar in VRED.

3.1 Menus

The Menu bar includes all main functions for creating and editing content in VRED. It provides access to the different modules available in VRED and enables basic file actions like saving or opening files.

3.1.1 File

This chapter informs about loading, importing and saving data.

» **New** Creates a new empty scene. The current scene will be closed.

» **Open** Opens files. A dialogue box opens up to choose from. One or more files can be selected.

- » VRED Essentials Project Binary: *.vpe
- » Maya ASCII: *.ma
- » Maya Binary: *.mb
- » CATIA V4: *.model, *.mdl, *.session, *.exp, *.dlv, *.dlv3, *.dlv4
- » CATIA V5: *.catpart, *.catproduct, *.cgr
- » Autocad: *.dxf, *.dwg
- » ProE/Granite: *.prt, *.asm, *.neu, *.g
- » IGES: *.igs, *.iges
- » STEP: *.stp, *.step
- » Inventor: *.ip, *.iam
- » OpenInventor: *.iv

- Studio: *.wire
- SolidWorks: *.sldprt, *.sldasm)
- NX: *.prt
- 3ds Max - *.3ds
- CINEMA 4D Scene - *.c4d
- FBX Scene - *.fbx
- Rhinoceros - *.3dm
- VRML Geometry - *.vrml, *.wrl
- Wavefront Geometry - *.obj

» **Add** Adds files to the current scene. A dialogue box opens up, where the files to add can be selected from. The file is added to the Scenegraph as child of the currently selected node. If there is no node selected in the Scenegraph, the objects will be added as children of the root node. All objects of any added file are grouped in a group node. Imported files are marked green in the Scenegraph.
When merging projects, viewpoints will be preserved.

» **Save** Saves the current file with a supported VRED file type.

- VRED Essentials Project Binary - .vpe

» **Save As** Saves the current file. A dialogue box opens up, allowing to select the location, file type, and name of the file. If no file ending is entered, the file will be saved in the VRED native file type VPE.
VRED supports writing the following file types by default:

- VRED Essentials Project Binary - .vpe

VRED supports the storage of ICC color profiles in the project data to ensure consistency during the whole workflow and between the devices you use regarding color management. This guarantees that the colors visible on your workstation are the same as on your private computer.

» **Open Recent** Opens recently opened/modified files.

» **Import** With the import function additional file types and meta information can be added to the current scene. These Formats are only supported by VRED Essentials, when additional vCAD is licensed and used.

» **Export** The export function allows the export of the scene geometry and images.

- » Scene: Allows to export the scene in different data types. The default setting is *.vpe. Other supported types are:
  - VRML Geometry - .vrml .wrl
  - Wavefront Geometry - .obj
  - VRED Essentials Project Binary - .vpe
  - FBX Scene - .fbx
  - Maya® ASCII - .ma
  - Maya® Binary - .mb
  - Maya® Scene - .ma .mb .wire
- » Snapshot: Exports a snapshot of the viewport to the snapshot folder previously specified in the preferences.

» **Optimize Scene** Optimizes the scene to improve the performance. Rendering speeds up and memory usage lowers after optimization. There are three algorithms available:

- » Optimize Geometries: Optimizes the geometry structure.
- » Optimize/Share Geometries: Optimizes the geometry structure and tries to share duplicated geometries.
- » Merge/Optimize/Share Geometries: Changes the Scenegraph structure to achieve a maximum of optimization.

» **Quit** Quits the application.

3.1.2 Edit

» **Undo** Undo the last action.

» **Redo** Redo the last action.

» **Clear Undo Stack** Clears the undo stack (cache for any type of undo commands).

» **Selection**

- » Make Normals Consistent: Select with ALT + Left mouse click to make vertex and face normals of each selected object consistent.
- » Use Depth Selection: Allows to select all objects within the selection frame, whether they are behind another objects or not.

» **Preferences** Opens the Preferences window to edit the preferred settings for VRED.

3.1.3 View

» **Toolbars**

- » File: Toggles the file I/O icons in the Icons bar.
- » Render Options: Toggles the rendering related icons in the Icons bar.
- » View: Toggles the view related icons in the Icons bar.
- » QuickAccess: Toggles the QuickAccess bar at the bottom.

» **Show Grid** Toggles the display of the scene grid.

» **Show Ruler** Toggles the display of the ruler.

» **Show Manipulator** Toggles the display of the transform manipulator.

» **Show Shortcuts** Opens a new window and displays all available shortcuts in VRED.

» **Undo/Redo History** Displays a brief history of many actions in VRED.

» **Trash** Displays the trash container. Rightclick » Clear to clear it.

» **Terminal** Displays the Terminal module.

3.1.4 Visualization

The visualization menu provides a number of visual options and provides access to the available render modes.

» **Backplate** Helps to set up a backplate.

- » Toggle Backplate: Sets the backplate to visible/invisible.
- » Create Backplate: Creates a backplate. A file dialogue appears, where backplate images can be selected from. Creating a backplate activates the render option 'Backplate'.
- » Delete Backplate: Deletes all existing backplates in the scene.

» **Interactive Material Preview** Toggles the interactive material preview. When activated, you can drag a material from the Material Editor over any object in the scene and VRED immediately applies the material to the object. When you drop the material on the object, it will be assigned to it. In case the material should not be assigned, drop it to the Material Editor avoiding changes.

» **Rendering** Toggles rendering in the viewport.

» **Simulate** Toggles the VRED simulation engine. The simulation loop controls animations, viewpoint interpolations, etc.

3.1.5 Scene

This chapter includes information for creating and adjusting objects like lights, cameras, and geometry in VRED.

» **Create Geometry** With the "Create Geometry" function, it is possible to create simple geometries in VRED. The following geometric primitives are supported:

- » Line
- » Plane
- » Box
- » Cylinder
- » Cone
- » Sphere
- » Torus

» **Create Light** A selection of three different light types is available in VRED:

- » Directional Light
- » Point Light
- » Spot Light

» **Create Camera** VRED provides three different camera types. To create a new camera, select the desired camera:

- » Perspective Camera
- » Orthographic Camera
- » Viewpoint

» **Scenegraph** Hides/shows the Scenegraph.

» **Camera Editor** Opens the Camera module. In the Camera module, all camera settings can be defined and adjusted.

» **Light Editor** Opens the Light Editor module. The Light Editor module enables to create and edit lights sources. All the light sources in the scene are listed in the Scenegraph as well.

» **Material Editor** Opens the Material Editor module. The Material Editor module enables to create and edit materials including environment materials for image based lighting. It also allows to set up material libraries.

» **Node Editor** Opens the Node Editor. The Node Editor lists all node parameters and allows their editing.

» **Optimize** Opens the Optimize module. The Optimize module provides tools to restructure and optimize the scene data.

» **Texture Editor** Opens the Texture Editor. The Texture Editor allows you to interactively place textures on objects in the scene.

3.1.6 Animation

This chapter includes information for creating, adjusting, and playing animations in VRED.

» **Curve Editor** Opens the Curve Editor module. The Curve Editor can create animations for all objects.

» **Timeline** Opens the Timeline.

3.1.7 Interaction

The Interaction module helps for example to adjust the transformations of objects.

» **Navigation** The user can switch between the navigation modes listed below. Navigation may be enabled or disabled by (un)checking the item "Enabled".

- TrackBall: In trackball navigation, all camera rotation axes are unlocked. The camera rotates freely in all directions.
- TwoAxis: In two axis navigation, the camera has only two free rotation axes, while the third one, the role axis, is locked.

» **Transform** Opens the Transform module. The Transform module sets any kind of object transformations via specific entries. Object's pivots can be adjusted.

3.1.8 Rendering

In this menu section, you can find modules that help to set up special rendering configurations.

» **Render Settings** Opens the Render Settings. Here, all the settings for rendering can be defined.

3.1.9 Window

This chapter contains different render window options.

» **Render Window Size** Contains predefined image resolutions as well as a dynamic resolution mode and a resolution mode that uses the resolution set in the preferences. The preferences resolution mode is set as default.

» **Layout** Contains options to store, select or delete layouts of the windows within VRED. Additionally, previously stored layouts are selectable as default layout.

3.1.10 Help

Contains general information about VRED and access to the documentation.

» **About** The About window provides all information about the currently used VRED version, the license request state and the license agreement.

» **License** Shows the Autodesk licensing terms.

» **Documentation** Opens an HTML-site providing the online version of this Documentation. The documentation provides detailed information regarding the general handling of VRED.

» **Changes** Opens the Changes window. The Changes window lists all version changes.

3.2 Toolbars

» **File**

- » Open File
- » Add File
- » Save File

» **Render Options**

- » Toggle Stillframe Antialiasing [1]
- » Toggle Backplate
- » Toggle Wireframe Selection Mode
- » Toggle Bounding Box Selection Mode
- » Toggle Headlight
- » Toggle Statistics

» **View**

- » Show Fullscreen [2]
- » Show the Complete Scene
- » Zoom to Selected Object [3]
- » Toggle Grid [4]
- » Toggle Ruler [4]
- » Toggle Transform Manipulator [4]

[1] Keep mouse button pressed to enable downscale antialiasing or to enable raytraced antialiasing for OpenGL.
[2] Keep mouse button pressed to enable multi-display fullscreen.
[3] If no object is selected, show the initial camera view.
[4] Keep mouse button pressed for further options.

» **QuickAccess**

- » Scenegraph
- » Transform
- » Material Editor
- » Camera Editor
- » Curve Editor
- » Render Settings

3.3 Status Bar

» **Status bar** The Status bar provides information about the memory usage and allows you to change the up vector as well as near and far clipping planes and the field of view.

- » Info: Size of the scene, id and resolution of the current renderview.
- » Units: This option defines the mapping of the scene units to a physical unit of length.
- » Up: Sets the axis of the up vector.
- » NCP: Defines the distance of the near clip plane.
- » FCP: Defines the distance of the far clip plane.
- » FOV: Sets the field of view in degree.
- » ICV: Saves the current view as the initial camera view.

Preferences

4 PREFERENCES

This chapter provides detailed information about setting up global preferences in VRED. The Preferences can be found in Edit » Preferences. To save all changes, close the Preferences dialog by clicking 'OK'.

4.1 Animation

» **Base**

- » Time: This value determines the number of frames that make up a second.
- » Keep Keys at Current Frames: When activated, all Keyframes remain in their global position, even when changing the global time. As a result, those curves are modified. When deactivated, keys may map to a different frame when changing the global time value.

» **Playback**

- » Playback Speed: This value sets the number of frames that are processed per second.
- » Playback Range: This switch determines whether the full range or the detailed range is played.
- » Evaluation Context: Defines which curves are taken into calculation. When set to "Scene", all active Curves and Blocks are examined. When set to "CurveEditor", only the curves currently displayed in the Curve Editor are examined.
- » Loop: Switch on to loop the playback, or off to disable looping.

» **Timeline**

- » Full Range Start: Start frame for the complete timeline.
- » Full Range End: End frame for the complete timeline.
- » Detailed Range Start: Start frame for the current part of the timeline.
- » Detailed Range End: End frame for the current part of the timeline.

4.2 FileIO

Sets the global File I/O settings in VRED.

» **Base**

- » Verify Geometry: During import, verify that the structure of the geometries is suitable for rendering.
- » Optimize Geometry: Rebuilds geometry optimized for VRED Scenegraph.
- » Temporary Path: Path for temporary files.

» **Import Dialog**

- » Show Dialog: If switched on, a dialog will open up once you try to import a supported file format. Off will use the default settings defined in the preferences.
- » Center to Origin: If checked, places the imported objects in the origin of the scene.
- » Place Objects on the Ground: If checked, the objects are placed on the ground.
- » Adjust Object Size: Offers you to quickly resize the imported objects, enabling you to work with fitting scales. A wrong scaling may have a direct impact on many settings like flakes.

4.2.1 Base CAD

- » Enable Tesselation: Enables or disables the tesselation of CAD data.
- » Chord Deviation: The chord deviation is the distance from the midpoint of a tesselated edge to the geometry.
- » Normal Tolerance: The Normal Tolerance is the allowed normal deviation between the normals on the ends of a tesselated edge.

» Max Chord Length: The Max Chord Length is the maximum length of a tesselated edge.

» Merge Geometries: Allows to merge the geometry that is to be imported.

» Enable Stitching: Enables the stitching of adjacent edges.

» Stitching Tolerance: Sets the tolerance where two adjacent edges are considered to be touching and where they should be stitched together.

4.2.2 Maya

» Base

» Maya Directory: Sets the Maya installation path. This defines the Maya version file type which can be loaded.

» Loader

» Units: Sets the units to be used for imported data.

» Writer

» Units: Sets the units to be used for exported data.

4.2.3 Rhino

» Base

» Merge Geometry: Merges geometry when importing Rhino material.

4.2.4 VPE

» **Incremental Save**

» Enable Incremental Save: Enables the incremental save function. Before saving a file, a clone will be placed into a subfolder. This allows you to store an individual number of scene milestones. The number of versions can be defined under "Number of increments".

» Number of Increments: Defines the number of backup steps used by the incremental save function.

4.3 Import

Defines the CAD data and tessellation value settings.

4.3.1 Tesselation

» **Tesselation Quality**

» Tolerance: Sets the maximum triangle aberration for tessellation from the b-splines. Adding further tessellation tolerances, an LOD node is generated for each imported file. The tolerance values define the tessellation aberration for each LOD node's child. The number of children is defined by the number of tolerance values. With the Add and Remove button, tessellation values can be added or removed.

» Offset Factor: Sets the offset for the following tessellation tolerance value depending on the previously created.

» **Tesselation Topology**

» Topology: Offers three different options to tessellate geometries.

- Create New: Rebuilds a completely new geometry based on the imported b- splines.

- Reuse Existing (If Any): Refines the geometry according to the set tessellation settings. The new tessellation is based on the currently set tessellation in the imported data, if there is a tessellation already existing.
- No Topology: Does not tessellate geometries.

» Tolerance: Aberration of the tessellated geometries from the b-splines.

» Check Orientation: Ensures that normals of seamless patches are pointing in the same direction.

4.4 Main Window

» Base

» Show FPS in Statusbar: Shows the current frame rate in the lower left corner of the Renderview.

» Show Rendering Log Messages in Terminal: All log messages will be shown in the Terminal Module during the rendering process.

» Show Toolbutton Text: Shows the name of the icons.

» Window Opacity: Sets the opacity for all module windows.

» Disable Docking: Enables/disables the docking function for module windows in VRED.

4.5 Material Editor

» Material Library Paths

» Add: Adds a new search directory where material libraries can be found.

» Remove: Deletes the selected search directory for material libraries.

4.6 Navigator

» **Navigation Mode**

- » Trackball (2 Axis): Sets the navigation mode to two axis navigation. In two axis navigation, the camera has only two free rotation axes, while the third one, the role axis, is locked.
- » Trackball (3 Axis): Sets the navigation mode to trackball navigation. In trackball navigation, all camera rotation axes are unlocked. The camera rotates freely in all directions.
- » Auto Center: Automatically sets the rotation pivot in two axis and trackball navigation mode to the object's center currently placed in the Renderview's center.

4.7 Render Options

This chapter provides information about setting up the Renderview parameters in VRED.

4.7.1 Visualisation

» **Render Window**

- » Use Fixed Resolution: Enables/disables to set a fixed resolution for the render view.
- » Pixel Resolution: Sets the width and height of the render view in pixels.
- » Downscale Quality: Offers a total of three downscaling options to accelerate the work process.
  - Low: Uses every second pixel for the calculation.
  - Medium: Uses every fourth pixel for the calculation.

- High: Uses every eighth pixel for the calculation.

» Enable Stillframe Antialiasing: Activates still antialiasing rendering by default.

» Stillframe AA After: Sets the duration of no user input in seconds, before still antialiasing starts calculating.

» Interactive Material Preview: Activates the interactive material preview while dragging and dropping a material on an object in the render view by default.

» Automatic Clipping Plane Adaption: Adjusts the clipping plane automatically to the visible object's boundig box.

» Lighting

» Headlight Behaviour: Sets the default state of the headlight for new scenes.

- Auto: Auto leaves the headlight turned on until the first Truelight Shader is used. Then the headlight will be switched off.
- On: Switches the headlight on by default.
- Off: Switches the headlight off by default.
- Ignore: Retains the headlight state.

» Use Point Headlight: Uses a Point Light as headlight instead of a Directional Light.

» Wireframe

» Enable Wireframe: Draws a wireframe of all selected objects.

» Always in Front (OpenGL Only): Draws the wireframe always on top of all objects, even if others cover the selected.

» Wireframe Color: Sets the wireframe color.

» Navigation Help

» Show Coordinate System: Renders a miniature coordinate system in the lower right corner of the Renderview.

» Show Navigation Cube: Renders the VRED-navigation in the upper right corner of the Renderview by default.

» Use Z-Up Coordinate System: Sets the z-axis as up-axis by default.

4.8 Render Settings

In the Render Settings preferences, default settings for offline and interactive rendering can be defined.

4.8.1 Image

» Image

» Resolution: Sets the image size in pixels in width and height.

» DPI: Dots per inch. Defines the embedded image resolution in dots per inch.

» Size: Calculates the resulting image size in mm depending on the dpi and pixel resolution.

» Advanced

» Supersampling: Enables (On) or disables (Off) supersampling. If set to "On" all image samples are rendered.

» Compression Quality: Sets the compression quality of an image in percent, standard value is -1 for no compression. Only useful for image formats that define a compression quality like jpeg.

» Export Image with Alpha Channel: Activates alpha channel rendering. The alpha channel will be embedded into the resulting image, if the file type supports alpha channels. The alpha channel colour can be selected separately.

» Show Rendered Image After Saving: Opens a seperate window showing the rendered image.

» Single Image Viewer Window: Shows only one image after rendering.

» Ignore Aspect Ratio: Squashes or stretches the rendered image and ignores the aspect ratio.

» Export TIFF in HDR format: Renders TIFF format with 32 Bits per channel.

» Animation

» Start Frame: Sets the start frame of the sequence to be rendered.

» Stop Frame: Sets the end frame of the sequence to be rendered.

» Frames per Second: Sets the frame rate for the image sequence.

» Resolution: Sets the default resolution for the animation.

» Export Type: Defines the default export type for the animation.

4.8.2 General Settings

» Antialiasing

» Max Image Samples: Sets the number of samples taken during stillframe antialiasing. Higher values produce a cleaner result while lower values reduce the render time. A value of 256 is recommended as starting point in general but may be too low for interieur scenes with full global illumination.

» Adaptive Sampling: Adaptive sampling allows the raytracer to skip regions that are already smooth and focus the processing power on regions that are still noisy. The various quality settings control a threshold for a region to be considered as smooth. Setting the control to "Highest Quality" disables adaptive antialiasing and always samples each pixel with the number of image samples specified. While this gives the highest render quality it may waste processing power on regions that are already smooth.

- Preview Quality: Sets the sampling quality to a very low level, resulting in preview render quality and very short render times.

- Low Quality: Sets the sampling quality to low level, resulting in average render quality and short render times.
- Medium Quality: Sets the sampling quality to medium level, resulting in good render quality and medium render times.
- High Quality: Sets the sampling quality to high quality level.
- Ultra High Quality: Sets the sampling quality to production quality level.

» Use Clamping Value: Activates clamping of very bright pixels to eliminate white spots after antialiasing. The value sets the maximum value for a white pixel. Activating clamping and reducing the value reduces the maximum resulting image color range.

4.8.3 Raytracing Quality

» **Illumination Mode** Sets the default lighting mode for materials for interactive and still frame antialiasing.

» Precomputed + Shadows: The Precomputed + Shadows Mode uses precomputed image based lighting and calculates shadows based on the active environment.

» Full Global Illumination: The Full Global Illumination Mode doesn't use any precomputed values but accurately samples the global lighting distribution in a physically-based approach.

» **Quality**

» Interactive Quality: Sets the default interactive sampling quality of reflections and refractions.

» Still Frame Quality: Sets the default still frame sampling quality of reflections and refractions.

» Max Trace Depth: Sets the default maximum number of reflections and refractions each ray may encounter for interactive and still frame rendering.

4.8.4 Advanced

» **Snapshot**

» Path: Sets the file path where the snapshot will be saved.

» **Signature**

» Add Signature: You can add a signature to each video or image. The format for a signature is `filename` - `date` - `time` - `comment`.

» Position x/y: The position of the signature in pixels from the lower left corner of the image/video.

» Font Size: The font size in pixels of the text in the signature.

» Color: Defines the font color.

» Comment: If you want to add an additional comment to your signature, just enter the text here.

» Add Filename: The filename of the image/movie will be added to the signature.

» Add Date: The date the image/movie was rendered will be added to the signature.

» Add Time: The time the image/movie was rendered will be added to the signature.

4.9 Selection

» **Base**

» Bounding Box Visualization Size: Defines a minimal bounding box size for objects of size 0.

» Auto Scroll to Selected Node: Selecting a geometry node in the render window will automatically scroll in the scenegraph view to the selected node.

4.10 Transform

» **Transform Step Sizes**

- » Translation Step Size: Sets the default step size for translation actions.
- » Rotation Step Size: Sets the default step size for rotation actions.
- » Scale Step Size: Sets the default step size for scaling actions.


Scenegraph

5 SCENEGRAPH

The Scenegraph shows all the nodes constituting the current scene in a tree structure. Different icons indicate the node types existing in the scene. Imported files are marked in green. The basic node, at the same time the parent node of all other nodes in each VRED scene, is the Root node. The Root node is a group node. The Root group is the top node of each VRED file and cannot be deleted, renamed or otherwise edited. All additional nodes must be children of the Root node. Use the built-in search field at the top of the Scenegraph to find nodes. Regular expressions are supported.

» **Mouse actions in the Scenegraph**

- » Rename: Click the selected node with the left mouse button to rename the node.
- » Open node graph: Double-click the selected node with the left mouse button to expand the tree of the respective node. All the direct children of the selected node will be displayed.
- » Move objects in Scenegraph: Click and drag a node with the left mouse button to move nodes in the Scenegraph.
- » Isolated view: Click and drag a node with the left mouse button from the Scenegraph into the Renderview to view only the respective objects in the Renderview. To view the whole scene again, drag the Root node into the Renderview.
- » Open Scenegraph menu: Click a node in the Scenegraph with the right mouse button to open the Scenegraph menu.
- » Selection paths: When selecting a node within the Scenegraph, all its parent nodes will be marked light blue to simplify the navigation through the tree.
- » Split Scenegraph: At the bottom of the Scenegraph window, a splitting tool is indicated by a dotted line. Click and drag the splitter with the left mouse button to expand or reduce the size of the split view windows. The Scenegraph split view aids you in navigation, selection and the whole process of data preparation. Drag the splitting tool back into the dock to close the split view.

5 SCENEGRAPH

5.1 Create

All functions in the "Create" menu add additional nodes to the scene. Generated nodes are added as children to the currently selected node. If no node is selected, the new node will be a child of the Root node.

» **Create Geometry** Offers you to create one of the following geometric primitives:

- » Line: A line geometry will be rendered as a capsule, this is a tube capped with half-spheres on both ends. The radius of the tube can be specified for each material individually (see Materials Reference » General Truelight Material Settings » Raytracing » Line Tube Radius).
- » Plane
- » Box
- » Cylinder
- » Cone
- » Sphere
- » Torus

» **Create Light** Allows you to quickly create lights. Choose from the following:

- » Directional Light: Creates a directional light node. A directional light is a light source, which casts parallel light rays.
- » Point Light: Creates a point light node. A point light is a rotationally symmetric light source, which casts light rays from a single point into all directions.
- » Spot Light: Creates a spot light node. A spot light is a light source, which casts light rays from a single point preferably into a specific lobe.

» **Create Camera** Allows you to quickly create a camera. Choose from the following:

- » Perspective Camera: Creates a new perspective camera.

» Orthographic Camera: Creates a new orthographic camera.

» Viewpoint: Creates a viewpoint from the current view.

» **Group** Creates a group node. To move, scale or rotate multiple objects as one unit it is recommended to combine them to a group. Transformations can then be carried out on the whole group.

» **Clone** Creates a clone node. Clone nodes create an exact copy of the node that is dropped onto it.

5.2 Edit

» **Rename** Renames the selected node. Enter new node name. CRTL + R.

» **Delete** Deletes the selected nodes. DEL.

» **Filter** Deletes the selected node without deleting the scene structure underneath the selected node (i.e. the subtree).

» **Copy** Copies the selected node and temporarily stores the node and its subtree in the memory (i.e. the clipboard). CRTL + C

» **Cut** Cuts the selected objects from the Scenegraph and temporarily stores the node and its subtree in the clipboard. CRTL + X

» **Paste** Pastes the nodes currently stored in the clipboard into the Scenegraph. CRTL + V

» **Paste Clone** Pastes the nodes currently stored in the clipboard as clones into the Scenegraph. The clones are also known as referenced objects. Referenced objects are indicated by an underline. CRTL + SHIFT + V

» **Copy Transformation** Copies all transformation information from the selected node to the clipboard.

» **Paste Transformation** Pastes all transformation information from the clipboard to the selected node.

  » Paste All: Pastes all transformation information.

  » Paste Translation: Pastes only translation information.

  » Paste Rotation: Pastes only rotation information.

  » Paste Scale: Pastes only scaling information.

  » Paste Pivots: Pastes only pivot information.

» **Copy Animations** Copies the curve animations from the selected node to the clipboard.

» **Paste Animations** Pastes the curve animations from the clipboard to the selected node.

» **Paste Clone Animations** Pastes the curve animations from the clipboard to the selected node as a reference. Whenever you make changes to the referenced animation, those changes will take effect on the selected node.

» **Clone** Using the clone function, objects can be duplicated in the scene. A new node structure will be created for each copy. When manipulating a clone (e.g. transforming it or assigning a material to it) all other instances are automatically updated. Clones are referenced objects that are indicated by an underline in the Scenegraph.

  » Clone: Generates a referenced clone from the selected node(s).

  » Clone Mirror X/Y/Z: Mirrors the cloned object at the selected axis.

» **Duplicate** Duplicates an object. This process requires more memory than cloning an object. Unlike a clone, a duplicated object does not reference the source object.

- » Duplicate: Duplicates the selected node(s).
- » Duplicate Mirror X/Y/Z: Duplicates the selected node(s) and mirrors them at the preferred axis.
- » Duplicate Mirror X/Y/Z Flush: Duplicates the selected node(s), mirrors them at the preferred axis and flushes the transformation information.

» **Unshare** Removes a referenced connection. Referenced objects are indicated by an underline.

» **Merge Geometry** Merges separated geometries to a single mesh. CRTL + M

- » Preconditions for merging objects: The objects are unshared (not referenced!), they have the same materials and lie in the same group.

  To merge objects, select the parent groups.

» **Group by Material** Groups the objects of the Scenegraph by assigned materials. *Caution: The whole Scenegraph structure will be rearranged.*

» **Group Selection** Groups selected objects. A new group node will be created and all selected objects will be attached as children to the new node.

» **Show Optimize Module** Opens the Optimize Module. The optimize functions help to optimize the scene and thereby increase the rendering performance. All optimization processes will be applied to the selected nodes and their children.

5.3 Additional Options

» **Reload File** The external file referenced by the selected node is reloaded. Before reloading starts you are asked whether you want to keep the current materials. If not, the original materials from the file are applied to the reloaded

geometry. If yes, VRED transfers all material assignments of the node that is reloaded to the new node that is created during reload. This transfer relies on a consistent naming scheme of the nodes within the hierarchy of the loaded file. If some material assignments could not be restored a message will be displayed that lists all nodes for which no material assignment could be restored. Selecting "Show Reload Log..." in the menu also shows this message (only available for the last reload action).

» **Replace File...** The external file referenced by the selected node may be replaced by another file. After having chosen this new file the node is automatically reloaded, as with Reload File.

» **Reload All Files** All external files referenced by the nodes in the Scenegraph are reloaded.

» **Hide** Hides the selected nodes in the Renderview. This is also performed by unchecking the box left to the name of the node.

» **Show** Shows the selected nodes in the Renderview. This is also performed by checking the box left to the name of the node.

» **Hide Subtree** Hides the subtree of the selected node in the Renderview.

» **Show Subtree** Shows the subtree of the selected node in the Renderview.

» **Hide All** Hides all objects in the Renderview.

» **Show All** Shows all objects in the Renderview.

» **Select All** Selects all the children of the Root node.

» **Deselect All** Deselects all nodes.

» **Select Subtree** Selects all subtree nodes.

5.3 Additional Options

» **Select Parent** Selects the parent node of the selected object.

» **Invert Selection** Deselects all currently selected objects and selects all currently deselected objects.

» **Find** A search process can be executed to find nodes in the Scenegraph. A dialogue box will open.

- » Expression: Enter a search expression to find a node. Regular expressions are supported as search entry when Regular Expression is activated.
- » Node Type: Sets a filter to specify the node type for the search process.
- » Action: Sets the action to be executed for the objects found.
  - Select: Selects all objects found.
  - Add to Selection: Adds all objects found to current selection.
  - Sub from Selection: Removes all objects found from current selection.
- » Regular Expression: Activates the use of regular expressions. Deactivate to search for strings.

» **Scroll to Selected** Scroll the Scenegraph view to the selected node.

» **Information** A dialogue box will open containing all the information about the node.

» **Scenegraph Slider** The Scenegraph slider is placed at the bottom of the Scenegraph. Sliding the Scenegraph slider to the right expands the next tree level of the Scenegraph structure for the selected node with every step. Sliding the Scenegraph slider to the left closes a tree level with every step.

Modules

6.1 Scene

6.1.1 Camera Editor

Scene » Camera Editor

In the Camera Module, all 3D camera parameters can be set.

» **File**

» Load: Reads stored data from disc.

- Cameras: Import stored cameras from an .xml file.
- Viewpoint: Import stored viewpoints from an .xml file.

» Save: Writes selected data to disc.

- Cameras: Export all the cameras in the scene to an .xml file.

- Viewpoint: Export all the viewpoints in the scene to an .xml file.
- Selected: Export the seleced objects to an .xml file.

» **Camera Settings**

» General:

- Projection Mode: This menu sets up the projection mode of the projection matrix for the selected camera.
  - Perspective: In the perspective mode, the current scene is rendered in perspective projection view. This mode is the most natural way of image reception.
  - Orthographic: In the orthographic mode, the current scene is rendered in parallel projection view.
  - Spherical Map, Peters Map, Vertical Cross, Horizontal Cross: Renders the current scene with a 360° environment projection. To use one of these modes, create a new Perspective Camera, activate it and choose the desired projection mode.
- Wireframe: Renders the selected camera view in wireframe mode.
- Depth of Field: Activates or deactivates the depth of field function. With activated depth of field you have access to the FStop settings in the Lens Attributes.
- Motion Blur: Activates or deactivates motion blur. With activated motion blur you have access to the shutter settings in the Lens Attributes.
- Position: Sets the 3D coordinates for the camera position.
- Roll: Sets the roll angle for the current camera.
- Field of View: Sets the field of view angle of the camera, measured in degrees. You can switch between horizontally and vertically defined FOV via Lens Attributes » Field of View Mode. The Field of View parameter is directly connected to the focal length parameter.

» Viewing: There are two ways of defining the view. On the one hand, the view is definable using the attributes "Position", "At" and "Up". On the other hand, the view can be set with the parameters "Distance", "Height", "Turntable Angle" and "Distance to Center". Both methods determine the position and the orientation of the camera. They are interdependent and influence each other.

- Use Parent Transformation: Overrides the viewing settings. Always uses the transformation settings of the parent node in the scenegraph.
  Important: Now the camera is locked for mouse-navigation. The only way to move your camera is by transforming the parent node. This feature is useful for classic camera animation with regard to simple translation and rotation.
- At: Sets the coordinates for the center of interest (CoI).
- Up: Sets the coordinates for the up vector to define the direction that is oriented up in the scene.
- Update: Updates the render view to the entered values.
- Distance: Sets the distance between the camera and the CoI.
- Height: Sets the height regarding CoI and distance.
- Turntable Angle: Defines the vertical angle related to the focus point.
- Distance to Center: Defines the distance to the midpoint of the bounding box of your currently selected object.

» Lens Attributes:

- Field of View Mode: Defines whether the angular Field of View is specified horizontally or vertically.
- Focal Length: Sets the focal length of the virtual objective in millimeter depending on the given sensor height and field of view.
- Sensor Presets:
  · 1/3.6" (4.000 w, 3.000 h)

- 1/3.2" (4.536 w, 3.416 h)
- 1/3" (4.800 w, 3.600 h)
- 1/2.7" (5.371 w, 4.035 h)
- 1/2.5" (5.760 w, 4.290 h)
- 1/2.3" (6.160 w, 4.620 h)
- 1/2" (6.400 w, 4.800 h)
- 1/1.8" (7.176 w, 5.319 h)
- 1/1.7" (7.600 w, 5.700 h)
- 2/3" (8.800 w, 6.600 h)
- 1" (12.800 w, 9.600 h)
- 4/3" (18.000 w, 13.500h)
- 1.8" (23.700 w, 15.700h)
- 35mm film (36.000 w, 24.000h)

- Sensor Size: Sets the sensor width and height in milimeters.
- Aperture Diameter: Sets the aperture diameter in millimeters.
- FStop Presets:
  f/1, f/1.4, f/2, f/2.8, f/4, f/5.6, f/8, f/11, f/16, f/22, f/32, f/45, f/64, f/90, f/128
- FStop: Defines the FStop in f/x.
- Focus Distance: Sets the focus distance in millimeters.
- Shutter Presets:
  1/1000, 1/500, 1/250, 1/125, 1/62, 1/30, 1/15, 1/8, 1/4, 1/2, 1", 2", 4", 8", 16", 32", 64"
- Shutter Speed: Defines the shutter speed in 1/s.

» Clipping:

- Near Plane: Sets the distance between the near ClipPlane to the camera measured in millimeters. All objects closer to the camera than the near ClipPlane will not be rendered.
- Far Plane: Sets the distance between the far ClipPlane to the camera measured in millimeters. All objects further away from the camera than the far ClipPlane will not be rendered.
- Calculate Plane: Calculates near and far plane values based to the boundings of the current scene.

» **Image Processing**

» Tonemapping: Tonemapping offers the possibility to map the high dynamic range rendering for display on an output device with lower dynamic range.

- Tonemapper: Choose an algorithm to adjust the appearance of a 32-bit rendering. General parameters:
  - Reinhard Luminance: Uses the tone mapping methods based on Erik Reinhard's methods. The tone mapping takes place based on the luminance values of a pixel. This way you retain the color information of a pixel.
  - Reinhard RGB: Uses the tone mapping methods based on Erik Reinhard's methods. The tone mapping takes place for each channel of an RGB pixel separately. Therefore, the bright pixels will be desaturated, as with a digital camera sensor.
  - Logarithmic Luminance: Uses a logarithmic mapping based on the luminance values. This mapping corresponds approximately to the human perception. The color information will remain unchanged.
  - Logarithmic RGB: Uses a logarithmic mapping that affects each channel of an RGB pixel separately. Bright pixels will be desaturated.
  - Filmic: Uses an s-curve mapping that reproduces the behavior of a photographic film. RGB channels will be mapped separately. Two parameters control the shape of the s-curve:

- Shoulder Strength: Controls the gradient in the area of bright pixels.
- Toe Strength: Controls the gradient in the area of the dark pixels.

- Exposure: Scaling factor for the luminance of the image.
- Whitepoint: Sets the luminance value, which is mapped to the value 1 (i.e. the maximum luminance of the display device).
- Whitebalance: Defines the whitebalance value that affects the image in the post-processing procedure.

» Color Correction:

- Hue-Shift: Defines the hue-shift value.
- Saturation: Sets the color saturation.
- Contrast: Sets the overall contrast.
- Brightness: Sets the overall brightness.

» Glow

- Use Glow: Enables/disables glow.
- Glow Threshold: Determines the threshold of the brightness of a pixel where the glow effect sets in.
- Glow Size: The glow size determines the size of the glow surrounding an object.
- Glow Intensity: The glow intensity determines the brightness of the glow.

» Advanced

» Intrinsic Parameters: Here, the intrinsic parameters are definable for the camera.

- Principal Point Offset:
  - x-Offset: Sets the x-Offset. The view itself is not affected by this setting.
  - y-Offset: Sets the y-Offset. The view itself is not affected by this setting.
- Skew Factor: Defines how much VRED skews the view.

» Animation:

- Animate Camera Change: Turn on/off camera change animation. Camera parameters are smoothly interpolated when switching to a viewpoint that has this option activated.
- Duration: Sets the duration of the animation in frames.

» Distortion Map:

- Use Distortion Map: Activates or deactivates the distortion map.
- Left and Right Eye Distortion Map: Allows the use of a distortion texture at pixel level. The texture describes the course of the normalized XY-image coordinates. The input texture is an EXR-image. The red channel describes the course of the X-image coordinate. The green channel describes the course of the Y-image coordinate. The origin (0,0) is at the bottom left corner.

6.1.2 Light Editor

Scene » Light Editor

The Light Editor provides all the functions for creating and manipulating the light sources available in VRED. It contains a list of all the light sources in the scene. After selecting one of the light sources from the list, the parameters like the name, color or intensity are editable.

The headlight is the only light source generated by default. It will be disabled automatically when new light sources are created. In case the headlight is to be used in combination with other light sources, it has to be activate in the Light Editor or with the "Toggle headlight" button in the toolbar of the main window.

Three different basic light types are available in VRED:

» **Directional Light** A Directional Light is a light source whose origin is infinitely far away from all points in the scene. Therefore, its light rays are always parallel. This light type is often used to simulate outdoor lighting like sunlight.

» **Spot Light** A Spot Light is the most common light source to illuminate a scene. It emits light within a cone that is described by two angles: a cone angle defining the areas with hard light and a penumbra angle defining the areas with soft illumination.

» **Point Light** A Point Light emits light from a given position uniformly to all directions.

Each light source consists of two entries in the Scenegraph: a light source node and a light transformation node. Double-clicking on a light source in the Light Editor selects its corresponding light source node in the Scenegraph. Its position in the graph defines which geometries are lit by the light if *Local Lighting* (see below) is activated for it. By default, the other node that stores the light transformation is a child node of a special group node called *"LightTransforms"* which contains all light transformation nodes. It is only visible in the Scenegraph if *Show Internal Nodes* is activated in the Preferences: Edit » Preferences » MainWindow » Show Internal Nodes in Scenegraph. The transformation node of a light source called *"LightName"* has the name *"LightNameTransformGroup"*. You may reposition this node in the Scenegraph structure.

» **Properties**

- » Name: Sets the name for the selected light.
- » Type: Changes the light source type.
- » Local Lighting: Activating this feature provides light sources to function as a local light. Only geometry inside the light source node will be lit. This enables the user to set a more sophisticated lighting of the scene.
- » Enabled: If checked, the light source is active and emits light. If unchecked, the light source is inactive and doesn't emit any light.
- » Intensity: Changes the light intensity. Higher values result in brighter lighting.
- » Diffuse: Diffuse color is the color of light of a diffuse reflection (characteristic for light reflected from a dull, non-shiny surface). A diffuse color attribute specifies the color of the light diffusely reflected by the objects to which it is assigned.

» Specular: Specular color is the color of the light on shiny surfaces.

» Use Temperature: Enables or disables the color selection by temperature.

» Temperature: Changes the color temperature.

» Spotlight and Pointlight specific parameters:

- Light Attenuation: Sets the falloff of the light intensity. Three values are available:
  - None: Light intensity of light is constant in relation to the distance of light.
  - Linear: Light intensity decreases linearly in relation to the distance of light.
  - Quadratic: Light intensity decreases quadraticly in relation to the distance of light.

» Spotlight specific parameters:

- Cone Angle: Light beam's angle from one edge to the other measured in degrees.
- Penumbra Angle: Controls the light edge's falloff in degrees. This can be a positive or negative value. *In case of a positive value, the falloff occurs from the edge of the light determined by the cone angle, outward by the penumbra angle. Therefore, if the Cone Angle is set to 30° and the Penumbra Angle is set to 5°, the light has a total angle of 40° (30° + 5° + 5°, that is 5 degrees on each side). The beam's falloff would begin at 30 degrees and would fall off to an intensity of 0 at 40 degrees.*

» Shadow Intensity: Changes the intensity of casted shadows.

» Cast Shadow on Shadow Material: Enables/disables to casts a shadow on the special shadow material.

» Illuminate Shadow Material: When activated, the light source illuminates the shadow material. The shadow material needs to have its reflection mode set to "Diffuse Only", "Glossy Only" or "Diffuse + Glossy".

» **Area Light**

- » Enable: Enables/disables the two-dimensional extent of the light source to simulate soft shadows.
- » Shape: Defines the shape of an area light.
- » Attenuation Mode: Sets the falloff of the light intensity. "Realistic Attenuation" is simulated by computing the view factor between the illuminated surface and the light source, "Custom Attenuation" uses the "Light Attenuation" mode from the "Properties" frame.
- » Primary Visibility: Enables/disables the primary visibility of the light source in the rendering.
- » Visible in Reflections: Enables/disables the visibility of the light source in reflections.
- » Interactive Quality: Sets the quality for Interactive rendering. Selecting a higher value results in a higher number of shadow rays for this light source and thus in a higher quality and a lower rendering performance.
- » Still Frame Quality: Sets the quality for Still Frame rendering.

» **Visualisation**

- » Show All Lights: Unhides all available light source geometries in the scene for visual feedback and interactive transformation actions like scaling, rotation and translation.
- » Hide All Lights: Hides all available light source geometries in the scene.
- » Show Light: Unhides selected light source geometry in the scene.
- » Hide Light: Hides selected light source geometry in the scene.
- » Scale: Scales the light source geometry in the scene for better visual feedback.

» **Transform**

- » Position:

- Get from Camera: Sets the light position and direction to the current camera position and direction.
- Apply to Camera: Sets the camera position and direction to the current light position and direction.
- Get from Node(s): Uses the transform properties of the selected geometry for the selected light. This way the positioning of the light is very fast.

» Flush Matrix:

- Flush: Resets light settings.

» Additional context menu

» Right mouse context menu » Create: Creates new light sources (directional, point and spot light).

» Ctrl + R / Right mouse context menu » Rename: Renames the currently selected light source.

» Ctrl + D / Right mouse context menu » Duplicate: Duplicates the currently selected light source.

» Del / Right mouse context menu » Delete: Deletes the currently selected light source.

» Ctrl + A / Right mouse context menu » Select All: Selects all available light sources in the stack.

» Ctrl + Shift + A / Right mouse context menu » Deselect All: Removes the selection on all light sources.

» Ctrl + I / Right mouse context menu » Invert Selection: Inverts the current selection.

» Ctrl + F / Right mouse context menu » Find: Opens a new window for searching specific light sources by name (REGEX are supported).

» Ctrl + N / Right mouse context menu » Select Node: Selects the marked light source in the Scenegraph.

» Right mouse context menu » Switch On: Enables selected light source.

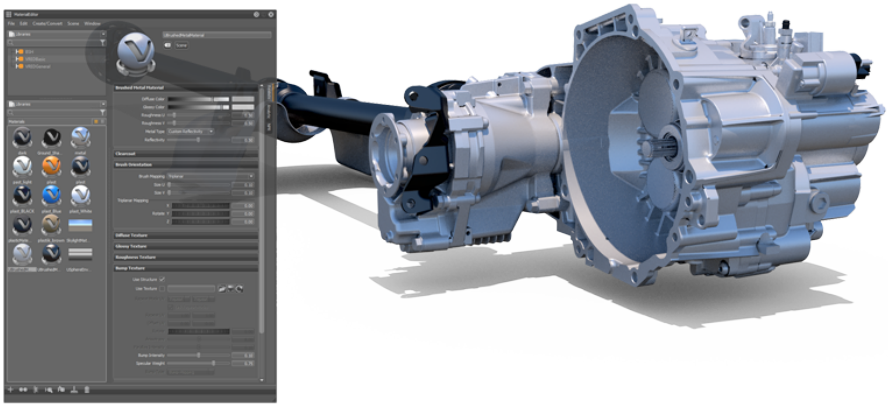
» Right mouse context menu » Switch Off: Disables selected light source.

» Ctrl + T / Right mouse context menu » Toggle: Toggles the state of the selected light source (on/off).

» Right mouse context menu » Change Type: Changes the type of the selected light source.

» Right mouse context menu » Validate: Validates all lights and updates all lights in the Scenegraph.

6.1.3 Material Editor



Scene » Material Editor

In the Material Editor material and surface shading settings for objects can be adjusted. To obtain detailed information about the materials provided in the VRED package, go to the Materials Reference section.

» **Material Editor Hotkeys**

- » Select Nodes: CTRL + N
- » Add Nodes to Selection: CTRL + SHIFT + N
- » Apply to Selected Nodes: CTRL + A
- » Create Group: CTRL + G
- » Create Group from Selection: CTRL + SHIFT + G
- » Scroll to Selected : CTRL + SHIFT + F

» Copy: CTRL + C
» Paste: CTRL + V
» Rename: CTRL + R
» Delete: DEL
» Remove Unused Materials: CTRL + U
» Optimize Materials: CTRL + O
» Optimize Textures: CTRL + SHIFT+ O
» Lock: CTRL + L
» Unlock: CTRL + SHIFT + L

» **Material Editor Views** The Material Editor comes with 3 columns. The left column contains two views, which can be configured to show "Materials" or "Libraries" using the drop down menu at the top of each view. The middle column shows the preview area, these can be viewed as Icon or List. The right column contains a large material preview at the top and the material specific settings.

» **Materials**: The Materials View lists all materials in the current scene. The materials can also be arranged in groups. The list can be filtered using the search field at the top or the filter button which allows to find a certain type of material. The top of the Preview area also shows filter symbols to indicate an active filter. Click with the right mouse button in the Materials View to open the following menu:

- Create Material: Creates a new TruelightMaterial.
- Edit: Offers a few options to edit materials:
  - Copy: Copies the currently selected material(s) into the memory.
  - Paste: Pastes the material(s) from memory as a clone.
  - Duplicate: Directly duplicates the selected material(s)
  - Delete: Deletes the selected material(s).

- Lock: Locks the selected material(s). No changes can be made to the settings of the material(s).
- Unlock: Unlocks the previously locked material(s). Changes can be made again.

- Convert To: Converts the selected material into another TrueLightMaterial.
- Create Group: Creates a new group. Groups are perfect for sorting materials by their structural dependencies.
- Create Group from Selection: This feature takes the currently selected materials and puts them into a new group.
- Select Nodes: Selects the geometry which is assigned to the currently selected material(s).
- Add Nodes to Selection: This feature extends the selection in the scenegraph with the nodes that are assigned to the currently selected material(s).
- Apply to Selected Nodes: Applies the currently selected material to the selected nodes.

» **Libraries**: This view contains a list of material libraries found in the MaterialLibraryPaths (Preferences). By clicking on a library it will be loaded and the containing materials are shown in the Preview area. Click with the right mouse button in the Libraries View to access the following menu:

- Create Group: Creates a library group. All library materials can be grouped and sorted comfortably. This makes it easier for the user to quickly find specific materials.
- Remove: Deletes selected library or library group.
- Save: Saves selected library or library group.
- Apply to Scene: All materials in the scene are replaced by same-named materials from the library.
- Create Library: Creates a new library. Library groups can be added to the library. All created libraries will be available on startup.

- Import Library: Imports an external library.

» **Preview**: Shows icons or a list of materials. The shown materials depend on the selection in the Materials View or Library View. If you click somewhere in the Materials View, the Scene Materials will be shown. By clicking the Library the Libraries Materials are shown. The top line of the Preview area identifies what is currently shown. If a Group is selected only the contents of this group is shown. To see all materials again, unselect the group by clicking outside of it in the Materials or Library view.

» **Material Attributes**: The Attributes View shows all available settings of the currently selected material with a big preview image at the top.
Hint: To set the file path of a material's texture you can also simply drag and drop an image file from the explorer to the respective texture slot.

» Material Editor Menu

» File:

- Import Library: Locate a library file on the filesystem, it will be copied into VRED's library collection and can be accessed in the "Libraries" view.
- Import Library and Apply: After import the library will be applied to the scene where materials in the scene are replaced by materials with the same name found in the library. See Library function "Apply to Scene".
- Reload Library: The VRED library collection will be checked for changes and the Material Libraries will be updated.
- Save Selected Materials...: Locate a directory on the filesystem, where the selected materials will be saved. For each selected material an OSB file will be created.
- Load Materials...: Locate the material files (saved with the above function) and add them to the scene.
- Render Preview Images: Create the preview image for each material. The previews are usually created when needed, which can result in delays while

scrolling through the preview list. Creating the previews explicitly takes a bit of time and avoids these delays.

- Statistics: Opens a dialog box listing a brief scene materials summery.
  - Number of materials: Displays the amount of materials used in the scene.
  - Number of textures: Displays the amount of textures used in the scene.
  - Texture memory: Displays the amount of memory used for all textures.

» Edit:

- Copy: Caches the selected material or chunk.
- Paste: Pastes the currently cached material or chunk.
- Delete: Deletes the selected node. Only nodes which are unused (not assigned to any object) can be deleted.
- Duplicate: Duplicates the selected material or chunk.
- Merge Duplicated Materials: Deletes all duplicated materials, not assigned to any object or connected to any material bin.
- Remove Unused Materials: Deletes all unused materials, not assigned to any object or connected to any material bin.
- Reference Unused Materials: Creates a MaterialGroup node (in the Scenegraph) for each unused material. Afterwards there are no unreferenced materials in the scene any more.
- Optimize Materials: Deletes all unused materials, references unused materials und optimizes textures.
- Optimize Textures: Converts all RGB textures where only grayscale textures are needed to grayscale textures.
- Remove All Groups: Removes the material group structure. All materials will appear as a flat list.
- Scroll to Selected: Scrolls to the selected material in the Materials View.

- Lock: Lock selected material settings.
- Unlock: Unlocks selected material settings.
- Compress Textures: Compresses all loaded textures.
- Uncompress Textures: Uncompresses all loaded textures.

» Create/Convert:

- 'Create Material', 'Create Group', 'Create Group from Selection', 'Convert': Please refer to the Materials view context menu described above.

» Scene:

- Select Nodes: Selects the geometry which is assigned to the currently selected material(s).
- Add Nodes to Selection: This feature extends the selection in the scenegraph with the nodes that are assigned to the currently selected material(s).
- Apply to Selected Nodes: Applies the currently selected material to the selected nodes.
- Apply Environment to All Materials: Applies the Environment and its lighting and reflection behavior to all materials in the scene.

» Window:

- Groups, Library: Shows or hides the left column of the editor containing Materials and Libraries views.
- Preview: Shows or hides the preview area with material preview icons in the middle of the editor.
- Attributes: Shows or hides the right column containing the settings of the currently selected material.

» **Filter** The 'Materials' and the 'Libraries' views have a search field and a filter button. Both can be used to find specific materials in the scene or in the library. Whether a filter is active is indicated by the filter button icon state and also as an icon on top of the preview area. Clicking these icons will turn the filter off.

» Type filter: The filter button allows the selection of a material type. Only materials with the selected type will be shown in the views.

» Search: When entering text in the search field the search filter will become active and only materials with names matching the search will be shown. To turn off the search filter delete the text or click the search symbol.

6.1.4 Texture Editor

Scene » Texture Editor

In the Texture Editor textures can be positioned on selected objects. By default VRED uses the UV layout any imported object already has. *Caution: Changes made in the Texture Editor induce a full replacement of the previous UV layout by the selected projection.* Textures and the assigned attributes of a selected material are listed in the texture window.

» **Edit Texture Projection** Enables the texture projection feature.

» **Mode** Offers planar or cylindrical texture projection.

» **Apply Projection** Uses the projection mode that is defined in "Mode" with the entered settings and adds them to the selected geometry.

» **Instant Mapping** If instant mapping is enabled, changes to the texture projection

settings will be interactively visible in the Viewport as the texture projection will be instantly applied to the selected objects.

» **Show Support Geometry** Shows a support geometry which is a transparent plane textured with the currently selected texture for planar projection. For cylindrical projection it is a transparent textured cylinder.

» **Visibility** Sets the visibility of the support geometry.

» **Distance** Sets distance of the planar projection plane to the 3D projection center.

» **Place Texture 3D**

» Projection Center: Offers two ways for defining the projection center. You can either pick the center manually in the scene or set it to the center of the selected object(s). To pick the center in the scene, activate the picking mode with the "Pick" button, then hold Shift and left-click in the render window.

» Center (x,y,z): Sets custom coordinates for the center of the projection.

» Rotation: Sets the texture's orientation. The rotation value defines the angle the texture is rotated away from the projection plane orientation.

» **Place Texture 2D**

» Keep Aspect Ratio: Keeps the aspect ratio of the texture when projecting.

» Scale Mode: Offers two scaling modes.

- Fit Scale Only
- Fit Scale and Center

» Repeat: Sets the texture repetition on x- and y-axis.

» Offset: Sets the texture offset value. The offset X(Y and Z) defines how far the texture is shifted from the projection center position on the x-, y- or z-axis.

» Rotation: Sets the texture orientation. The rotation value defines the angle the texture is rotated away from the projection plane orientation.

6.1.5 Optimize

Scene » Optimize
The Optimize module helps to optimize the scene and thereby raise the render performance. All optimization processes will be applied to the selected nodes and their children.

» Filter

- » Remove Texture Coordinates #1: Deletes the texture UVs from the object nodes their are assigned to.
- » Remove MaterialGroup Nodes with No Children: Removes empty Material Group nodes.
- » Remove Empty Geometry nodes: Deletes empty Geometry nodes.
- » Remove Identity Transforms: Removes identity Transform nodes.
- » Remove Invalid Texture Coordinates: Deletes invalid texture coordinates.
- » Remove Degenerated Polygons: Removes all polygon nodes which cannot be drawn.
- » Remove Animations: Removes all existing animations in the selected node and its subnodes.

» Flush/Unflush

- » Flush Transformation Nodes (Adjust Face Normals): Converts Transform nodes to group nodes and adjusts the face normals appropriately.
- » Flush MaterialGroup Nodes: Deletes Material group nodes. The material of a MaterialGroup is assigned to its child nodes.

» Optimization

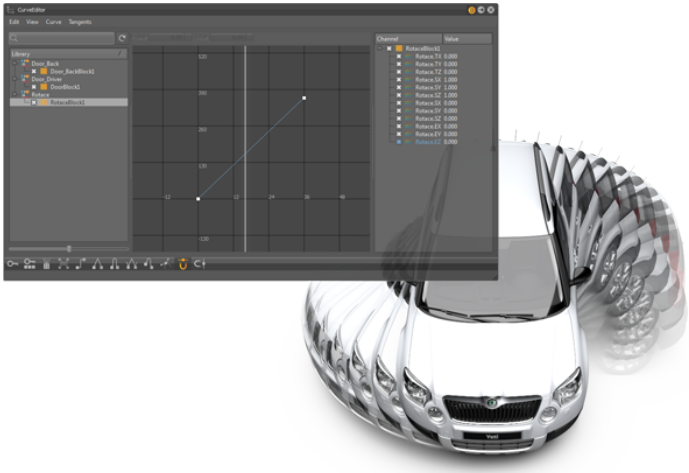
- » Merge Materials: Merges identical materials to one.
- » Merge Geometry Nodes: Geometries which fulfill all preconditions for merging will be merged.

» Cleanup Group Nodes: Groups which have less than two children will be filtered.

» **Optimize** Executes the optimize process with the current optimize settings.

6.2 Animation

6.2.1 Curve Editor



Animation » Curve Editor

The Curve Editor allows the user to create and modify animations. Select the object to be animated. Whe scrubbing through the Curve Editor's timeline the Renderview will render the playback settings defined in advanced in the Curve Editor, including Motion Blur settings, FOV and others.

» **Edit**

- » Rename: Renames selected node.
- » Delete: Deletes selected node.
- » Copy: Copies selected node and temporarily stores the block structures in the cache.

- » Cut: Cuts selected node and temporarily stores the node structures in the cache.
- » Paste: Pastes the currently in the cache stored block to selected position.
- » Paste Clone: Pastes the currently in the cache stored node to selected position.
- » Clone: Creates a reference of the selceted node.
- » Duplicate: Creates a new node with the same attributes of the selected node.
- » Unshare: Removes a referenced connection. Referenced objects are indicated by an underline.
- » Group Selection: Groups selected objects. A new group node will be created and all selected objects will be attached as children to the new node.
- » Select Node: Selects the marked animation in the Scenegraph.
- » Information...:Opens the information window. This window contains serveral information about the node's attributes.

» View

- » Frame: Shows the current frame of the selected keyframe. Changing the values moves the keyframe to a new position.
- » Lock Objects: Locks/Unlocks selected attribute.

» Curve

- » Pre Infinity Mode: Defines the behavior before the first keyframe has been reached.
- » Post infinity Mode: Defines the behavior after the last keyframe has been reached. Values for both options are:
  - Constant: Runs the curve one time. Continues the curve constant with the last key frame of the curve.
  - Loop: Loops the curve endlessly.
  - Loop with Offset: Loops the curve endlessly. Beginning of the new curve is the last keyframe of the old curve

- Oscillate: Runs the curve forwards and backwards alternately in an endless mode.
- Linear: The curve will continue linear to the basis of the keyframe's tangent.

» Key All Channels: Creates a key at the current frame for all object attributes listed in the Curve Editor's Scenegraph.

» Key All Selected Channels Types: When selecting several objects, all objects can be edited for the same channels at the same time.

» Key Selected Channels: Creates a key at the current frame for the selected attributes in the Curve Editor's Scenegraph.

» Create Block: A Block is a bin which can store animations. The animation can be accessed and edited at any later time. Objects may have an unlimited amount of Blocks. Each Block's length is individually starting from the first keyframe position to the last keyframe position. When a Block is selected, the keyed animation curves will be drawn. To create an Animation Block press the Block button.

» Snap to Grid Options:

- Time: Allows to snap to the time (x-)axis by an integer step.
- Value: Allows to snap to the value (y-)axis by an integer step.

» **Tangents** Tangents describe the entry and exit of a key's curve segments. This menu operates on the shape of curve segments around selected keys.

» Constant: Specifying a stepped tangent creates an animation curve whose out tangent is a flat curve. The curve segment is flat (horizontal), so the value changes at the key without gradation.

» Linear: Specifying a linear tangent creates an animation curve as a straight line joining two keys. A linear in and out tangent results in a straight line bfeore and behind the curve segment.

- » Flat: Sets in and out tangents of the key to horizontal with a slope of 0 degrees. (Scenario: When a ball reaches its ascent, it hangs in the air for a brief time before start-ing its descent. You can create this effect by using a flat tangent).
- » Hermite: Specifying a hermite tangent creates a smooth animation curve between the key before and the key after the selected key. The tangents of then curve are co-linear (both with the same angle). This ensures that the animation curve smoothly enters and exits the key.
- » Following: Specify a flow tangent to create an animation curve that is smooth between the key before and the key after the selected key. The tangents of the curve are co-linear (both at the same angle). This ensures that the animation curvesmoothly enters and exits the key.
- » Break: Breaks the in and out tangent linking.

» **Search** Enter the name of animation you want to find.

» **Update Animation tree** Updates the animation tree.

» **Frame** Shows the current frame of the selected keyframe. Changing the values moves the keyframe to a new position.

» **Value** Shows the current value of the selected keyframe. Changing the values moves the keyframe to a new position.

» **Quick Access Bar** You will find the descriptions for the icons int the section obove

» **Right click on a node to see the submenu** You can find all informations about the options in the Edit menu above, except for the following:

- » Play: Plays the animation.
- » Stopp: Resets the animation.
- » Motion Blur: Enables motion blur.

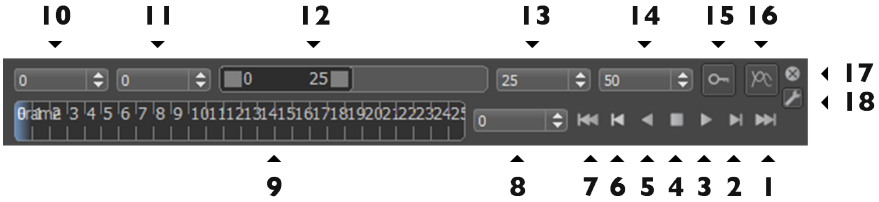
» **Hotkeys**

- » select: left mouse click.
- » zoom: right mouse click.
- » pan: middle mouse click.
- » focus: double right click.
- » multi selection: STRG + SHIFT + left mouse click.
- » deselect: STRG + SHIFT + right mouse click.
- » move: SHIFT + left mouse click.
- » zoom horizontal: X + right mouse click.
- » zoom veertical: Y + right mouse click.
- » center: F

» **icon bar**

- » Key all channels.
- » Key selected channels.
- » Create an animation block element.
- » Constant tangents
- » Linear tangents
- » Flat tangents.
- » Hermite tangents.
- » Following tangents.
- » Break tangents.
- » Horizontal grid snapping.
- » Vertical grid snapping.

6.2.2 Timeline



» **1** Sets the timesilder to the end frame position.

» **2** Sets the timeslider to the next keyframe. A key frame saves the state of different

attributes at a specific time. Key frames are the basis for non-linear animations in VRED.

» **3** Plays the selected animation forward.

» **4** Stops the selected animation.

» **5** Plays the selected clip backwards.

» **6** Sets the timeslider to the previous keyframe.

» **7** Sets the timeslider to the start frame position.

» **8** Defines the current frame.

» **9** Gives visual feedback about used keyframes.

» **10** Sets the start frame of full timeline range.

» **11** Sets the start frame of the detailed timeline.

» **12** Slider for detailed timeline.

» **13** End value for detailed timeline range.

» **14** Sets the end frame of the full timeline range.

» **15** Sets a keyframe for the selected object and all its animated attributes. This has the same effect as the function "Key All" in the Curve Editor.

» **16** Activates /deactivates the local evaluation of the shown curves in the Curve Editor instead of all active animations in the scene.

» **17** Closes the timeline.

» **18** Opens the Animation Tab in the Preferences Modul.

6.3 Interaction

6.3.1 Transform

Interaction » Transform

Often it is necessary to alter the position of objects within the scene. You can transform selected objects in two ways, interactively with the transform manipulator in the toolbar or by entering the transformation values into the transform module. You can move geometry, resize it, rotate it and redefine its pivot.

When transforming multiple objects at once, the transform module always shows the transformation properties of the last selected object, and the transform manipulator is connected to the last selected object. Transformation values that differ among the selected objects are highlighted by a yellow background in the respective input field. When entering a certain value, it is applied to all selected objects. With the wheel control next to the input field, you can increase or decrease the respective values of

all selected objects at once.

» **Basic**

» Translation

- Coordinate System: Defines whether the translation values are presented based on world space or on object space. In world space, the translation defines the object's global position within the world. In object space, the translation defines the object's offset from its origin.

  Example: A parent node is translated by «0, 0, 10» (TX TY TZ) in world space. If the child node is translated by «0, 0, 5» in local space, its translation values in world space will be «0, 0, 15».

- Translate(x,y,z): Moves the object on the x-, y- or z-axis.
- Move to Camera: Moves the object to the location of the camera.
- Move to Origin: Moves the object to its origin.

» Rotation

- Rotate(x,y,z): Rotates the object on the x-, y- or z-axis.
- Rotation Order: Euler rotations are not clear. The rotation order defines the order in which the rotations around the 3 axes will be realized.
- You can define the rotation axis of the object by picking one in the 3D scene. The rotation pivot will be automatically positioned and aligned according to the picked axis.
  - Pick Axis (x,y,z): Defines whether x-, y- or z-axis of the rotation pivot will be aligned to the picked axis.
  - Show Axis: Displays the picked rotation axis.
  - Pick Mode: Allows to select two or three points for defining the rotation axis. With two points you directly define the axis in 3D space. With three points you define a triangle in 3D whose normal vector will be the picked axis.

» Scaling

- Scale (x,y,z): Scales the object on x-, y- or z-axis.
- Uniform Scaling: Connects x-, y- and z-axis and keys the same value to all of them. To scale an object in only one direction or unequally in different directions deactivate this option.

» Rotation Pivot

- Coordinate System: The rotation pivot can be defined in world space or related to the object.

  Example: An object is positioned at «10,10,10» in world space. The rotation pivot of the object is positioned at «0,0,0» in object space and at «10,10,10» in the world coordinate system.
- Position (x,y,z): Moves the rotation pivot point on the x-, y- or z-axis.
- Orientation (x,y,z): Rotates the rotation pivot point on the x-, y- or z-axis.
- Move To Object Center: Moves the rotation pivot point to the center of the object's bounding box.
- Move To World Center: Moves the rotation pivot point to the center of the world.

» Scaling Pivot

- Coordinate System: The scale pivot can be defined in world space or related to the object.

  Example: An object is positioned at «10,10,10» in world space. The scale pivot of the object is positioned at «0,0,0» in object space and at «10,10,10» in the world coordinate system.
- Position (x,y,z): Moves the scaling pivot point on the x-, y- or z-axis.
- Move To Object Center: Moves the scaling pivot point to the center of the object's bounding box.
- Move To World Center: Moves the scaling pivot point to the center of the world.

» **Advanced**

» Bounding Box: Bounding box calculation options:

- Bounding Box Center: Returns the coordinates of this object's bounding box center.
- Create Bounding Box Center Transform: Creates a transform node with transform of the selected bounding box center.
- Create Bounding Box Center Inverse Transform: Creates a transform node with inverse transform of the selected bounding box center.

» Shearing: Shearing transformation options:

- Shear XY: Shears the object on the x- and y-axis.
- Shear XZ: Shears the object on the x- and z-axis.
- Shear YZ: Shears the object on the y- and z-axis.

6.4 Rendering

6.4.1 Render Settings

Rendering » Render Settings

» **File Output**

» Image:

- Camera: Sets the camera for the rendering. The default setting is Perspective camera.
- Filename: Sets the path and name of the image file to save the rendering to.
- Use Time Stamp: Appends a timestamp to the filename.

- Image Size Presets: Sets image or printing size from a preset.
- Image Size: Sets the image width and height in pixels.
- Printing Size: Sets width and height of the resulting print in centimeters.
- Resolution: Sets the printing resolution in dots per inch.
- Region Render: Restrict rendering to the rectangular region specified by the coordinates below.
  - Upper Left Corner: Defines the X and the Y coordinate for the upper left corner of the region frame.
  - Lower Right Corner: Defines the X and the Y coordinate for the lower right corner of the region frame.
- Render Mode: Sets the illumination mode to apply for rendering the image to file. *Caution: This value automatically changes the still frame illumination mode in the Raytracing Quality tab.*
- Render Quality: Sets the number of image samples which will be used for rendering. *Caution: This value automatically changes the Antialiasing Image Samples value of the General Settings tab.*
- Supersampling: Activates/Deactivates supersampling for the rendering. The default setting is On.
- Background Color: Sets the background color when rendering a file with raytracing.
- Tonemap HDR: Applies tone mapping to the high dynamic image rendering. As a result, the 32 bit renderings look the same in the compositing tool as set in VRED. However, the values of the image will be compressed by the chosen tone mapper to values between 0 and 1. In doing so, the dynamic range will be lost. Therefore, effects like glow will be hard to calculate in the compositing tool afterwards.
- Export Alpha Channel: Activates alpha channel rendering. The alpha channel will be embedded into the resulting image, if the file type supports

alpha channels. The background color mentioned above is seen through transparent objects.

- Premultiply Alpha: Renders the alpha channel premultiplied.
- ICC Profile: Sets the ICC Profile for the rendering. The default setting is Current Settings.

» Renderpasses:

- Export Renderpasses: Activates rendering with render passes. All activated Renderpasses will be rendered and saved at a time. NOTE: To reconstruct the beauty pass image using the other renderpasses it is necessary to render to EXR/HDR/Floating Point TIFF image format without "Tonemap HDR" activated. Tonemapping changes the linearity of values and therefore needs to be done after the renderpasses are combined to the final image. To reconstruct the beauty pass, the Diffuse IBL/Light/Indirect, Glossy IBL/Light/Indirect, Specular Reflection, Translucency and Incandescence Passes need to be layered using a linear add operation in your compositing tool.

» Animation:

- Render Animation: Enables to render an animation.
- Format: Choose whether to save the rendered animation as image sequence or movie.
- Start Frame: Sets the start frame of the sequence to be rendered.
- Stop Frame: Sets the end frame of the sequence to be rendered.
- Frame Step: Skips a predefined amount of frames between rendered frames, e.g.: Frame Step 3, Start 0 would result in rendering frames 0, 3, 6, 9...

» General Settings

» Antialiasing: The Antialiasing settings control the number of samples taken during stillframe antialiasing. These are the primary controls that influence the quality of the rendered image.

- Image Samples: Sets the number of samples taken during stillframe antialiasing. Higher values produce a cleaner result while lower values reduce the render time. A value of 128 is recommended as starting point in general but may be too low for interieur scenes with full global illumination.
- Adaptive Sampling: Adaptive sampling allows the raytracer to skip regions that are already smooth and focus the processing power on regions that are still noisy. The various quality settings control a threshold for a region to be considered as smooth. Setting the control to "Highest Quality" disables adaptive antialiasing and always samples each pixel with the number of image samples specified. While this gives the highest render quality it may waste processing power on regions that are already smooth.
  - Preview Quality: Sets the sampling quality to a very low level, resulting in preview render quality and very short render times.
  - Low Quality: Sets the sampling quality to low level, resulting in average render quality and short render times.
  - Medium Quality: Sets the sampling quality to medium level, resulting in good render quality and medium render times.
  - High Quality: Sets the sampling quality to high quality level.
  - Ultra High Quality: Sets sampling quality to a production quality level.
- Use Clamping: Sometimes sampling may result in single very bright pixels that are hard to antialiase. There are two options to get rid of these samples:
  - Tracing many more image samples: Casting more image samples would sample these bright pixels softer, but results in higher calculation times.
  - Clamping the image values to a specified maximum value. Be aware that the results may look dull if the clamping value is set too high.
    Caution: Activating clamping and reducing the value will reduce the maximum resulting image color range.

» **Raytracing Quality**

» Illumination Mode: VRED has two illumination modes for rendering in raytracing. You may choose different illumination modes for interactive rendering and still frame rendering. This allows to work in a precomputed mode for fast interaction with the scene and automatically switching to full global illumination for still frame rendering.

- Precomputed + Shadows: The Precomputed + Shadows Mode uses precomputed image based lighting and calculates shadows based on the active environment.
- Full Global Illumination: The Full Global Illumination Mode doesn't use any precomputed values but accurately samples everything in a physically based approach.

» Lightsource Sampling Quality Settings:

- Interactive: Sets the interactive lightsource sampling quality.
- Still Frame: Sets the still frame lightsource sampling quality.

» Reflection/Refraction Sampling Quality Settings:

- Interactive: Sets the interactive sampling quality of reflections and refractions.
- Still Frame: Sets the still frame sampling quality of reflections and refractions.

» Trace Depth Settings:

- Max Trace Depth: Sets the maximum amount of reflection and refraction each ray may encounter.
- Max Shadow Depth: Sets the maximum amount of shadow samples.

» Quality Settings:

- Interactive Quality: Sets the interactive sampling quality of reflections and refractions.
- Still Frame Quality: Sets the still frame sampling quality of reflections and refractions.

- Trace Depth: Sets the maximum amount of reflection and refraction each ray may encounter for interactive and still frame rendering.

» **Display Output**

» Visual Support:

- Show Snapshot Frame: Draws a yellow frame into Renderview, indicating the target image to be rendered.
- Show Region Render Frame: Draws a green frame into the Renderview dependent on the values of the region start XY and region end XY input fields.
- Show Rule of Thirds Guide: Draws orange guide lines into Renderview, allowing to use the rule of thirds.
- Show Inner Frame: Draws an orange frame into Renderview, indicating the area where text or graphics show neatly.
- Unit: Defines the distance unit of the inner frame.
- Left - Right: Sets the distance of the left and right side.
- Top - Bottom: Sets the distance of the top and bottom side.

Materials Reference

7 MATERIALS REFERENCE

7.1 Truelight Materials

7.1.1 General Truelight Material Settings

Many truelight materials used in VRED share the same properties. These attributes are explained below.

» **Incandescence Settings** The incandescence defines the shader's self-illumination behavior.

» Color: Sets the self-illumination colour.

» Intensity: Sets the self-illumination intensity.

» Use Texture: Loads an image texture, which defines the self-illumination area and intensity.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Use as Light Source (Raytracing Only): If this option is turned on, geometry with the shader applied will act like a geometry light source.
- Illuminate Shadow Material: If turned on, the geometry light will illuminate shadow materials. You will also need to set the Reflection Mode of the shadow material to Diffuse, Glossy or Diffuse + Glossy.

- Cast Shadow on Shadow Material: You may disable shadows cast by the geometry light onto shadow materials.
- Shadow Intensity: Sets the intensity of shadows cast by the geometry light.
- Interactive Quality: Sets the light sampling quality during interactive rendering.
- Still Frame Quality: Sets the light sampling quality during still-frame rendering.

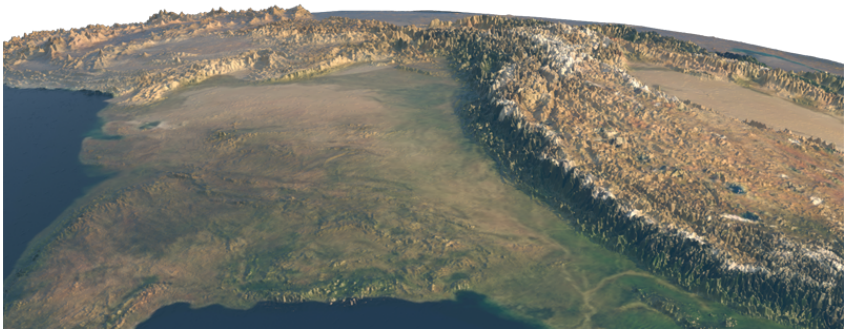
» **Transparency Settings** The transparency settings define the shader's opacity.

» See Through: Renders the shader transparent.

» Use Texture: Loads an image texture, which defines the self-illumination area and intensity.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. Value 1 is lowest quality. Value 16 is highest quality.
- Invert Texture: Inverts the texture.

» **Displacement**



Displacement maps are detailed maps, which are interpreted as height information. Using displacement maps you can create highly detailed structures from rather simple geometry by just using a plain image. Each point on the geometry is displaced along the interpolated vertex normals using the height information of the map, resulting in a realistic silhouette and producing correct shadows and reflections. Accuracy is only limited by the resolution of the texture image and memory requirements are very low. To avoid cracks in the displaced surfaces the vertex normals should be smooth and consistent. Using a higher tesselated bases mesh can improve performance a lot.

» Displacement Height: Defines the height of the displacement.

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:

  · Repeat: Repeats the texture in all directions. Repeat

- Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
- Decal: The texture will not be repeated.
- Clamp: Repeats only the last pixel of the texture will be repeated.

- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.

» **Raytracing Settings**

» Material ID: Sets the material id.

» Line Tube Radius: Sets the radius of the tube when the shader is applied to a line geometry.

» Override Trace Depth: If enabled, the setting overrides the global set maximum raytrace depths.

- Max Interactive Depth: Sets how often a ray may get refracted or reflected during interactive rendering.
- Max Still Frame Depth: Sets how often a ray may get refracted or reflected during still-frame rendering.

7.1.2 Brushed Metal

The TrueLight Brushed Metal material simulates any type of metal surfaces.

» **Brushed Metal Material Settings**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader adopts when the light reflection of the surface is spread to many directions.

» Glossy Color: Sets the shader's color for glossy reflection. Reflection behavior is described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray) form the same angle with respect to the surface normal. Since a surface usually is not perfectly smooth, the orientation of the normals varies, thus creating a glossy reflection.

» Roughness UV: The roughness parameter defines the amount of diffuse reflection and its complement specular reflection. The higher the roughness value,

the more diffuse reflection will be rendered.

On metallic surfaces the roughness can vary against the surface direction. Especially when the surface is finished. Due to this the roughness can be separately set in U and V direction.

» Metal Type: The Metal Type attributes allows to choose between a wide range of metal material presets.

» Reflectivity: Sets the Brushed Metal's reflective intensity.

» Brush Orientation

» Brush Mapping: Allows to choose between a range of possible brush orientations, e.g. metal brushed in one direction or metal with radial brushes. For example, Brush Mapping 'Radial XY' simulates radial brushes within the xy-plane. The projection planes are defined relative to the object coordinate system of the object the material is assigned to.

- Size U: Defines the brush's size on the U-axis.
- Size V: Defines the brush's size on the V-axis.

» The properties of the chosen Brush Mapping can be further modified.

- Planar Mapping (Brush Mappings 'Planar XY', 'Planar XZ', 'Planar YZ')
  - Orientation X/Y/Z: Sets the projection plane's orientation.
- Radial Mapping (Brush Mappings 'Radial XY', 'Radial XZ', 'Radial YZ')
  - Center X/Y/Z: Sets the projection plane's center of the radial brushes.
  - Orientation X/Y/Z: Sets the projection plane's orientation of the radial brushes.
- Triplanar Mapping (Brush Mapping 'Triplanar')
  - X/Y/Z Rotate: Sets the projection plane's rotation on the X/Y/Z-axis.

» Diffuse Texture

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Link repeat modes: Links the values to each other. When changing one value, the other one adapts it.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» Glossy Texture

» Use Texture: Loads an image texture for the glossy color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.

- Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
- Decal: The texture will not be repeated.
- Clamp: Repeats only the last pixel of the texture.

- Link repeat modes: Links the values to each other. When changing one value, the other one adapts it.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Roughness Texture**

» Use Texture: Loads an image texture for the roughness channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Link repeat modes: Links the values to each other. When changing one value, the other one adapts it.

- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Minimum Roughness U: Sets the minimum roughness for U which is determined by the red color channel of the roughness texture.
- Maximum Roughness U: Sets the maximum roughness for U which is determined by the red color channel of the roughness texture.
- Minimum Roughness V: Sets the minimum roughness for V which is determined by the green color channel of the roughness texture.
- Maximum Roughness V: Sets the maximum roughness for V which is determined by the green color channel of the roughness texture.

» **Bump Texture**

» Use Structure: Uses a procedural structure generated by VRED to simulate a rugged surface.

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.

- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.
- Bump Type: Sets the bump type. The bump mapping can be drawn as bump map or as pixel displacement map wihout selfshadowing.

For further information on the Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.3 Carbon

The TrueLight Carbon material is a procedural material that simulates carbon surfaces. It offers a special triplanar texturing mode which is useful for objects that do not have an appropriate UV mapping.

» **Triplanar Carbon Material Settings**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader adopts when the light reflection of the surface is spread to many directions.

» Glossy Color: Sets the shader's colour for glossy reflections. Glossy reflections result from irregularities of a surface at a microscopic level. Reflection behavior is described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray) form the same angle with respect to the surface normal, thus the angle of incidence equals the angle of reflection. Since a surface is usually not perfectly

smooth, the orientation of the normals varies, thus creating a glossy reflection.

» Roughness: The roughness parameter defines the microscopic roughness of a surface. The higher the roughness value, the more diffuse the glossy reflections will be rendered.

» **Clearcoat Settings** Sets the clearcoat color. The clearcoat is a transparent, strongly reflective paint layer on the base carbon layer.

» Clearcoat color: Sets the clearcoat color.

» Reflectivity: Sets the clearcoat reflective intensity.

» **Carbon Pattern Settings**

» Pattern type: There are several different pattern types, according to the carbon structures usually sewed.

- 2 X 2
- 3 X 1 staircase
- 3 X 1 interleave
- 5 X 1

» Pattern Size: Sets the carbon structure size.

» Pattern intensity: Sets the fissure depth intensity.

» Pattern orientation (Rotate x,y,z): Sets the pattern direction on x, y and z projection direction.

» **Bump Texture**

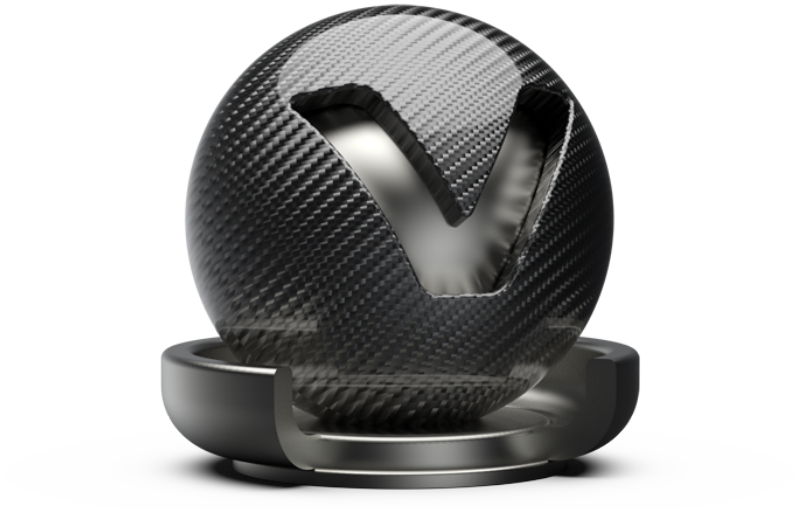
» Use Structure: Activates a procedural bump structure.

- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.

7.1 Truelight Materials

For further information on the Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.4 Carbon 2D



The TrueLight Carbon 2D material is a procedural material that allows to simulate carbon surfaces. The carbon pattern is mapped to the surface by using the texture coordinates of the object to which the material is assigned. Therefore, an appropriate UV mapping is required. Alternatively you can use the CarbonMaterial which offers a special triplanar texturing mode.

» **Carbon Material Settings**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader takes on, when the light reflection of the surface is spread to many directions.

» Glossy Color: Sets the shader's colour for glossy reflections. Glossy reflections result from irregularities of a surface at a microscopic level. Reflection behavior is described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray)

form the same angle with respect to the surface normal, thus the angle of incidence equals the angle of reflection. Since a surface is usually not perfectly smooth, the orientation of the normals varies, thus creating a glossy reflection.

» Roughness: The roughness parameter defines the microscopic roughness of a surface. The higher the roughness value, the more diffuse the glossy reflections will be rendered.

» **Clearcoat Settings** Sets the clearcoat color. The clearcoat is a transparent, strongly reflective paint layer on the base carbon layer.

» Clearcoat color: Sets the clearcoat color.

» Reflectivity: Sets the clearcoat reflective intensity.

» **Carbon Pattern Settings** Defines the carbon pattern.

» Pattern Type: There are four different pattern types, according which carbon structures are usually sewed.

- 2 X 2
- 3 X 1 staircase
- 3 X 1 interleave
- 5 X 1

» Pattern Size: Sets the carbon structure size.

» Pattern Intensity: Sets the fissure depth intensity.

» Rotate: Defines the pattern's rotation value.

» **Bump**

» Use Structure: Activates a procedural bump structure.

- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.

7 MATERIALS REFERENCE

For further information on the Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.5 Chrome

With the Chrome material chromic and metallic surface behaviors can be simulated.

» **Chrome Material Settings**

- » Reflection Color: Sets the chrome reflection color. When the chrome reflection is colored, reflected objects will also be colored.
- » Contrast: Sets the reflection's contrast level.
- » Saturation: Sets the reflection's saturation level.
- » Type: Various metal types are available (for example Aluminium, Silver, Gold, Cobalt, Copper, Chromium, Iron, and many more).
- » Use Roughness: Activates roughness value.
- » Roughness: Sets the roughness of the material. The higher the roughness value, the blurrier the reflection will be.

» **Roughness Texture**

» Use Texture: Loads an image texture for the roughness channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Link repeat modes: Links the values to each other. When changing one value, the other one adapts it.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Minimum Roughness: Sets the minimum roughness which is determined by the red color channel of the roughness texture.
- Maximum Roughness: Sets the maximum roughness which is determined by the red color channel of the roughness texture.

» **Bump Texture**

» Use structure: Activates a procedural bump structure.

» Use texture: Activates a Texture Menu. Loads an image texture for the bump channel. Uses the loaded image as a pattern on the surfaces.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:

  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. Value 1 is lowest quality. Value 16 is highest quality.
- Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.
- Bump Type: Sets the bump type. The bump mapping can be drawn as bump map or as pixel displacement map wihout selfshadowing.

For further information on the Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.6 Flipflop

A TrueLight Flipflop material offers a carpaint shading which varies in color under different viewing angles.

» **Flipflop Carpaint Material Settings**

  » Base Color: Sets the diffuse reflection color of the Flipflop. The shader adopts this color, when the surface is globally lit.

» **Flake Settings** Describes the metallic flake's behaviour, which are embedded in metallic paints. They have a strong specular light reflection and are layered on top of the base shading color.

  » Flake Color 1: Sets the metallic shiny flake's first color. It gets stronger and more brilliant the further the normal orientation points away from the camera.

  » Flake Color 2: Sets the metallic shiny flake's second color. It gets stronger and more brilliant the further the normal orientation points towards the camera.

- » Blending: Defines the mixture ratio of two colors. Drag the slider to the left to increase the intensity of color 1. Drag the slider to the right to increase the intensity of color 2.
- » Roughness: Defines the amount of diffuse reflection and its complement specular reflection. The higher the roughness value, the more diffuse reflections will be rendered.
- » Flake Size: Sets the flake's size.
- » Flake Intensity: Sets the flake's contrast value of each flake's normal direction.

» **Clearcoat Settings** Sets the clearcoat color. The clearcoat is a transparent, strongly reflective paint layer on the base paint layer.

- » Clearcoat color: Sets the clearcoat color.
- » Reflectivity: Sets the clearcoat reflective intensity.
- » Use orange peel: Activates a noisy bump structure in the shader.
  - Orange peel frequency: Sets the bump structure's noise frequency.
  - Orange peel intensity: Sets the bump structure's intensity.

For further information on the Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.7 Glass

The TrueLight Glass material simulates glass surface behaviors including frosted glass.

» **Glass Material Settings**

- » Exterior Transparency: Sets the shader's transparency color. The exterior transparency acts like a color filter for the light coming from behind the surface. A darker color blocks more light making the surface more opaque.
- » Reflection Color: Sets the shader's colour for reflections.
- » Select Medium: Offers a wide selection of refraction indices based on materials existing in reality.
- » Index of Refraction: Sets the material's refraction index.
- » Use Reflectivity: Sets the material's reflectivity intensity.
- » Use Roughness: If turned on, the Glass will be handled as frosted glass with glossy reflections and refractions.

» Use Material Density: If turned on, ray-travelling through the glass gets attenuated based on the distance it travels inside the glass.

» **Texture Settings** Texture settings define how a texture will be placed on the surface and how the planar projection will be blended at the edges.

» Texture Mode: Defines how a texture will be placed on the surface, whether uses UV Coordinates or Triplanar projection.

» Edge Blend: Sets the range for overlapping areas of the planar projection.

» Texture Size X: Defines the textures size on the X-axis.

» Texture Size Y: Defines the textures size on the Y-axis.

» Uniform Repeat: Synchronizes the repetition value for all projection axes.

» X Repeat U, X/V, Y/U, Y/V, Z/U, Z/V: Set the repetition value of the U and V-axis for each projection direction.

» X Offset U, X/V, Y/U, Y/V, Z/U, Z/V: Set the offset value of the U and V-axis for each projection direction.

» X,Y,Z Rotate: Sets the projection orientation.

» **Roughness Texture**

» Use Texture: Loads an image texture for the roughness channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.

- Link repeat modes: Links the values to each other. When changing one value, the other one adapts it.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Minimum Roughness: Sets the minimum roughness which is determined by the red color channel of the roughness texture.
- Maximum Roughness: Sets the maximum roughness which is determined by the red color channel of the roughness texture.

» **Bump Texture**

» Use Structure: Activates a procedural bump structure.

» Use Texture: Loads an image texture for the bump channel. Uses the image as pattern on the surfaces.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link repeat modes: Links the values to each other. When changing one value, the other one adapts it.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.

- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.
- Bump Type: Sets the bump type. The bump mapping can be drawn as bump map or as pixel displacement map wihout selfshadowing.

For further information on the Displacement, Raytracing, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.8 Metallic Paint

The Metallic Paint offers a shading model suited for metallic painted surfaces like metallic car paint.

» **Metallic Carpaint Material Settings**

  » Base Color: Sets the diffuse reflection color of the UnicolorPaintMaterial. The shader adopts this color, when the surface is globally lit.

» **Flake Settings** Describes the metallic flake's behaviour, which are embedded in metallic paints. They have a strong specular light reflection and are layered on top of the base shading color.

  » Flake Color: Sets the metallic shiny flake's base color.

  » Roughness: Defines the amount of diffuse reflection and its complement specular reflection. The higher the roughness value, the more diffuse reflections will be rendered.

» Flake Size: Sets the flake's size.

» Flake Intensity: Sets the flake's contrast value of each flake's normal direction.

» **Clearcoat Settings** Sets the clearcoat color. The clearcoat is a transparent, strongly reflective paint layer on the base paint layer.

» Clearcoat color: Sets the clearcoat color.

» Reflectivity: Sets the clearcoat reflective intensity.

» Use orange peel: Activates a noisy bump structure in the shader.

- Orange peel frequency: Sets the bump structure's noise frequency.
- Orange peel intensity: Sets the bump structure's intensity.

For further information on the Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.9 Multi Pass

The Multi Pass material allows to layer TrueLight materials. The first material in the list is the first rendered and the following shaders are rendered according to their position in list from top to bottom.

» **Sort key** Sets the render priority of the Multi Pass material. Only supported in OpenGL mode.

» **Transparency mode** Offers three different transparency modes.

- » Auto Detection: Set automatically the material order according to their transparency.
- » Force Transparent: Draws all transparent materials at last so that all transparent materials in the stack lays about the opaque materials.
- » Force Opaque: Draws all opaque materials at last so that all opaque materials in the stack lays about the transparent materials.

7.1.10 Phong

The Phong material uses the Phong illumination algorithm which is an empirical model of local illumination. It describes the way a surface reflects light as a combination of the diffuse reflection of rough surfaces with the glossy reflection of shiny surfaces. It is based on the fact that shiny surfaces have small intense glossy highlights, while dull surfaces have large highlights that fall off more gradually.

» **Phong Material Settings**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the colour the shader adopts, when light reflections of the surface are spread to many directions.

» Glossy Color: Sets the shader's colour for glossy reflections. Glossy reflections result from irregularities of a surface at a microscopic level. Reflection behavior is described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray)

form the same angle with respect to the surface normal, thus the angle of incidence equals the angle of reflection. Since a surface is usually not perfectly smooth, the orientation of the normals varies, thus creating a glossy reflection.

» Roughness: The roughness parameter defines the microscopic roughness of a surface. The higher the roughness value, the more diffuse the glossy reflections will be rendered.

» Diffuse Backscattering: Defines the roughness of the material's diffuse component. A value of 0.0 means smooth (Lambertian surface), a value of 1.0 means very rough (e.g. concrete).

» Diffuse Texture

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Use Alpha: Uses an alpha channel of the image texture if it has an alpha channel embedded.
- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirror: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Repeat UV: Sets the number of repetitions for the UVs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.

- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Glossy Texture**

» Use Texture: Loads an image texture for the glossy color channel. Uses the image as a pattern on the surfaces.

- Repeat mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Repeat UV: Sets the number of repetitions for the UVs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. Value 1 is lowest quality. Value 16 is highest quality.
- Input gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Roughness Texture** Use a roughness texture for varying roughness values on the surfaces. If a roughness texture is active the simple roughness slider loses its function. Instead you define how the texture values are mapped to roughness values via a minimum and a maximum roughness value.

» Use Texture: Activates the roughness texture settings. Load an image texture for the roughness channel. Using a greyscale image is recommended, for color images the red channel is used.

- Repeat mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Repeat UV: Sets the number of repetitions for the UVs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. Value 1 is lowest quality. Value 16 is highest quality.
- Minimum Roughness: Defines the roughness value to which a texture value of 0 is mapped.
- Maximum Roughness: Defines the roughness value to which a texture value of 1 is mapped.

» Bump Texture

» Use Structure: Activates a procedural bump structure.

» Use Texture: Activates the bump texture settings. Loads an image texture for the bump channel. Uses the loaded image as a pattern on the surfaces.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.

  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. Value 1 is lowest quality. Value 16 is highest quality.
- Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.
- Bump Type: Sets the bump type. The bump mapping can be drawn as bump map or as pixel displacement map wihout selfshadowing.

For further information on the Subsurface Scattering, Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.11 Plastic

The Plastic material is designed to simulate diffuse plastic or leather surfaces.

» **Plastic Material Settings**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader adopts when the light reflection of the surface is spread to many directions.

» Glossy Color: Sets the shader's colour for glossy reflections. Glossy reflections result from irregularities of a surface at a microscopic level. Reflection behavior is described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray) form the same angle with respect to the surface normal, thus the angle of incidence equals the angle of reflection. Since a surface is usually not perfectly smooth, the orientation of the normals varies, thus creating a glossy reflection.

» Roughness: The roughness parameter defines the microscopic roughness of a

surface. The higher the roughness value, the more diffuse the glossy reflections will be rendered.

» Reflectivity: Sets the clearcoat reflection intensity.

» Diffuse Texture Settings

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

» Use alpha: Uses the transparency information from the texture.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link repeat modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» Glossy Texture Settings

» Use Texture: Loads an image texture for the glossy color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link repeat modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is the lowest quality. 16 is the highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» Roughness Texture Settings

» Use Texture: Loads an image texture for the roughness channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.

- Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
- Decal: The texture will not be repeated.
- Clamp: Repeats only the last pixel of the texture.

- Link repeat modes: Links the values to each other. When changing one value, the other one adapts it.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Minimum Roughness: Sets the minimum roughness which is determined by the red color channel of the roughness texture.
- Maximum Roughness: Sets the maximum roughness which is determined by the red color channel of the roughness texture.

» **Bump Texture Settings**

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link repeat modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.

- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.
- Bump Type: Sets the bump type. The bump mapping can be drawn as bump map or as pixel displacement map wihout selfshadowing.

For further information on the Subsurface Scattering, Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.12 Reflective Plastic

The Reflective Plastic is suitable to simulate shiny or glossy plastic surfaces that are finished with a clearcoat.

» **Reflective Plastic Material Settings**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader adopts when the light reflection of the surface is spread to many directions.

» Specular Color: Sets the shader's color for specular reflections. Specular reflections result from completely smooth surfaces and are described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray) form the same angle with respect to the surface normal, thus the angle of incidence equals the angle of reflection.

» Reflectivity: Sets the specular reflection intensity when the surface normal is

directly facing the viewer. The intensity of the reflection increases based on the fresnel term when the angle between the viewer and the surface normal increases.

» **Diffuse Texture**

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Specular Texture**

» Use Texture: Loads an image texture for the specular color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Bump Texture**

» Use Texture: Loads an image texture for the bump channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.

- Clamp: Repeats only the last pixel of the texture.

- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.
- Bump Affects Specular Reflections: Allows the bump texture to affect the specular reflections.
- Bump Type: Sets the bump type. The bump mapping can be drawn as bump map or as pixel displacement map wihout selfshadowing.

For further information on the Subsurface Scattering, Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Trueelight Material Settings" section at the beginning of the chapter.

7.1.13 Reflective Triplanar

A TrueLight Reflective Triplanar material simulates shiny and glossy plastic and comparable surfaces while offering a special triplanar texturing mode for objects that do not have an appropriate UV mapping. All surfaces finished with a clearcoat can be perfectly visualized with this shader.

» **Reflective Triplanar Material Settings**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader adopts when the light reflection of the surface is spread to many directions.

» Specular Color: Sets the shader's color for specular reflections. Specular reflections result from completely smooth surfaces and are described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray) form the same angle with respect to the surface normal, thus the angle of incidence equals the angle of

reflection.

» Reflectivity: Sets the specular reflection intensity when the surface normal is directly facing the viewer. The intensity of the reflection increases based on the fresnel term when the angle between the viewer and the surface normal increases.

» **Triplanar Settings** Triplanar settings define how a texture will be placed on the surface and how the planar projection will be blended at the edges.

» Edge blend: Sets the range for overlapping areas of the planar projection.

» Texture Size X, Y: Defines the textures size on the X-/Y-axis.

» Uniform Repeat: Synchronizes the repetition value for all projection axes.

» X Repeat U, X/V, Y/U, Y/V, Z/U, Z/V: Set the repetition value of the U and V-axis for each projection direction.

» X Offset U, X/V, Y/U, Y/V, Z/U, Z/V: Set the offset value of the U and V-axis for each projection direction.

» X/Y/Z Rotate: Sets the projection orientation.

» **Diffuse Texture**

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.

- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Specular Texture**

» Use Texture: Loads an image texture for the specular color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

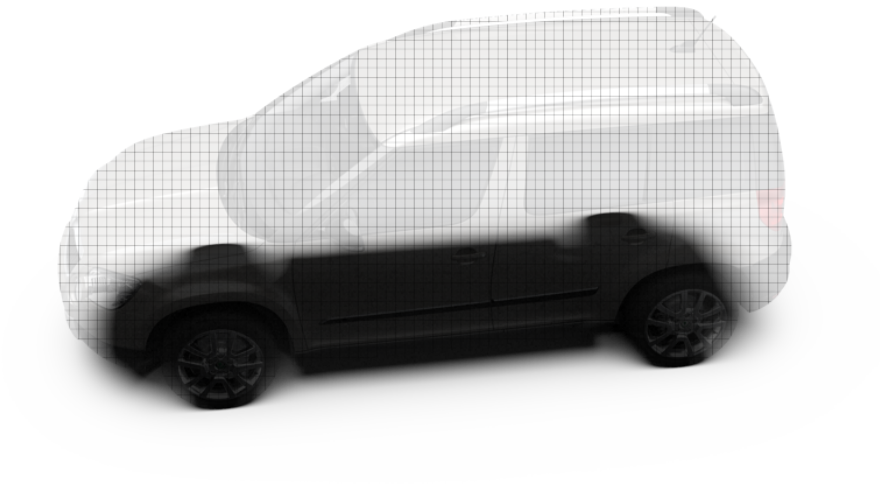
» **Bump Texture**

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Bump Affects Specular Reflections: Allows the bump texture to affect the specular reflections.

For further information on the Subsurface Scattering, Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Trulight Material Settings" section at the beginning of the chapter.

7.1.14 Shadow



The Shadow material is a transparent material by default. It will only be shaded in areas of shadows calculated by linear lights sources or global illumination light sources. It is also capable of receiving diffuse and glossy reflections to simulate wet or mirroring surfaces.

» **Shadow Material Settings** Define the color and intensity of the shaded areas.

- » Occlusion Color: Sets the color of the environment shadows.
- » Occlusion Color: Sets the intensity of the environment shadows.
- » Shadow Color: Sets the shadow color of all light sources.
- » Opacity Mode Settings:
  - Transparent: Renders the Shadow transparent by default.
  - Solid: Renders the Shadow white by default.

» Sort key: Sets the render priority of the Shadow. Only supported in OpenGL mode.

Reflection Settings:

» Reflection Mode: Offers three different reflection modes:

- Diffuse only: Shows only the diffuse reflections.
- Glossy only: Shows only the glossy reflections.
- Diffuse + Glossy: Shows the diffuse and glossy reflections.

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader takes on, when the light reflection of the surface is spread to many directions.

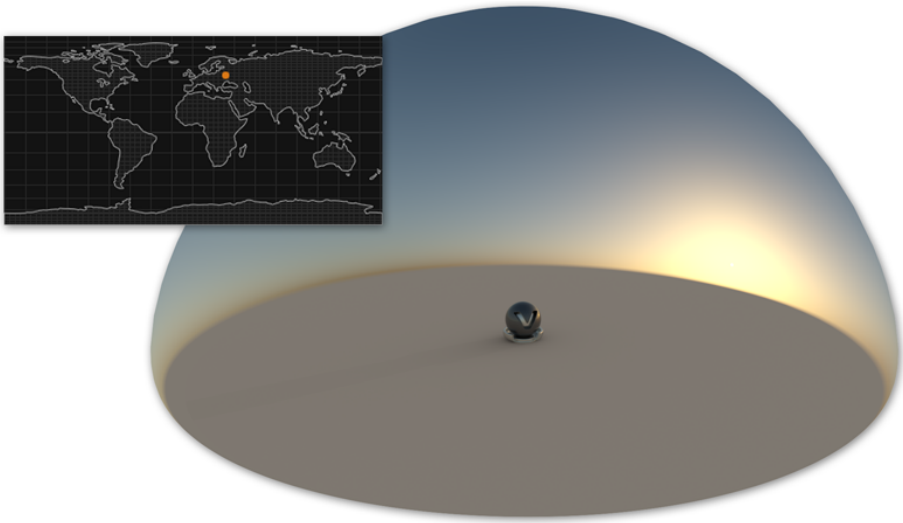
» Glossy Color: Sets the shader's colour for glossy reflections.
Glossy reflections result from irregularities of a surface at a microscopic level. Reflection behavior is described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray) form the same angle with respect to the surface normal, thus the angle of incidence equals the angle of reflection. Since a surface is usually not perfectly smooth, the orientation of the normals varies, thus creating a glossy reflection.

» Reflectivity: Sets the material's reflectivity intensity.

» Roughness: The roughness parameter defines the amount of diffuse reflection and its complement specular reflection. The higher the roughness value, the more diffuse reflections will be rendered

For further information on the Raytracing settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.15 Skylight



A Skylight can be used as environment for lighting the scene by a sun and a sky. Skylights are procedurally generated Sphere Environment materials. *You can create a Skylight by selecting the Sphere Environment in the Material Editor and changing the environment type at the top of the Attributes view to "Skylight Environment". Be aware that your current HDR will be lost after the conversion.*

» **Preview Image** The Skylight provides an interactive preview image that allows you to quickly change the sun position. The yellow curve within the preview image depicts the sun path from sunrise to sunset at the currently set date and location. You can set the sun position represented by a circle by clicking on the sun path. The preview image includes labels of the four cardinal directions (N = North, E = East, S = South, W = West). If the current location is on the nothern hemisphere, 'South' is the centered direction; for locations on the southern hemisphere 'North' is the centered direction.

» **Skylight Material Settings**

- » Resolution: Sets the resolution of the procedural environment texture. A higher quality yields higher generation times for the environment but might be necessary in precomputed illumination mode with animated sun.
- » Flip Inside Out: Flips the normals of the object this material is assigned to.
- » Is Visible: Sets the light source to on by default.
- » Use as Lightsource: Uses the HDR as light source. Only supported in FullGI illumination mode.
- » Show Compass: Displays a compass in the render window for the currently selected skylight material. The compass is positioned at the environment's center and oriented according to the environment rotation (see Transformation).

» **Sky and Sun**

- » Sky Model: Choose between two different sky models: 'Realistic' and 'Artistic'. The artistic sky model produces more reddish and colorful skies, especially for sunrise/sunsets.
- » Exposure: Sets the HDR-Image's exposure level. The higher the exposure level, the longer will be the series of shutter cycles which will be used to calculate the image's light intensity.
- » Sky Turbidity: Controls the amount of haze in the atmosphere. Low values correspond to a clear sky. The default value of 3.0 is a clear sky in a temperate climate. The maximum value of 10.0 yields a hazy sky.
- » Sun Scale: Controls the size of the sun. The default value 1.0 corresponds to the real size of the sun, seen from the earth. The sun is drawn as a filled circle within the sky environment. Increase the sun scale to get softer shadows.
- » Sun Visible in Specular Reflections: Defines whether the sun of this skylight material is visible in all specular reflections in the scene, e. g. on clear coat.
- » Use Mirrored Sky as Ground: The mirrored upper hemisphere (sky without sun) is used as lower hemisphere (ground).

» Ground Color: Sets the color for the single-colored ground in the lower hemisphere if 'Use Mirrored Sky as Ground' is not enabled. *Note: When using the 'Realistic' sky model, the ground color serves as a ground albedo which influences the tint of the sky.*

» Date and Time

» Date: The date determines the sun path. The sun position is computed from Local Time, Date and Location. The 'Today' button sets the date to the current operation system date.

» Local Time: Controls the sun position at the current date. The sun position is computed from Local Time, Date and Location. The 'Now' button sets the date to the current operation system local time.

» Location

» Longitude/Latitude: Sets the location to these geographic coordinates in decimal degrees.

» Time Zone: The time zone is expressed as time difference to UTC (Coordinated Universal Time). It is automatically estimated from the given geographic coordinates.

» DST: Enables/disables daylight saving time. Please specify whether there is daylight saving time at the current location on the current date because this information is not retrieved automatically.

» Closest City: The City (Country) information names the city that is closest to the given geographic coordinates. The current time zone is this city's time zone.

» Location Search: Retrieve longitude/latitude data from a database of over 22,000 cities. You may also enter a country name and choose a city from the popup list.

» Color Correction

» Whitebalance: Sets the whitepoint value in kelvin.

- Hue-Shift: Shifts all colors in the HDR-Image uniformly through the hue color range.
- Contrast: Separates the light and dark color values further from each other.
- Brightness: Raises the color value of the whole HDR-Image.
- Saturation: Sets the HDR-Image's saturation.
- Reflected Saturation: Sets the HDR-Image's saturation for reflections of the HDR-Image in any surface.

» **Transformation** With transformation parameters the source of spherical projection of the Skylight can be set.

- Environment Size: Sets the radius of the projection sphere. The projection sphere must enclose all objects using a material having this Skylight as environment shader assigned. All objects that are outside of the projection sphere using a Truelight Material with this Skylight as input channel, will not be rendered properly.
- Center: Defines the projection sphere's center position.
- Get from Object: Sets the projection sphere's center. To center the projection pivot automatically, select an object and press "Get Center". The selected object's center will now be used as projection sphere's pivot.
- Rotate X, Y, Z: Sets the Skylight's orientation.
- Scale X, Y, Z: Sets the Skylight's size. With the scale value the image projection can be stretched and squashed on any axis.

» **Raytracing Settings**

- Material ID: Sets the id of the material.
- Illumination:
  - Upper Hemisphere: Emits light only from the top half of the sphere.
  - Full Sphere: Emits light from the whole sphere.

7.1.16 Sphere Environment

Environments enable to add realistic reflections and lightsources to the scene. Sphere Environments are required by every Truelight Material. They deliver the precomputed image based lighting (IBL) for any Truelight Material they are assigned to. The lighting of a Truelight Material can be adjusted with the settings of the Sphere Environment. Each Sphere Environment can be assigned as an input node of each Truelight Material in the Material Editor (see General Truelight Material Settings » Common » Environment).

» **Sphere Environment Material Settings**

- » Environment: Loads the HDR image to be used as light source. The HDR image will also be used as environment, which will be reflected on reflective surfaces.
- » Flip Inside Out: Flips the normals of the Environment Sphere.
- » Is Visible: Sets the light source to on by default.

» Use as Lightsource: Uses the HDR als light source. Only supported in FullGI illumination mode.

» **HDR Light Studio** The HDR image of a Sphere Environment can be interactively created using HDR Light Studio by Lightmap LTD. This part of the GUI will be only visible if a demo or full version of HDR Light Studio is detected by VRED on startup.

» Edit & Load Settings: Opens HDR Light Studio and tries to load a project that has been saved for this material. If no project has been previously saved for this material you will start with a blank canvas. Please note, that the current HDR image will be replaced. All changes made on the HDR Light Studio canvas are immediately applied to the HDR image of the connected VRED Sphere Environment.

» Save Settings: Internally saves the HDR Light Studio project for the Sphere Environment that you are currently editing.

» LightPaint: This feature is available since HDR Light Studio version 4.0. The integration of LightPaint within VRED allows you to directly click in the VRED render window to position your light sources in the HDR image such that, for example, the current light source will reflect in that position. Please refer to the HDR Light Studio manual for detailed information on the different painting modes. Choosing one of the three painting modes activates the paint tool in the VRED render window. Hold SHIFT and left-click in the scene to place the light source that is currently selected in the HDR Light Studio canvas. Hold SHIFT and right-click in the scene to select a light source. The active painting mode will be used to determine the light node in the HDR map.

» **Color Correction**

» Exposure: Sets the HDR-Image's exposure level. The higher the exposure level, the longer will be the series of shutter cycles which will be used to calculate the image's light intensity.

» Whitepoint: Defines the exact value between displaying white color and light-emissive image data.

- Whitebalance: Sets the whitepoint value in kelvin.
- Gamma: Encodes the linear luminance values into digital image file values. Gamma encoding helps to map data (both analog and digital) into a more perceptually uniform domain.
- Hue-Shift: Shifts all colors in the HDR-Image uniformly through the hue color range.
- Contrast: Separates the light and dark color values further from each other.
- Brightness: Raises the color value of the whole HDR-Image.
- Saturation: Sets the HDR-Image's saturation.
- Reflected Saturation: Sets the HDR-Image's saturation when the HDR-Image reflects in any surface.

» **Transformation** With transformation parameters the source of spherical projection of the Sphere Environment Material can be set.

- Environment Size: Sets the radius of the Sphere Environment Material's projection sphere. The projection sphere must enclose all objects using a material having this Sphere Environment Material as environment shader assigned. All objects that are outside of the projection sphere using a Truelight Material with this Sphere Environment Material as input channel, will not be rendered properly.
- Center X, Y, Z: Defines the projection sphere's center position.
- Get from Object: Sets the projection sphere's center. To center the projection pivot automatically, select an object and press "Get Center". The selected object's center will now be used as projection sphere's pivot.
- Rotate X, Y, Z: Sets the Spher eEnvironment Material's orientation.
- Scale X, Y, Z: Sets the Sphere Environment Material's size. With the scale value the image projection can be stretched and squashed on any axis.

» **Raytracing Settings**

» Material ID: Sets the id of the material.
» Illumination:
  - Upper Hemisphere: Emits light only from the top half of the sphere.
  - Full Sphere: Emits light from the whole sphere.

7.1.17 Tire

The Tire material allows you to quickly texture tires and give them a rubber shading.

» **Tire Material Settings**

» Diffuse Color: Sets the shaders diffuse reflection color. This is the color the shader takes on, when the light reflection of the surface is spread to many directions.

» Glossy Color: Sets the shader's colour for glossy reflections. Glossy reflection behavior is described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray) form the same angle with respect to the surface normal, thus the angle of incidence equals the angle of reflection.

» Roughness: The roughness parameter defines the microscopic roughness of a surface. The higher the roughness value, the more diffuse the glossy reflections will be rendered.

» Reflectivity: Sets the material's reflectivity intensity.

» Diffuse Texture

» Use Marking: Loads an image texture to be applied to the tire's sides for the diffuse color channel. The image will be used as a pattern on the surface's sides.

» Use Profile: Loads an image texture to be applied as the tire's profile for the diffuse color channel. The image will be used as a pattern on the surface's middle.

» Input Gamma: Sets the texture image gamma correction.

» Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» Glossy Texture

» Use Marking: Loads an image texture to be applied to the tire's sides for the glossy channel. The image will be used as a glossy pattern on the surface's sides.

» Use Profile: Loads an image texture which will be applied as the tire's profile for the glossy channel. The image will be used as a pattern on the surface´s middle.

» Input Gamma: Sets the texture image gamma correction.

» Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» Bump Texture

» Use Marking: Loads an image texture to be applied to the tire's sides for the bump structure. The image will be used as a bump pattern on the surface's sides.

- » Use Profile: Loads an image texture which will be applied as the tire's profile for the bump structure. The image will be used as a pattern on the surface´s middle.
- » Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- » Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.

» **Texture Settings** Sets the texture projection position of the used textures.

- » Rotation Axis: Select the rotation axis.
- » Center: Sets the brush projection center. To center the projection pivot automatically, select an object and press "Get From Object". The selected object's center will now be used as projection pivot.
- » Repeat Profile U/V: Sets the U and v repetition of the profile texture.
- » Scale Markings: Sets the texture's scale value for the marking texture.
- » Blend Position: Sets the marking and profile texture blendposition.
- » Anisotropy: Sets the texture filter quality for the image texture. Value 1 is lowest quality. Value 16 is highest quality.

For further information on the Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.18 Triplanar

The TrueLight Triplanar material simulates diffuse plastic or leather surfaces while offering a special triplanar texturing mode for objects that do not have an appropriate UV mapping. With the bump and texture channel many diffuse surface structures can be simulated.

» **Triplanar Material**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader adopts when the light reflection of the surface is spread to many directions.

» Glossy Color: Sets the shader's colour for glossy reflections. Glossy reflections result from irregularities of a surface at a microscopic level. Reflection behavior is described by the law of reflection which states that the direction of incoming light (incident ray) and the direction of outgoing light reflected (reflected ray) form the same angle with respect to the surface normal, thus the angle of

incidence equals the angle of reflection. Since a surface is usually not perfectly smooth, the orientation of the normals varies, thus creating a glossy reflection.

» Roughness: The roughness parameter defines the microscopic roughness of a surface. The higher the roughness value, the more diffuse the glossy reflections will be rendered.

» Reflectivity: Sets the clearcoat reflection intensity.

» **Triplanar Settings** Triplanar settings define how a texture will be placed on the surface and how the planar projection will be blended at the edges.

» Edge blend: Sets the range for overlapping areas of the planar projection.

» Texture Size X, Y: Defines the textures size on the X-/Y-axis.

» Uniform Repeat: Synchronizes the repetition value for all projection axes.

» X Repeat U, X/V, Y/U, Y/V, Z/U, Z/V: Set the repetition value of the U and V-axis for each projection direction.

» X Offset U, X/V, Y/U, Y/V, Z/U, Z/V: Set the offset value of the U and V-axis for each projection direction.

» X/Y/Z Rotate: Sets the projection orientation.

» **Diffuse Texture**

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.

- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Glossy Texture**

» Use Texture: Loads an image texture for the glossy color channel. Uses the image as pattern on the surfaces.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Roughness Texture** The Roughness texture allows you to control the material's roughness. If the roughness texture is enabled the default roughness slider loses his functionality. Instead, you can define a minimum and maximum roughness. The minimum roughness defines the roughness value that is mapped to the value 0 of the texture image. The maximum roughness defines the roughness value that is mapped to the value 1 of the texture image. For Isotropic materials the red color channel will be interpreted. This allows the usage of a grayscale image. For anisotropic materials the red color channel will be used for the roughness in U and the green color channel for the roughness in V.

» Use Texture: Loads an image texture for the bump color channel. Uses the image as pattern on the surfaces.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Minimum Roughtness: Defines the roughness value that is mapped to the value 0.
- Maximum Roughness: Defines the roughness value that is mapped to the value 1.

» **Bump Texture**

» Use Texture: Loads an image texture for the bump color channel. Uses the image as pattern on the surfaces.

- Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.

For further information on the Subsurface Scattering, Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Trulight Material Settings" section at the beginning of the chapter.

7.1.19 Unicolor Paint

The Unicolor Paint offers a shading model suited for unicolor painted surfaces.

» **Unicolor Carpaint Material**

  » Base Color: Sets the diffuse reflection color of the Unicolor Paint. The shader adopts this color, when the surface is globally lit.

» **Clearcoat Settings** Sets the clearcoat color. The clearcoat is a transparent, strongly reflective paint layer on the base paint layer.

  » Clearcoat color: Sets the clearcoat color.

  » Reflectivity: Sets the clearcoat reflective intensity.

  » Use Orange peel: Activates a noisy bump structure in the shader.

    • Orange Peel Frequency: Sets the bump structure's noise frequency.

    • Orange Peel Intensity: Sets the bump structure's intensity.

7 MATERIALS REFERENCE

For further information on the Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.20 Velvet

The Velvet material imitates the behavior of a velvet or satin-like material.

» **Velvet Material Settings**

» Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader adopts when the light reflection of the surface is spread to many directions.

» Glossy Color: Sets the shader's color for glossy reflections. Its appearance is controlled by the falloff parameter.

» Darkening: Controls the appearance of the diffuse component. A darkening value of 1.0 corresponds to a perfectly diffuse surface. Higher values than 1.0 darken the material, lower values brighten it up.

» Falloff: Controls the glossy component, which is depending on the viewing angle and affecting the edges of the objects.

» **Diffuse Texture**

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Use Alpha: Uses the alpha channel of the image texture if it has an alpha channel embedded.
- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions. Repeat
  - Mirrored Repeat] Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Glossy Texture**

» Use Texture: Loads an image texture for the glossy color channel. Uses the image as pattern on the surfaces.

» Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.

» Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.

» Repeat UV: Sets the number of repetitions for the Uvs.

» Offset UV: Sets the offset for the UVs.

» Rotate: Rotates the UVs.

» Anisotropy: Sets the texture filter quality for the image texture. 1 is the lowest quality. 16 is the highest quality.

» Input Gamma: Sets the texture image gamma correction.

» Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» Bump Texture

» Use Structure: Activates a procedural bump structure.

» Use Texture: Loads an image texture for bump mapping.
  - Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
    · Repeat: Repeats the texture in all directions. Repeat
    · Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.

  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
- Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.
- Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
- Structure Size: Sets the structure size when the procedural bump structure is activated.
- Bump Type: Sets the bump type. The bump mapping can be drawn as bump map or as pixel displacement map wihout selfshadowing.

For further information on the Subsurface Scattering, Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.

7.1.21 Woven Cloth

The Woven Cloth material imitates the behavior of a woven material and its weaving patterns by a procedural bidirectional texture function (BTF).

» **Woven Cloth Settings**

- » Diffuse Color: Sets the shader's diffuse reflection color. This is the color the shader adopts when the light reflection of the surface is spread to many directions.
- » Darkening: Controls the appearance of the diffuse component. A darkening value of 1.0 corresponds to a perfectly diffuse surface. Higher values than 1.0 darken the material, lower values brighten it up.
- » Warp Yarn Color: Sets the color of the vertical (warp) yarn. It is best practice to use similar colors for warp and weft yarn.
- » Weft Yarn Color: Sets the color of the horizontal (weft) yarn. It is best practice to use similar colors for warp and weft yarn.

- » Cloth Presets: Choose from a variety of handpicked material presets. These presets are also available in the VRED Basic Material Library.
- » Weaving Pattern: The weaving pattern defines how the yarn was woven to cloth.
- » Yarn Type: Defines the glossiness of the yarn.
  - Staple Yarn: Staple Yarn simulates yarn that is made up of many tiny threads. Use this type for rough types of clothes such as denim.
  - Filament Yarn: Filament Yarn simulates yarn that is made up of one single untwisted, virtual yarn. Use this type for shiny types of clothes such as silk.
- » Yarn Twist Angle: The yarn twist angle determines the glossiness of the yarn and is dependant on the choice made in the yarn type.
- » Highlight Width: Defines the 'width' of the glossy highlight on the yarn segments.
- » Exposure: Defines the brightness of the glossy component.
- » Noise Intensity: Sets a natural noise effect for matt surfaces (staple yarn is recommended).
- » Moiré Removal: The higher the value, the more effective the moiré pattern is being softened. If too high, any structure will be softened and surface information might get lost.
- » Advanced Yarn Settings: Allows to define the curvature for weft and warp yarn.

» **Procedural Weaving Texture** The procedural BTF is highly dependent on how the weaving pattern is mapped onto the object's surface. The texture mapping controls size and direction of the yarn and therefore its reflection behaviour.

- » Texture Mode: Sets the texture projection mode.
  - UV Coordinates: Uses the UV information for the texture projection.
  - Triplanar: Activates the triplanar projection mode regardless of UV information.

» Pattern Repeat: When the texture mode is set to 'UV Coordinates', 'Pattern Repeat' defines the amount of repetitions of the texture along the UVs.

» Pattern Rotate: When the texture mode is set to 'UV Coordinates', 'Pattern Rotate' defines rotation angle of the texture along the UVs.

» Texture Size X/Y: When set to triplanar projection mode, this value allows to scale the weaving pattern in mm.

» Uniform Repeat: Fills the same value into all 'X/Y/Z Repeat' fields.

» X/Y/Z Repeat UV: Allows to change the repetition rate for all projection axes.

» X/Y/Z Rotate: Allows to change the rotation angle for all projection axes.

» Diffuse Texture

» Use Texture: Loads an image texture for the diffuse color channel. Uses the image as pattern on the surfaces.

- Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:
  - Repeat: Repeats the texture in all directions.
  - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
  - Decal: The texture will not be repeated.
  - Clamp: Repeats only the last pixel of the texture will be repeated.
- Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
- Repeat UV: Sets the number of repetitions for the Uvs.
- Offset UV: Sets the offset for the UVs.
- Rotate: Rotates the UVs.
- Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.

- Input Gamma: Sets the texture image gamma correction.
- Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Yarn Texture** Loads an image texture for the yarn. Uses the image as pattern on the surfaces.

» Repeat Mode UV: Sets the repeat mode of the texture. There are four modes, which can be set:

- Repeat: Repeats the texture in all directions. Repeat
- Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
- Decal: The texture will not be repeated.
- Clamp: Repeats only the last pixel of the texture will be repeated.

» Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.

» Repeat UV: Sets the number of repetitions for the Uvs.

» Offset UV: Sets the offset for the UVs.

» Rotate: Rotates the UVs.

» Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.

» Input Gamma: Sets the texture image gamma correction.

» Use ICC Profile: If turned on, the texture's colors will be interpreted based on an embedded color profile if present. If a color profile is missing, it is assumed that the colors are stored in sRGB.

» **Bump Texture**

» Use Structure: Activates a procedural bump structure.

» Use Texture: Uses an image texture for bump mapping.
  - Repeat Mode: Sets the repeat mode of the texture. There are four modes, which can be set:
    - Repeat: Repeats the texture in all directions. Repeat
    - Mirrored Repeat: Repeats and mirrors the texture on the x- and y-axis with every repetition.
    - Decal: The texture will not be repeated.
    - Clamp: Repeats only the last pixel of the texture will be repeated.
  - Link Repeat Modes: Uses the same repeat mode for v-coordinates as for the u-coordinates.
  - Repeat UV: Sets the number of repetitions for the Uvs.
  - Offset UV: Sets the offset for the UVs.
  - Rotate: Rotates the UVs.
  - Anisotropy: Sets the texture filter quality for the image texture. 1 is lowest quality. 16 is highest quality.
  - Parallax Intensity: Sets the parallax shift interpretation of the bump image texture.
  - Bump Intensity: Sets the bump intensity interpretation of the bump image texture.
  - Structure Size: Sets the structure size when the procedural bump structure is activated.
  - Bump Type: Sets the bump type. The bump mapping can be drawn as bump map or as pixel displacement map wihout selfshadowing.

For further information on the Subsurface Scattering, Displacement, Raytracing, Incandescence, Common and Transparency settings please refer to the "General Truelight Material Settings" section at the beginning of the chapter.