

# ELITECAD

Course unit  
Real-time visualisation and VR

Version 15

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# Introduction

## How to use this course unit

This course unit is not a manual but a combination of theory and workshops with which to learn the program on a 1-to-1 basis. Every mouse-click and every entry is described in detail, providing you with a teaching resource that lets you learn the basics of the program by yourself. Each chapter provides explanations, information, and a workshop to practice the functions. To enable the workshops to be completed smoothly, the explanations should be read through very carefully. The order of the chapters should not be changed because each workshop is based on the previous one. The program DVD contains examples stored as an ELITECAD file, enabling problematic places to be reviewed on the finished project.

## Conventions used in this course unit

The start and end of a workshop are marked as follows:



### TIP

Tips refer to the application of ELITECAD.

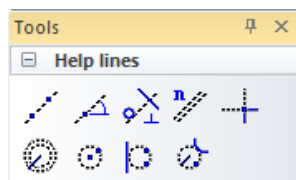
### NOTE

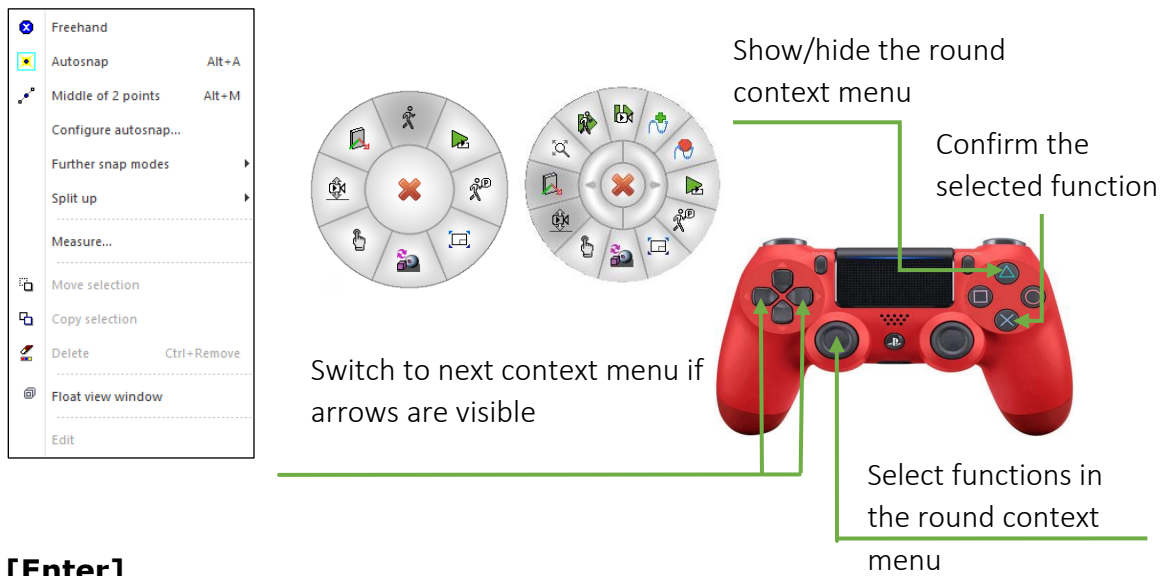
Notes concern system relevant points (installation etc.).

Functions are written in block capitals. The corresponding icon also appears for new functions.

FUNCTIONS (BLOCK CAPITALS) 

Functions can be accessed directly using icons (buttons). The functions are grouped together in tool bars or under tool management. All functions can be selected with the mouse and the round context menu can be selected with the gamepad as well.





**[Enter]**

Function keys on the keyboard appear within square brackets.

**Input values (bold)**

Input values must be entered using the keyboard. When the text is entered in the input line, it must be confirmed with the [Enter] key.

# Introduction

ELITECAD Architecture 14 includes real-time visualisation of your BIM models using impressive effects like reflections, bump maps, animated grass and water, Skymaps etc. With the new walkthrough mode, you can explore your future building together with your customers in a realistic visualisation using well-known input devices like PlayStation® controllers. Using VR glasses, you can immerse yourself in virtual reality and experience your model first hand. There are hardly any ways to present your models more impressively.



All those functions can be used without the need of additional software, the model is always available and adaptable. Furthermore, all plans and sections are always up-to-date so you are in control the entire time. Changes of materials or library parts can be done very intuitively in real time, eliminating the need for long renderings. You can generate images of up to 16K within seconds. 360° panoramic images are possible as well.

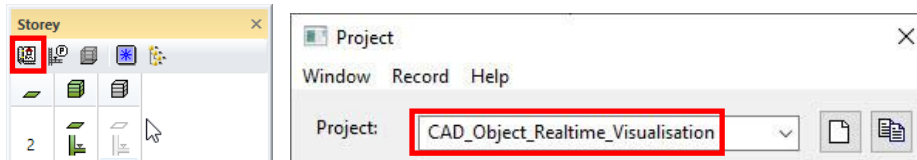
Your virtual walkthroughs are save das intelligent camera paths and can be exported as videos or 360° videos with graphical effects.



# Preparations

## Project settings

In ELITECAD Mechanical and ELITECAD Styler go to the next item *Load drawing*.  
In ELITECAD Architecture, open the project settings ...



... and choose the project *CAD\_Object\_Realttime\_Visualisation*.

## Load drawing

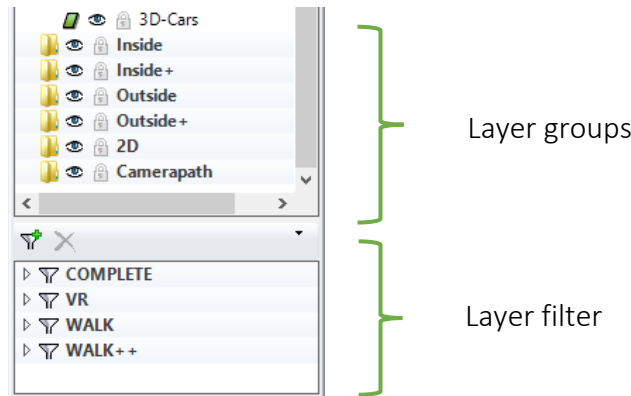
Load the drawing *CAD\_Object\_Realttime\_Visualisation.d* by using FILE > OPEN.

The loaded drawing should look like this.



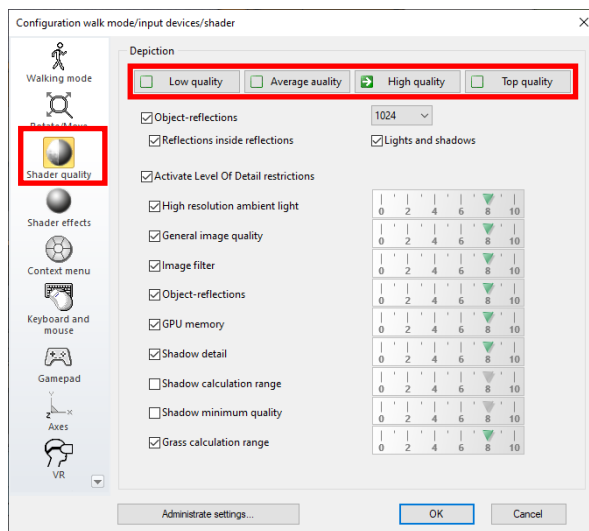
## Performance settings using layer/layer filters

The model includes various layers and layer filters which allow you to adapt the level of detail of the model to the performance of your system. If you have a high-end graphics-card, you may activate the highest level of detail by activating the filter *COMPLETE* or showing all layers. Depending on the performance of your graphics card you can reduce the details to four different levels, the lowest being "VR". This allows for a more realistic VR experience. Another possibility to influence the performance is switching entire layer groups on or off. These layer groups are already predefined for the example model.



## Performance settings using level of detail


Despite high performance on graphics cards, complex shader effects can be resource intensive and are time consuming during scene refresh. Depending on your graphics card, you can influence the performance by reducing the level of detail. One example for this kind of setting would be the distance from the camera until which the grass shader should generate 3D grass.



Four predefined quality standards allow for easily changing the settings with one click. When you create images and videos from your models, you can deactivate these LOD settings.

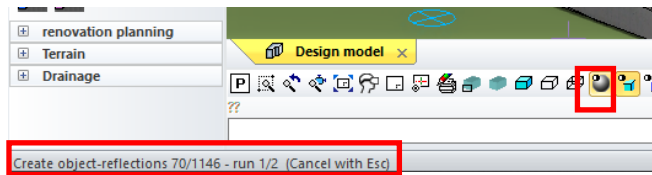
## Shader-material properties

### Shader mode

 The shader mode is an additional option for the solid mode. Analog to the 3D edges, the shader mode can optionally be activated with the solid mode. Furthermore, the shader mode is activated when the walking mode is switched on. The shader mode can be activated for every view and allows a more realistic depiction by using materials with special material properties (in ELITECAD marked as S-).



The shader properties (reflections, mirrors etc.) have to be pre-calculated before the first usage. This Process can be manually started by the function SHADER ON/OFF. The required iterations are displayed in the status bar by the number of required calculations.



The calculation of shader properties may take some time. Therefore, it is possible to interrupt the calculation anytime by [ESC] and to continue working with the current partial result.

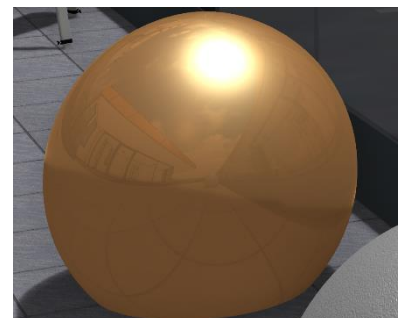
Using the shader mode is highly recommended, because it allows for a more detailed and vivid depiction of the model, but it is not required for interactive walkthroughs through a model. This means the existing sample model can be explored out of the box.

### Material editor with shaders

The material editor now features more settings, the so-called shader effects. These shaders generate animated materials on 3D surfaces at runtime. So surfaces with complex structures and depth effects can be created on plain surfaces, which only need little memory. This process is done on the graphics card so the performance is improved dramatically.

### Reflections

Object reflections and inter-reflections are calculated for reflecting surfaces. Even moving and transparent surfaces feature reflections. The sample model contains several spheres at the top floor, which show these effects in detail.



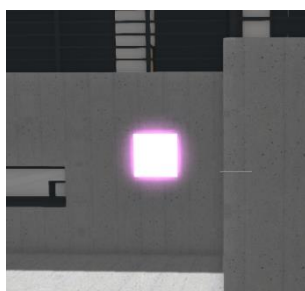
### Shininess

Light sources can be used to generate impressive effects on shiny materials. This effect even applies to moving surfaces like water. It is possible to configure the quality of the material, so if the material is rough, varnished, oiled or translucent.

### Transparency, Absorption, Refraction

These are some further effects that can also be configured for real-time visualisation.

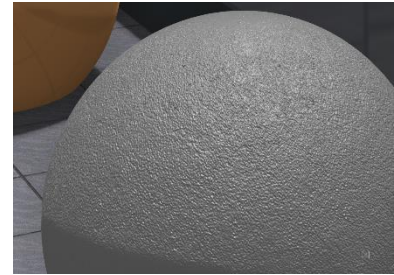
### Light sources



Light sources are not considered 3D objects in the visualisation. Objects that represent light sources, for instance lamps, can be equipped with a light emitting material to enable a more realistic depiction. In the example model there is a light source at the staircase.

## Bumpmaps

Bump maps are textures that represent depth information. The height information contained in a bump map is applied to materials. This allows to realistically depicting joints, tiles and bricks or rough surfaces on geometrically plain surfaces. The example model features one sphere with a gravel surface on the top floor.



## Animated water

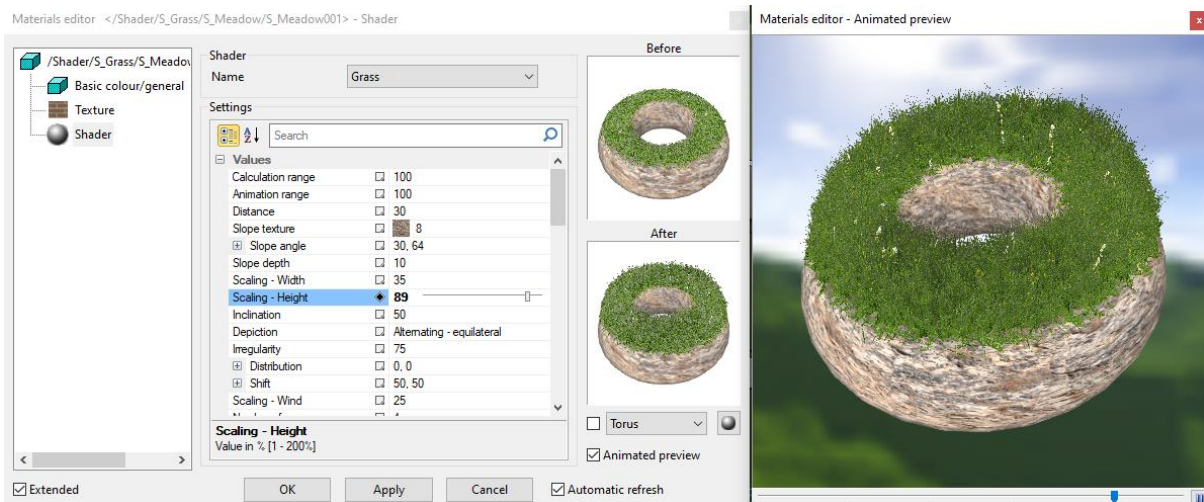
Water is another special shader material. In order to depict water, multiple waves are overlapped, which can all be configured in wavelength and amplitude. The sum of all the waves is a complex moving surface, which resembles real moving water. The movements can be either calm or rapid. The library contains predefined water materials, so it is not necessary to configure them by hand.



## Animated grass

Modelling grass in 3D would be an impossible task. Using the new grass shaders, enhancing your models with realistic looking grass is as easy as it gets. By mixing different types of grass and flowers, you can achieve a natural distribution in your environment. Every type of grass can be individually configured in height, growing direction, tilt relative to the surface and so on. The adaptations can be made using simple sliders, and effects can be seen in real time in your model. Of course, ELITECAD products come with predefined grass types, so it is not necessary to configure it yourself.

On top of all the grass settings, you can even configure wind, which is applied to the culms depending on how strong the wind is.



### Automatic calculation of reflections



Adding new objects to a scene immediately has an effect on the depiction of reflections. In order to improve the performance, the real-time object reflections are pre-calculated when the walking mode is enabled. When new objects are added to the scene, the reflections have to be recalculated. If this should be done automatically or manually can be configured by the user.

### Realistic interior



Ambient shadows (SSAO shader) enhance the shadows of corners and edges inside the building. This leads to a more contrasting depth perception for example of joining walls having the same colour.

### Soft shadows

While the sun in nature generates a precise shadow, soft shadows (shadow occlusion) can often be observed with extended light sources. This effect is displayed in real-time as well.



## Skymaps – 360° background



A skybox, also called skymap, is a background image, which automatically adjusts according to the viewing direction. In contrast to the previously used static background images, which only works for one camera position, a skymap can be used for 360° views. Landscape images and views of the sky work particularly well. One can even take their own 360° picture via app or 360° camera of the future building site and load it into ELITECAD.

The panorama can be positioned horizontally in order to align the orientation of the model with the panorama image.

### TIP

Information on how to create and edit materials can be found in ELITECAD user manual section MATERIAL MANAGER or MATERIAL EDITOR. Furthermore, we recommend completing course unit 6 – Visualisation for learning how to work with materials.

## Walking mode

The walking mode allows navigating through a model by moving the camera in a first person angle. Changing the position can be achieved in several different ways by using various input devices. Depiction in walking mode is in perspective projection.

### Mouse and keyboard

You can use standard input devices like mouse and keyboard for navigating within the walking mode. Key mapping and mouse buttons can be freely configured. The directions can be inverted and the sensibility can be adapted to your personal preferences as well.



### Gamepads

Gamepads are the preferred choice for navigating through a model in the walking mode. ELITECAD already has predefined configurations for common devices so the PlayStation 4® or Xbox® controllers work out of the box. Other devices work as well, but have to be configured manually. Depending on the devices, all buttons and switches on the gamepad can be configured freely. This means you can map your favourite ELITECAD functions to buttons on your gamepad. The sensitivity of the buttons can be configured to your preferences.



### VR glasses and peripherals



ELITECAD comes with a native integration of STEAMVR. This platform contains OpenVR, which is a vendor independent runtime library that supports various VR glasses like the Oculus Rift, HTC Vive and the Windows Mixed Reality. In order to use OpenVR you need to create an account with Steam. After you have installed SteamVR, you need to install the runtime library separately.

### Status display

When the walking-mode is enabled, there is an optional transparent status bar at the lower part of the display. It features various indicators about which state you are currently in and which options are active.





## Sensitivity



The camera features freely configurable eye height as well as opening angles. The sensitivity of linear movements and rotations can be configured as well.

## Start settings

Upon activation of the walking mode, various presets enable an easy and comfortable start. You have the ability to switch on shading, insert 360° panorama views, switch to full screen mode or activate the 3D-glasses.



## Speed



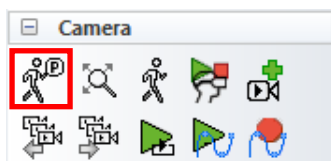
Additional functions, which can be mapped to the gamepad allow for a change of movement. For instance, one can run faster or move more slowly.

▼ ▼ ▼ ▼ WORKSHOP START

## Walking with mouse and keyboard

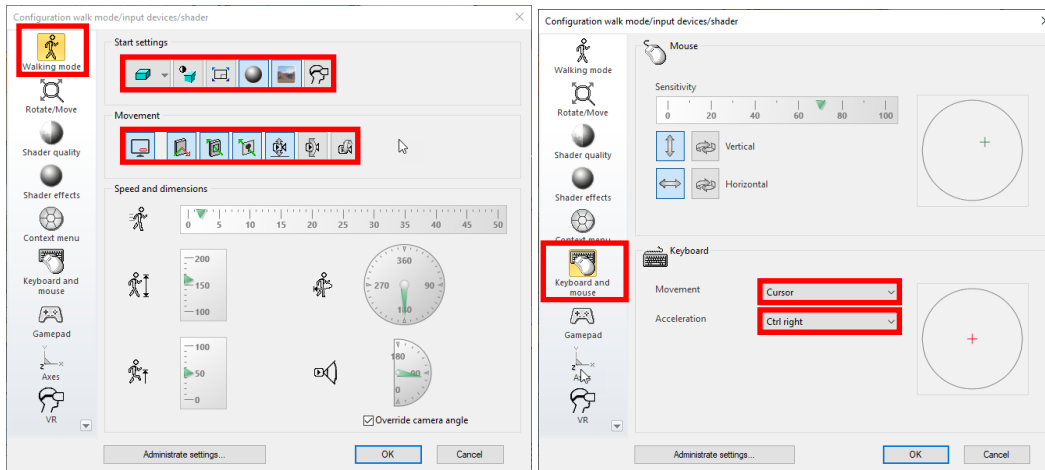
In this workshop, we will learn how to walk using the mouse and keyboard. The advantage of these devices is that every user is familiar with them and there is no need to buy new devices. The disadvantage is that many useful functions cannot be used with mouse and keyboard.

In order to get started we have to configure some settings by opening the `CONFIGURATION WALK MODE` dialog from the toolbar `CAMERA`.

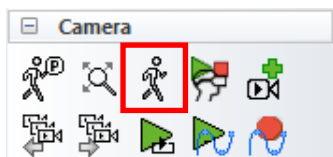


Please verify that your configuration looks like the one shown in the screenshot. In case you have different settings, please adapt them to match the standard settings.

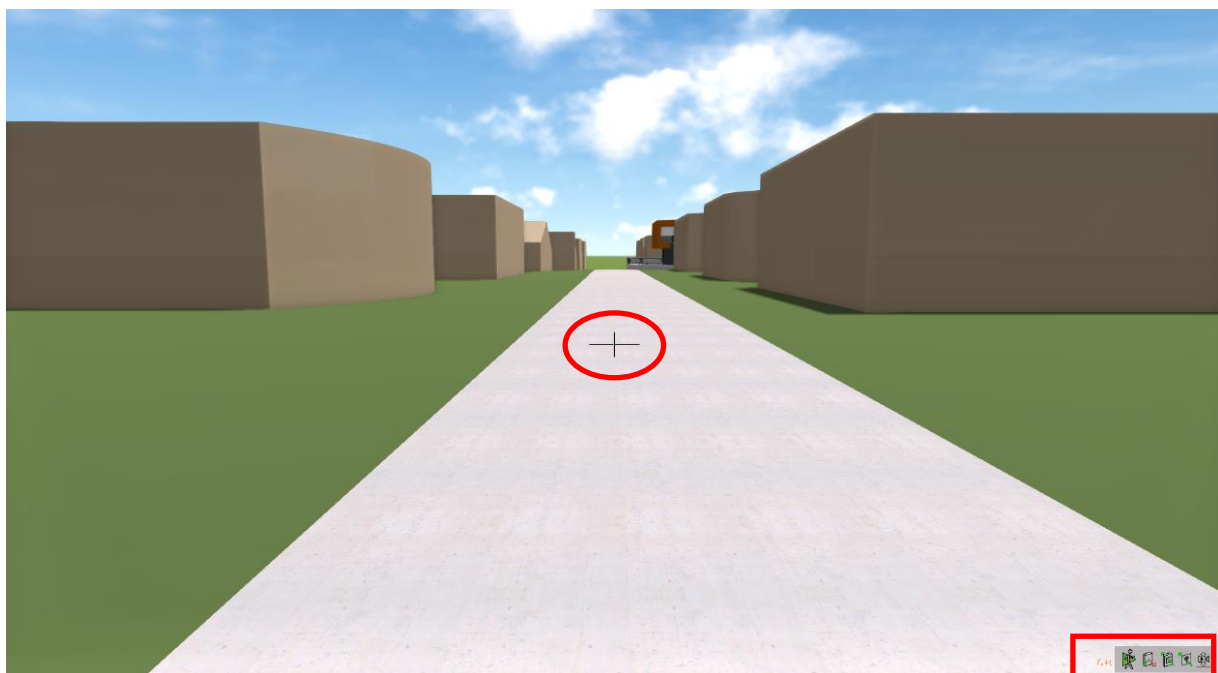




Confirm the dialog with OK and start the WALKING MODE from the toolbox.

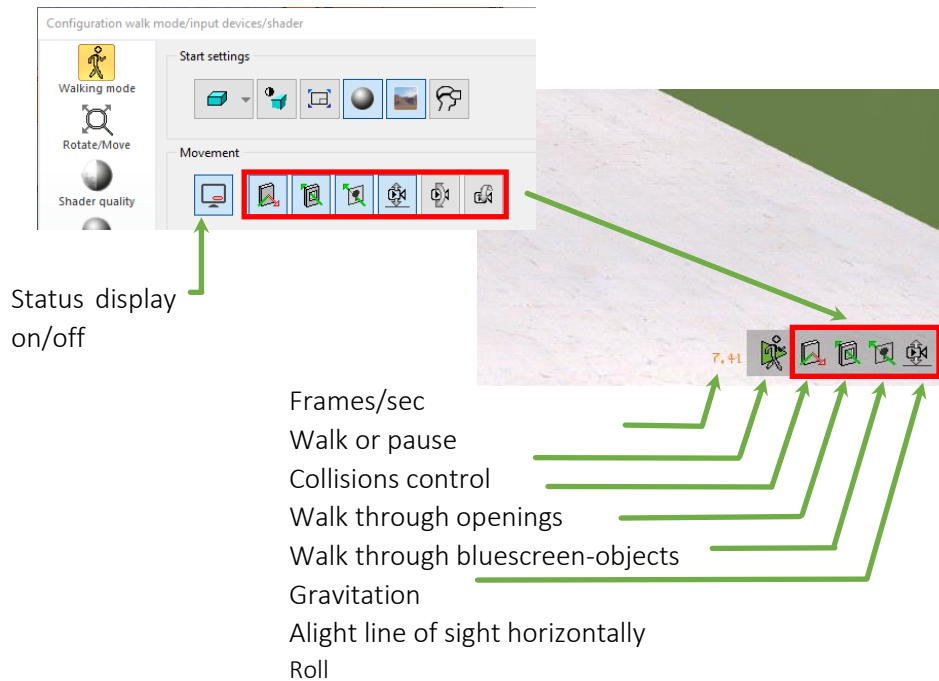


Your camera is placed into the scene and first you might fall to the bottom until the next active storey because of the gravity. Now use the keys W-A-S-D and SHIFT LEFT to navigate to the beginning of the street and look towards the street.



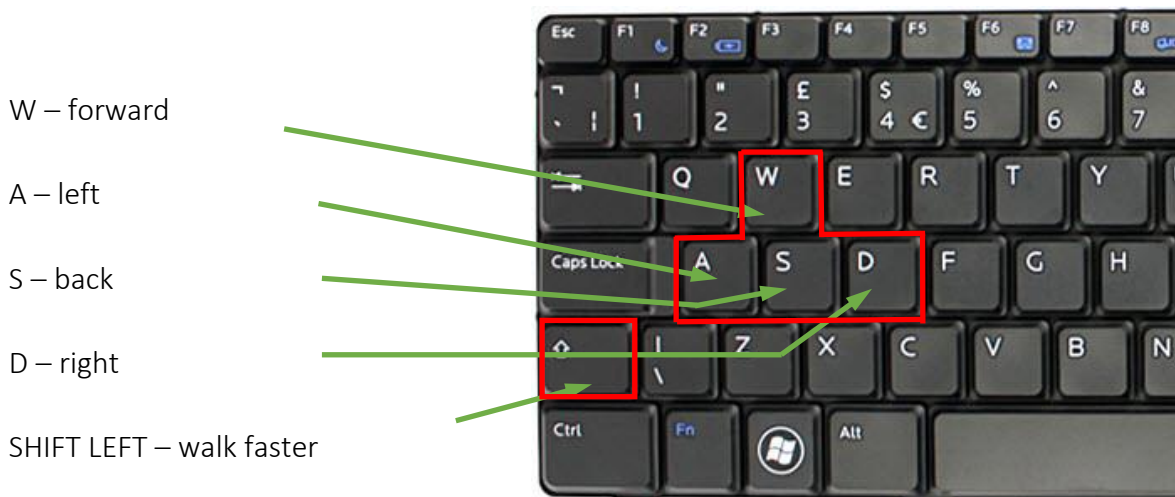
When you are in full screen mode, you have two orientation points that give you some information about the currently active settings and the location. On the one hand, there is a hair cross in the centre of the screen, which shows you the viewing and walking direction. On the other hand, there is a status view of the current settings in the bottom right corner of the screen.

This status bar shows the following information if they are active:



Now walk alongside the street past the house. At the end, turn around and walk back to the staircase. Walk up the stairs and around the house. Afterwards walk up the stairs to the first floor and enter the house via the balcony. You will realise that it is possible to pass through doors and windows (depending on the settings). That way you can reach all the rooms.

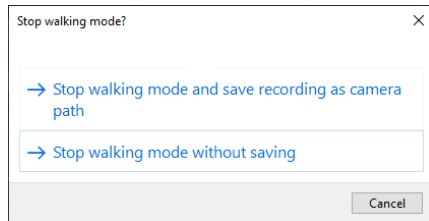
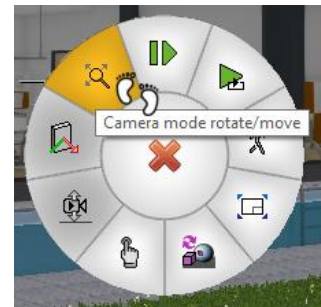
Use the following keys to navigate:



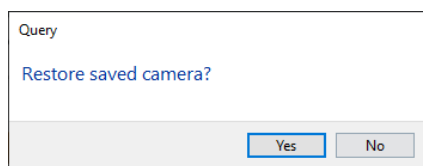
The walking direction, which corresponds to the viewing direction, is controlled via the mouse. Walk in and around the house until you are familiar with the controls.

In order to leave the walking mode, open the menu by performing a right click on the screen. Select CAMERA MODE ROTATE/MOVE.

This will open the following query, where we select the corresponding option.



Afterwards you can choose which position should be loaded when you return to the model.



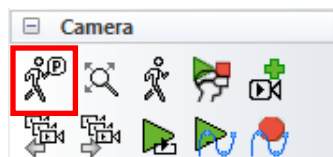
After the confirmation, we are back in CAD mode. The stored camera position is the last active camera in the CAD mode before entering the walking mode. If this query is answered with NO, then the current position stays active.



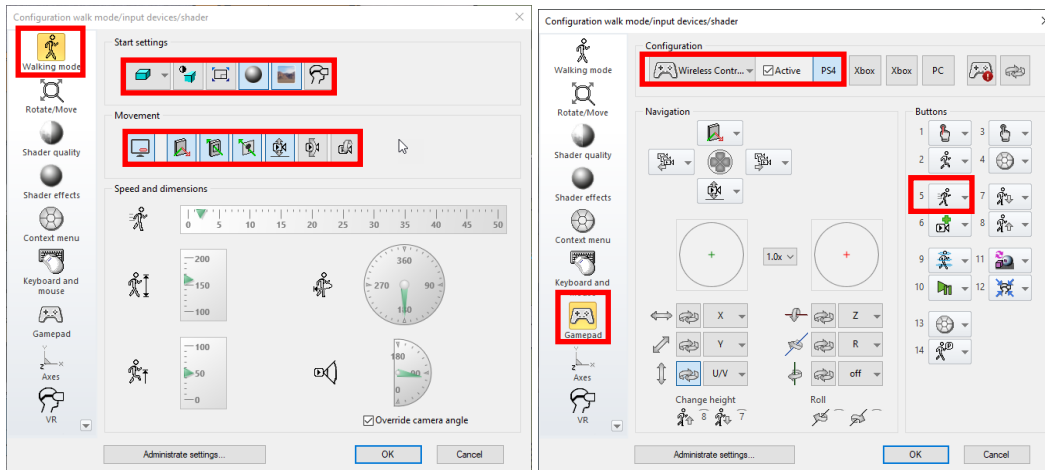
## Walking with gamepads

In this workshop, we will practice walking with gamepads. This input device is more efficient and intuitive and provides many additional functions, which cannot be accessed via mouse and keyboard.

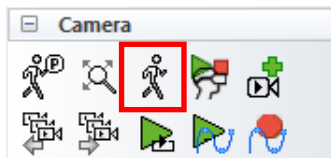
First, we have to check some configurations and maybe make adaptations. Open the CONFIGURATION WALK MODE dialog from the toolbar CAMERA.



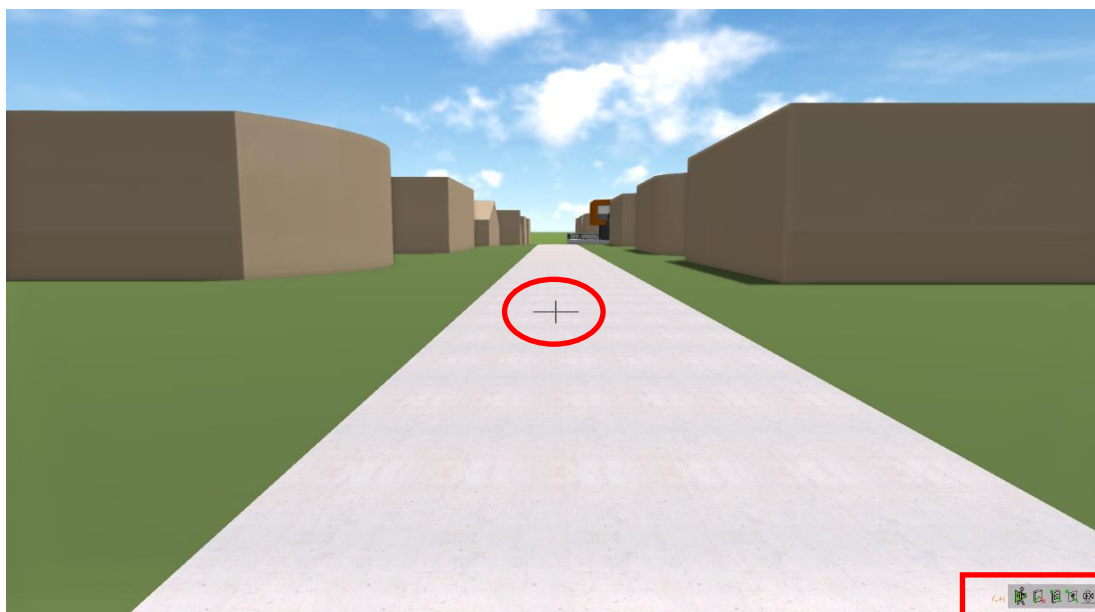
First, we need to connect the controller to the PC. This can be done by pressing and holding the PlayStation button for several seconds. Once connected, please verify whether your settings correspond to the settings shown in the screenshots below. In case they do not match, please adjust them accordingly.



Confirm the parameter dialog with OK switch to WALKING MODE using the toolbar



Your camera is placed into the scene and first you might fall to the bottom until the next active storey because of the gravity. Now use the joysticks and the button L1 to navigate to the beginning of the street and look towards the street.



Now walk alongside the street past the house. At the end, turn around and walk back to the staircase. Walk up the stairs and around the house. Afterwards walk up the stairs to the first floor and enter the house via the balcony. You will realise that it is possible to pass through doors and windows (depending on the settings). That way you can reach all the rooms.

We can use the following buttons to move around:

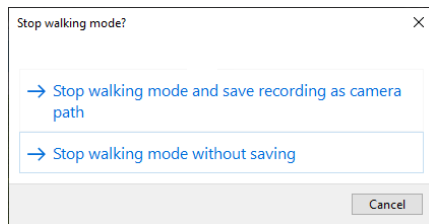
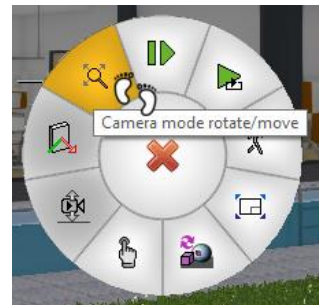


It is important to note that, in contrast to the keyboard, the amount of movement of the joystick controls the speed of the movements. This means, if the joystick is moved to the maximum, the speed will be much higher, than if it is moved just a little bit. Furthermore, it is possible to move both joysticks at the same time, which for instance allows moving forwards and at the same time changing the viewing direction.

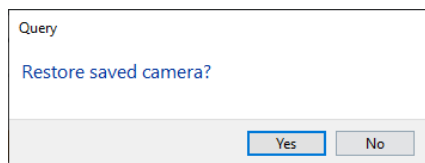
Now move around the model until you are familiarised with the navigation.

In order to leave the walking mode, open the menu by performing a right click on the screen. Select *CAMERA MODE ROTATE/MOVE*.

This will open the following query, where we select the corresponding option.



Afterwards you can choose which position should be loaded when you return to the model.



After the confirmation, we are back in CAD mode. The stored camera position is the last active camera in the CAD mode before entering the walking mode. If this query is answered with NO, then the current position stays active.

WORKSHOP END ▲▲▲▲

**TIP**

In order to switch to camera mode `MOVE/ROTATE` you can also open the menu with the gamepad. After the first query, you need to use the mouse to confirm.

**NOTE**

Sincere there are countless devices that can be used with ELITECAD, it is not possible to cover the installation of every single device in this course. Please make sure your device is properly installed and works correctly on your system. In case of questions, please contact your IT support.

In the scope of this course, we will work only with PlayStation 4 controllers because it is the most efficient input device for this purpose.



## Extended navigation functionality

In this workshop, we will learn additional functionality for the walking mode like flying and jumping. Up until now we move around in the virtual world similar to what we are used from the real world. However, in virtual worlds we more possibilities. We can activate and deactivate the gravity and collision control, which allows us to fly or walk through walls in our building. We can aim at points and use the teleport function to transport ourselves to a certain point in the model. All those functions are already pre-configured on our gamepad and can be activated by pressing certain buttons.

The standard configuration looks as follows:



### ▼ ▼ ▼ ▼ WORKSHOP START

## Flying and gravity



Gravity pulls the camera towards the floor. If the collision control is active, the free fall ends at the next surface. If there are no surfaces, the fall will be stopped at the active storey. Deactivating the gravity allows us to fly through the model using input devices.



Now let us walk to the balcony on the first floor of our building and walk towards the railing. Deactivate the gravity and now move up and back a little bit.



Now we can view our model from a perspective that in real life would only be possible in a helicopter. Fly around the house and familiarise yourself with the controller

## Collision detection – walking through walls

Just like in the real world, virtual objects also present an obstacle in the WALKING MODE that cannot be penetrated. Optionally, the collision control can be deactivated, so it is possible to walk through walls and objects in buildings. The collision control is permanently disabled for two types of objects. On the one hand, windows, doors and glass elements are ignored in collision control so it is possible to walk into rooms. On the other hand, bluescreen objects like plants can be neglected in the collision control as well.



Next, let us deactivate the collision control and fly through our model to the basement. When we are located in the basement we activate gravity and collision control again which puts us on the ground and we can continue our walkthrough from there.

Take some minutes to practice flying around in the model so you familiarise yourself with the functionality.

WORKSHOP END ▲▲▲▲

▼▼▼▼ WORKSHOP START

## Jumping



First, position yourself onto the balcony in the first floor next to the railing and make sure the gravity is enabled. If you walk towards the railing, at some point you will collide with it (because it is taller than 50cm) so you cannot go further. It is possible to jump across the

railing by using the jump button and simultaneously moving forward. That way we will land on the terrace one storey below. The same exercise can be done with the fence, which is also higher than 50cm.

### TIP

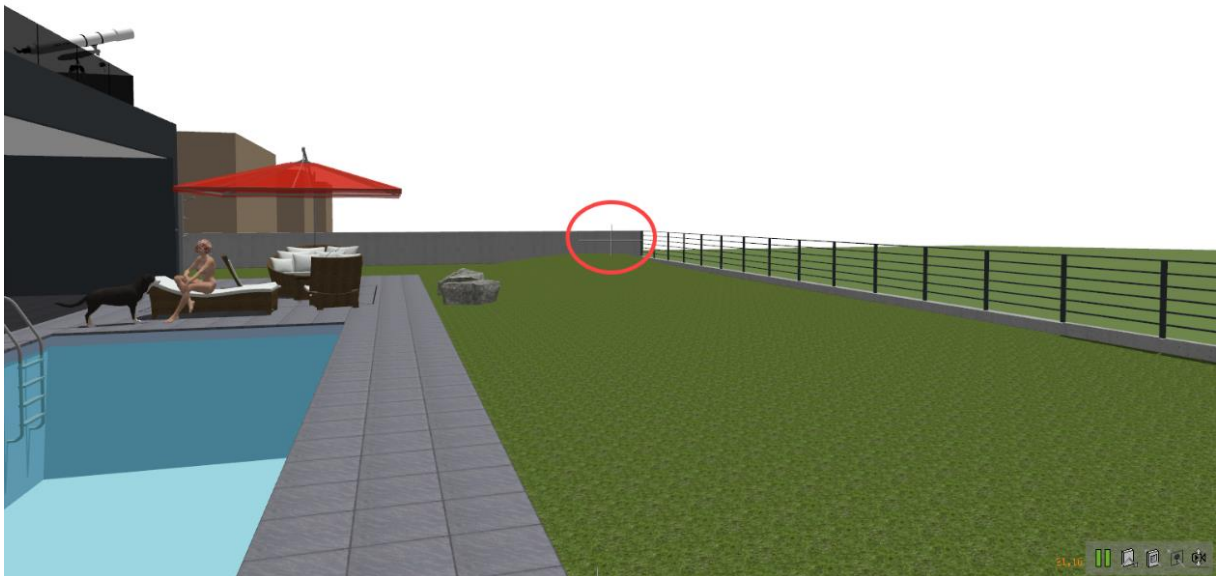
In case the jumping height is not sufficient, you can jump higher by pressing the jump button multiple times.

## Teleporting



Another possibility to move around in the model is using teleportation. This means you can point at a certain location with the hair cross, and then, by using the teleportation button, you can transport yourself to that place with one click. If you do not aim at a certain object, you will be transported into the pointing direction by 15 meters.

Let us stand next to the pool and aim at a point on the concrete wall in the corner of the backyard and press teleport.



With one big leap, we are teleported to the position, so this allows us to cover greater distances in shorter time. Pick some other places where you want to teleport yourself and practice this functionality.

WORKSHOP END ▲▲▲▲

## ▼ ▼ ▼ ▼ WORKSHOP START

## Save camera



Using the gamepad, you can also save certain camera positions (snapshots). These are then added to the camera list. The functions `NEXT CAMERA` and `PREVIOUS CAMERA` can be used to change the current camera position to the next or previous in the camera list. Changing the camera is animated (optional).

Walk or fly to a certain point and create a snapshot. Take several more snapshots from different angles and positions and then activate them by using the camera functions. The example model comes with several snapshots, which you can explore. This feature allows you save positions from which you can start your virtual walkthroughs.

## WORKSHOP END ▲ ▲ ▲ ▲

### TIP

The function camera from the toolbar camera opens the dialog for the camera positions, where you can define and edit the names for each camera. In this dialog, you can also select your desired camera position. If you choose the names for your positions well it will be easier to find certain positions. You can also delete camera positions in this window. If you define camera paths later on, it will also be beneficial if the positions have unique names.

# Interaction

## General

In the walking mode, it is possible to interact with the model without switching to the classical ELITECAD user interface. When in walking mode, a small hair cross shows the focal point on the screen. Depending on the focused object, the interaction button enables the following actions:

- Change library part
- Change material (texture)
- Change Skymap
- Show object information
- Select object



## Interaction



The function `INTERACT` shows a menu which lets the user choose between library parts, materials or selecting the object or displaying information.



## Quick interaction

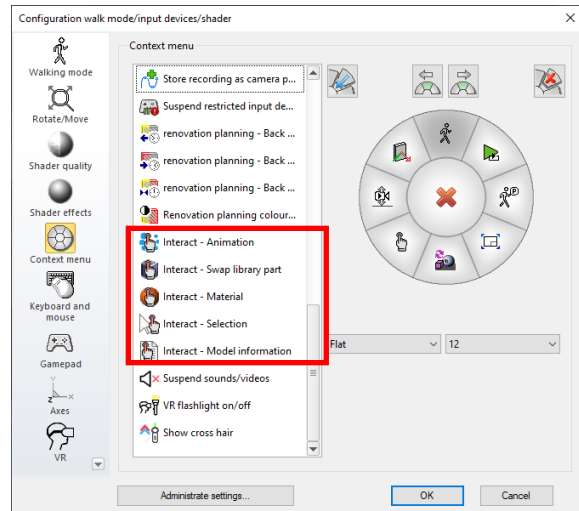


The function `QUICK INTERACTION` automatically performs the preferred option for the current scenario, for instance library part exchange when aimed at a library part. Shader materials like Skymaps, grass, fire, waves etc. are detected as well. This means that the system always suggests the most appropriate function to the user, which leads to a quicker result.



## Direct interaction

When `DIRECT INTERACTION` is used, the user can choose which kind of action shall be performed, e.g. animation, library part or material exchange, show info or select the object. This means only the desired actions are suggested to the user. The functions have to be configured in the context menu.



## ▼ ▼ ▼ ▼ WORKSHOP START

## Interact with library parts

### Exchange library parts



Let us use the hair cross to focus on a library part, for instance the piano inside the living room, and then press `INTERACT`. We select the button `CHANGE LIBRARY PART`. Now the graphical menu displays library parts and their corresponding preview images, which are located in the same folder as the selected one.

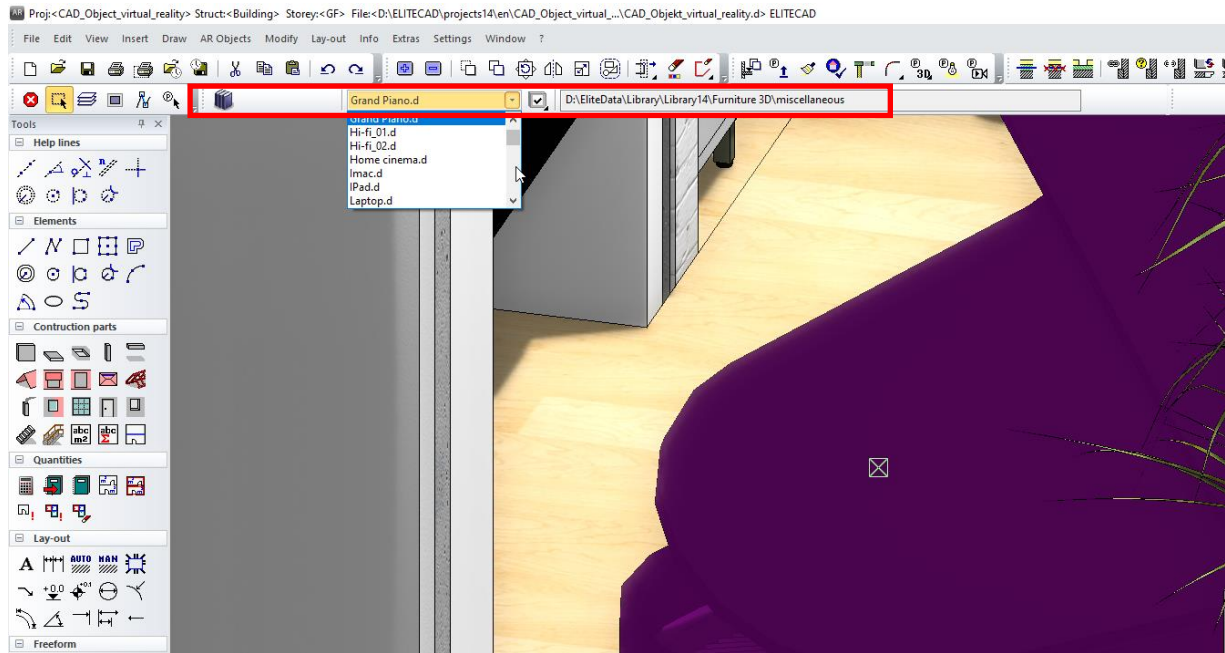
If we use the button `QUICK INTERACTION`, the menu with library parts will appear right away so we can choose library part to exchange. In order to see more library parts than the ones displayed we can use the arrow keys to switch between the pages. After we have found the desired library part we can use confirm to exchange it. That way the piano will be replaced by the chosen object.



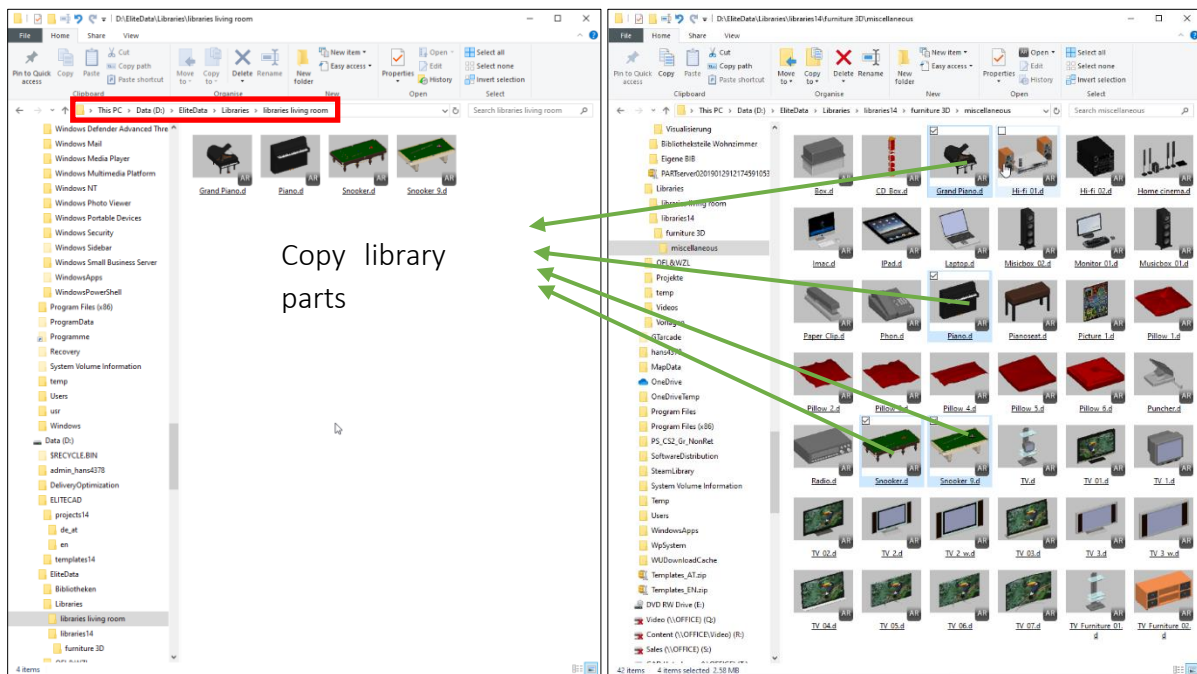
### Customise library parts

In order to appear in the menu, library parts have to be located in the same directory as the originally selected object. If we want to modify the selected object, we have to switch to the CAD user interface, which shows us information about the selected library part. Besides the library symbol and the name of the object, we also see the storage path. The name of library part is part of a dropdown menu, which shows all objects that are located in the same path. The content of this directory can be modified freely by the user, so the next time this function is executed the new content will be displayed.

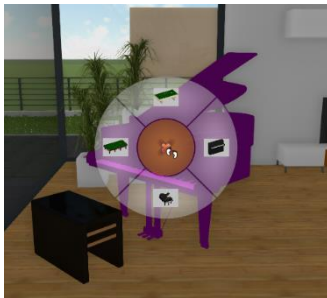
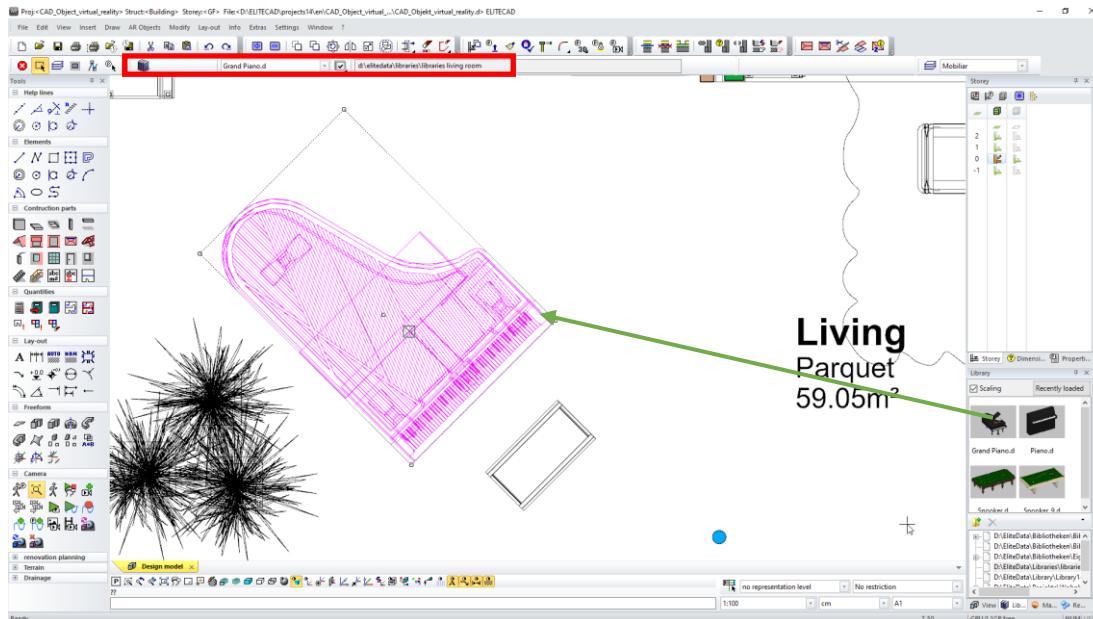




Since the library part is located in the default path, all library parts located in this path are displayed. Since we only want to provide some selected objects, but not change the default directory, we can just create a new folder and copy all the desired parts into this one. That way we have created a new directory that only provides the library parts that we want to provide for selection. Let us make a folder `\libraries\libraries living room` and fill it with the desired parts.



Now we only need to delete the existing library part in the model and exchange it with the one from the new directory.



Let us switch back to WALKING MODE and change the piano by selecting it with the hair cross and pressing QUICK INTERACTION. The selection now only shows the library parts, which are located in the new directory.

**WORKSHOP END ▲▲▲▲**

**TIP**

Please note that the library parts for exchange should also be ELITECAD files (\*.d extension).

If the library parts are a grouping, it is necessary to ungroup the objects before changing the library part, because it is only possible to exchange single objects.

▼ ▼ ▼ ▼ WORKSHOP START

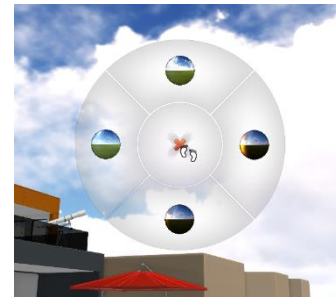
## Interact with Skymaps

### Exchange Skymaps



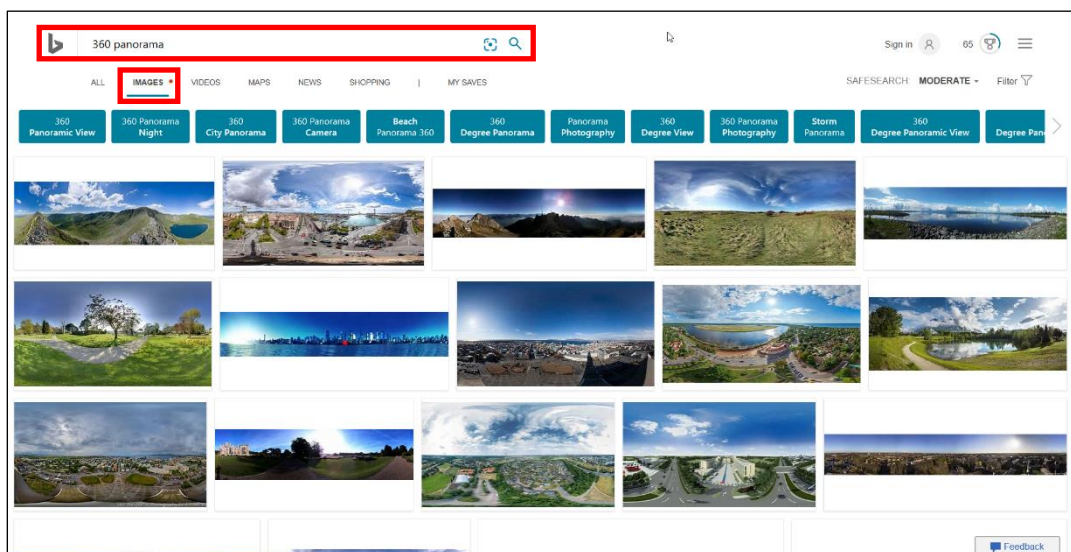
Now let us aim at the sky with our hair cross and press `INTERACT`. We choose the button `CHANGE SKYMAP` and the graphical menu is loaded with all available Skymaps that are stored in the same folder as the selected one.

If we press the button `QUICK INTERACTION`, the Skymap menu will be shown right away and we can select a Skymap to change the current one. After we have decided on which one we want to exchange, we can select it and confirm. The Skymap is exchanged and the background will be switched.



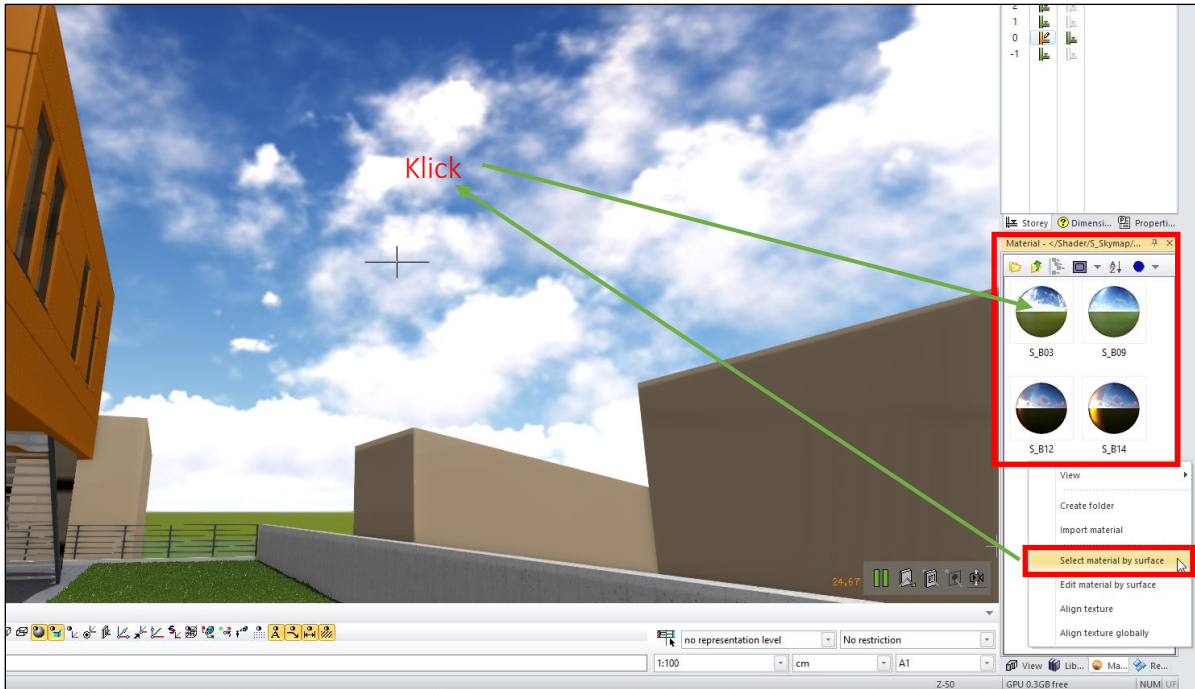
### Customise Skymaps

There are three ways to get additional Skymaps for your library. The first one is to create your own Skymaps, but keep in mind that the creation of custom Skymaps can only be done with special cameras. Secondly, it is possible to create 360 degree Skymaps with smartphones, but usually the quality is not very satisfying. In this example, we choose another way of obtaining Skymaps, which is downloading them from the internet. Let us open a web browser and look for “360 panoramas” in image search. If you find an image, you like, save it into a temporary directory.

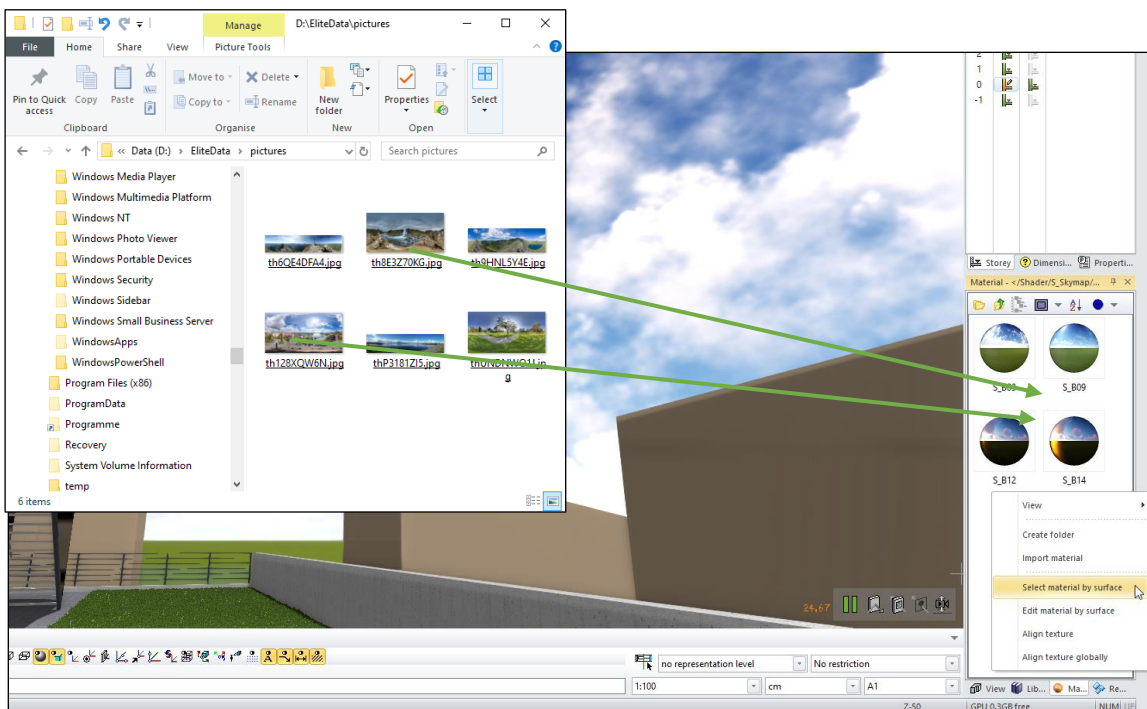


After saving the new images temporarily, we need to figure out where to save them, so they are suggested for the Skymap exchange function in ELITECAD. Since Skymaps are essentially materials (textures), with special shader properties, we can use the function `SELECT MATERIAL BY`

SURFACE and the required directory is opened in the material manager. First, we activate the shaders and switch to WALKING MODE, which we then pause and use the function SELECT MATERIAL BY SURFACE.

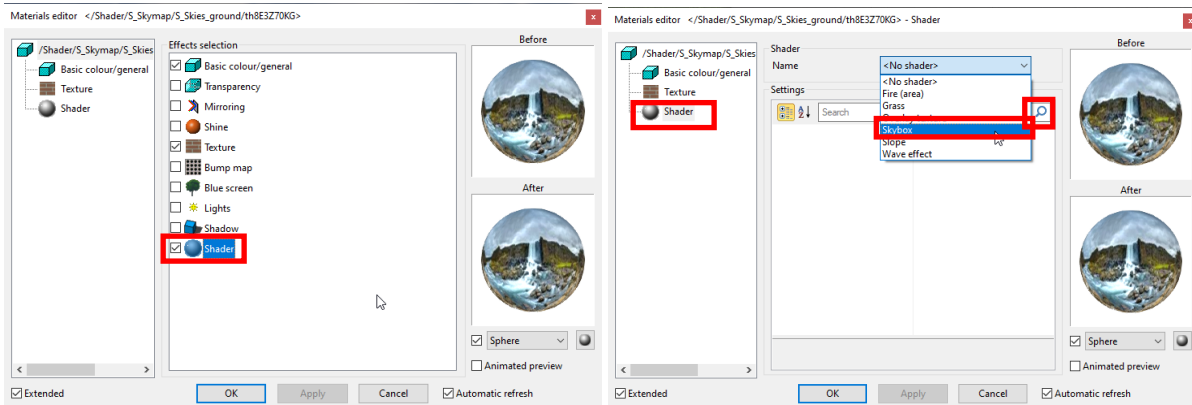


After we have found and opened the location for the new Skymap, we copy the new Skymap into this directory. We can do this simply via Drag&Drop.

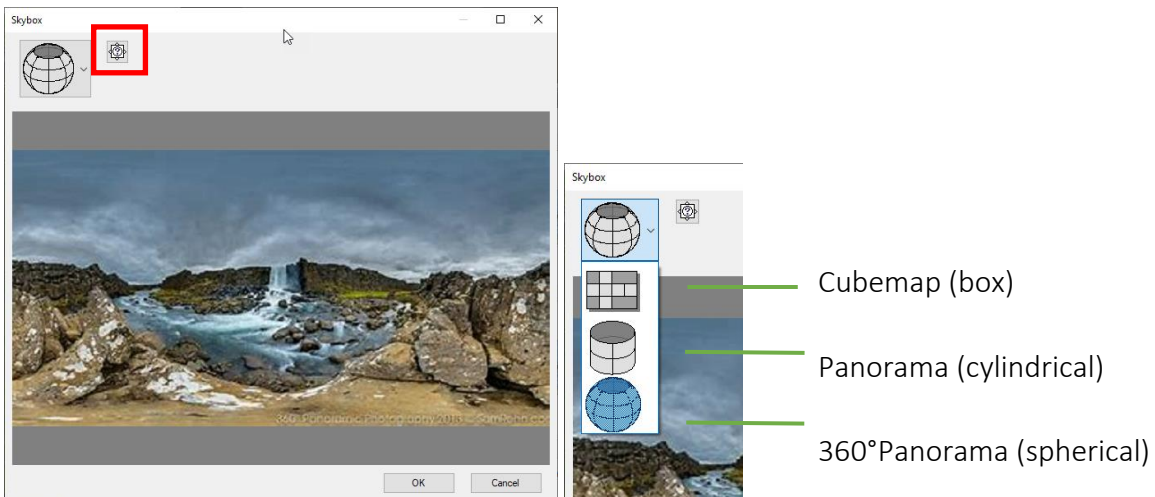


The next step is to assign the new panorama images the Skymap properties so we can use them in the Skymap exchange function. Let us open the material editor with a double click on the new materials and activate the shaders by setting the checkbox SHADER. In the shader properties, we activate the entry SKYBOX in the dropdown menu.

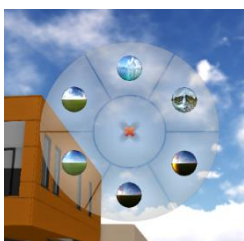




Afterwards we open the parameter dialog of the Skybox and activate the automatic detection of the Skybox type. The function `DETERMINE SKYBOX TYPE AUTOMATICALLY` only works with new images that have no type assigned. It is always possible to manually adapt the type later on. The following types are valid: Cubemap (aligned like a box), panorama (cylindrical) or 360-degree panorama (spherical).



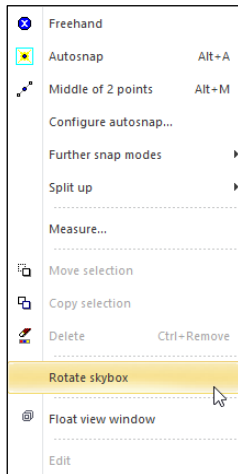
With this configuration, most of the Skymaps from the internet are ready to use in ELITECAD.



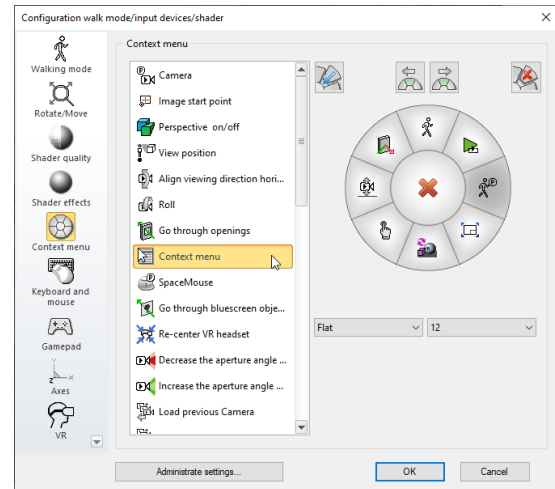
If we now switch back to `WALK MODE`, look up into the sky with our hair cross and press `QUICK INTERACTION`, we will see our new Skymaps available.

## Align Skymaps

If a Skymap is active and we are in WALK MODE, we have the possibility to align the Skymap horizontally in our model. Therefore, we open the WALK MODE CONFIGURATION and place the function context menu in our round context menu for the walk mode.



Now back in walk mode aim your hair cross at the sky and open the context menu. With the function ROTATE SKYMAP you can select the reference point and rotate your background with the mouse according to your model. The first click selects the reference point for rotation, the second click determines the new position of the point in the model. Using [ESC], you can abort this function.



**WORKSHOP END** ▲▲▲▲

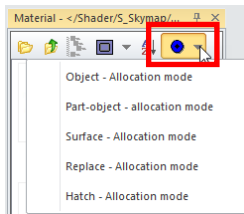
**TIP**  
 Skymaps are materials (textures) with special shader properties. If you need more information about materials, you can read chapter 1 – Manage and organise of the ELITECAD user manual.



## WORKSHOP START

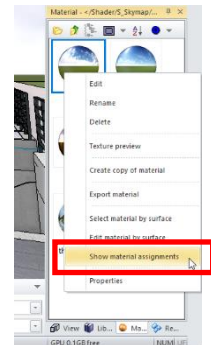
# Interact with materials (textures)

## Change materials



When changing materials there are two main points to consider, one being the type of MATERIAL ASSIGNMENT and the other being the crosscheck where this material has been used. First, let us open the material manager and check the type of MATERIAL ASSIGNMENT, because this setting has direct effect on the behaviour of the material exchange function.

Furthermore, it is important to know where the material has been used in order to see which objects are affected by the change of a material. For this purpose, we open the context menu in the material manager with the selected material and activate the function SHOW MATERIAL ASSIGNMENTS.



Now we use our hair cross to focus on the floor in the living room and press INTERACT. We choose the option CHANGE MATERIAL and now the graphical menu shows us all materials, which are located in the same path with a material preview for material change. If a library part is selected, both options CHANGE LIBRARY part and CHANGE MATERIAL are displayed and we can choose which action to perform.

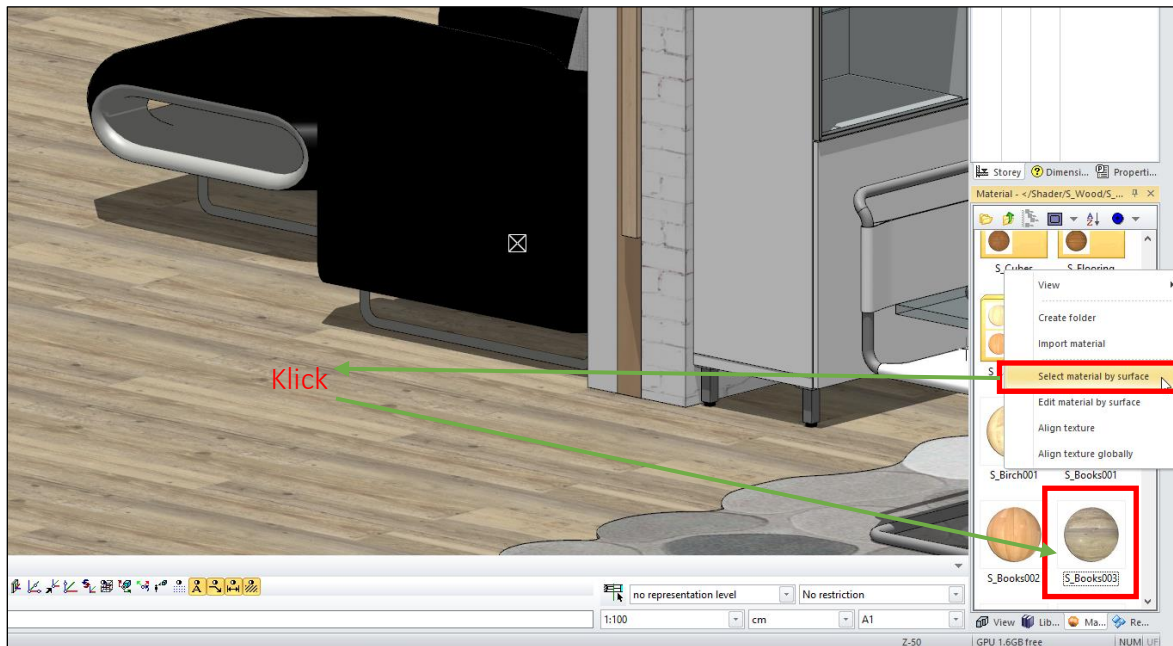
If we press the button quick interaction, the material menu appears directly and we choose a material for exchange right away or browse through the available materials. After we have decided on a new material, we can select and confirm it. The new material is activated and the appearance of the floor changes accordingly.



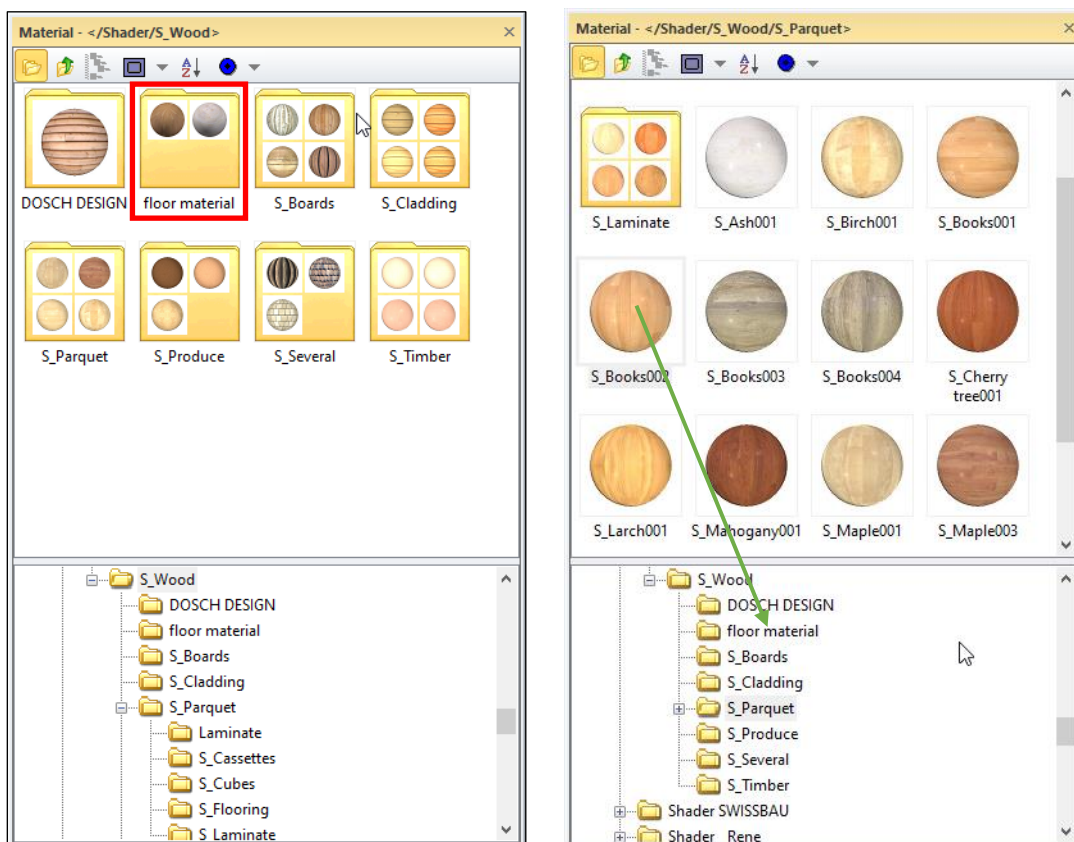
## Customise materials

There are several different ways how new materials can be obtained. One option is to create your own materials or customizing existing ones. Another option is to download new materials from the internet and importing them into ELITECAD. A detailed description of this can be found in the user manual chapter 1 – material management.

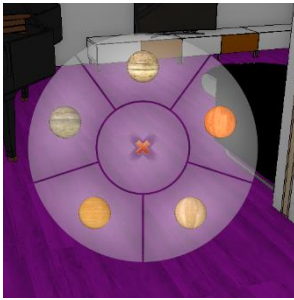
First, we need to find out where to store the new materials in order to have them available for material exchange. Therefore, we can use the function SELECT MATERIAL BY SURFACE that opens up the corresponding directory automatically. First, we activate the shader and WALK MODE, and then we pause the walk mode and use the function SELECT MATERIAL BY SURFACE in the material manager.



After we have found the directory for storing new materials (in the material database), we realise that this is a standard directory which we do not want to change. Therefore, we create a new folder *floor material* and copy the desired materials into this new directory. We can use the Drag&Drop functionality and simply move the materials from one path to another.



The next step is to assign the material from the new folder to the floor, which can also be done by drag and drop. After that, the next time we select this floor we have our custom material selection available for this specific floor.



So let us return to **WALK MODE** and go to the living room. When we now select the floor with our hair cross and press **QUICK INTERACTION**, we see the list of new materials for material exchange.

**WORKSHOP END** ▲▲▲▲

### **TIP**

The ELITECAD user manual chapter 1 contains a whole section on the topic of material management. If you want to use the same selection of materials on a different ELITECAD system, it is necessary to export the material database and import it in the target system.

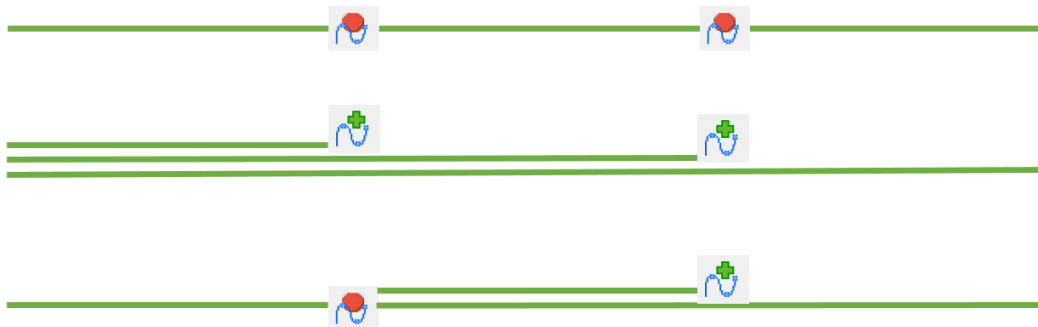
# Camera path

Camera paths are special objects assigned to the layer camera, depicted as 3D lines, which can even be stored separately. It is possible to have multiple camera paths in your model. There are two ways how camera paths can be generated. Either you can create a camera path in the walk mode or you create a path by selecting a sequence of camera positions and interpolate between them.

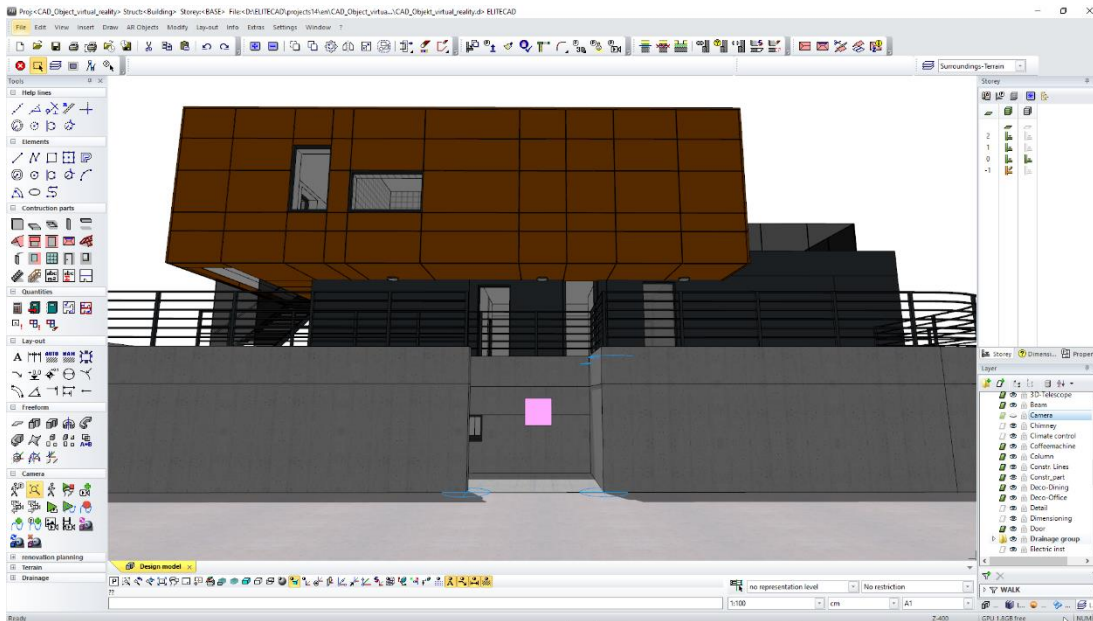
## ▼ ▼ ▼ ▼ WORKSHOP START

### Automatically record camera paths

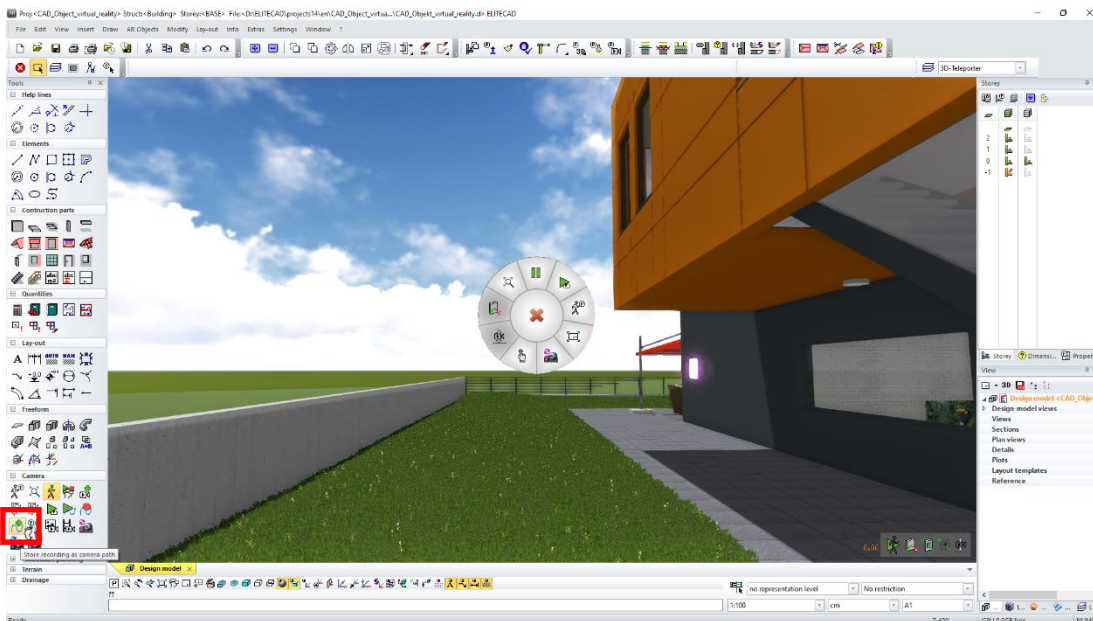
During walkthroughs in the model, ELITECAD always records all movements and stores them as intelligent camera paths. If the creation of a camera path is the goal, you can also use the function `RESTART RECORDING` and `STORE RECORDING AS CAMERA PATH` in order to manually define a certain start and end point of the path. Please note that the function `RESTART RECORDING` deletes all previously recorded movements and starts a new one. The function `STORE RECORDING AS CAMERA PATH` stores the camera path up to this point and keeps it for further recording. The following diagram shows the properties of these functions in detail. The two functions can also be mixed.



When the function `STORE RECORDING AS CAMERA PATH` is used, the current camera path and the new camera path will be identical in the first section, which is visible when the path is selected. That way different camera paths are created which can be accessed individually. Let us only look at the layer “camera” for a minute and delete all existing camera paths. Then move to the camera position “Start outside” and activate `WALK MODE`.

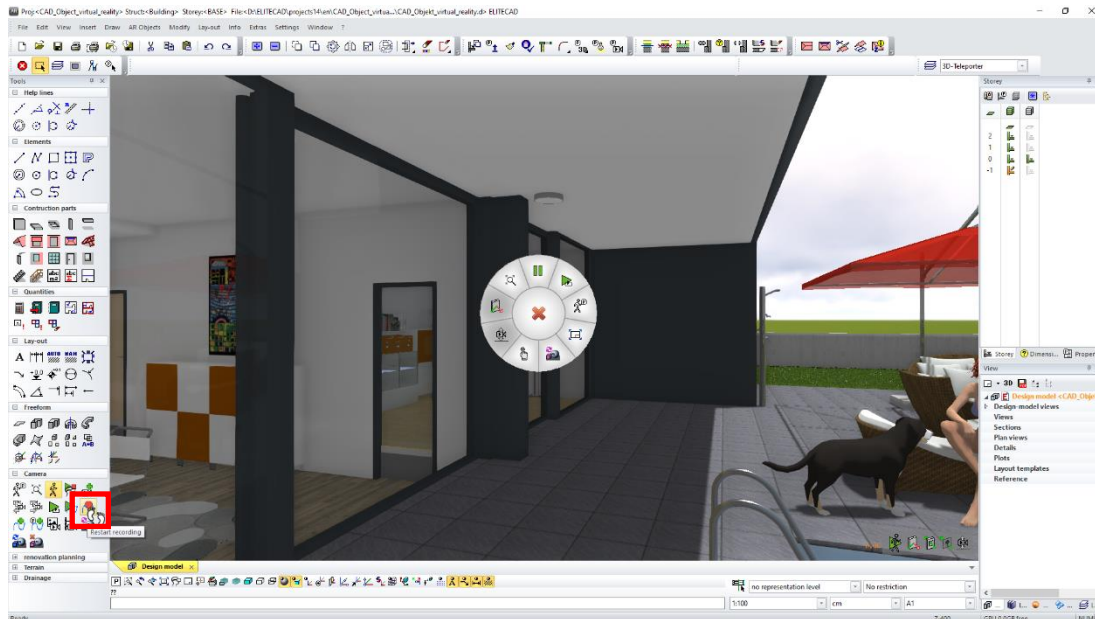


Now we walk up the stairs, stop on the grass approximately at half of the buildings length, and use the function STORE RECORDING AS CAMERA PATH. You can do this by clicking the right mouse button and then using the cursor to click the function.

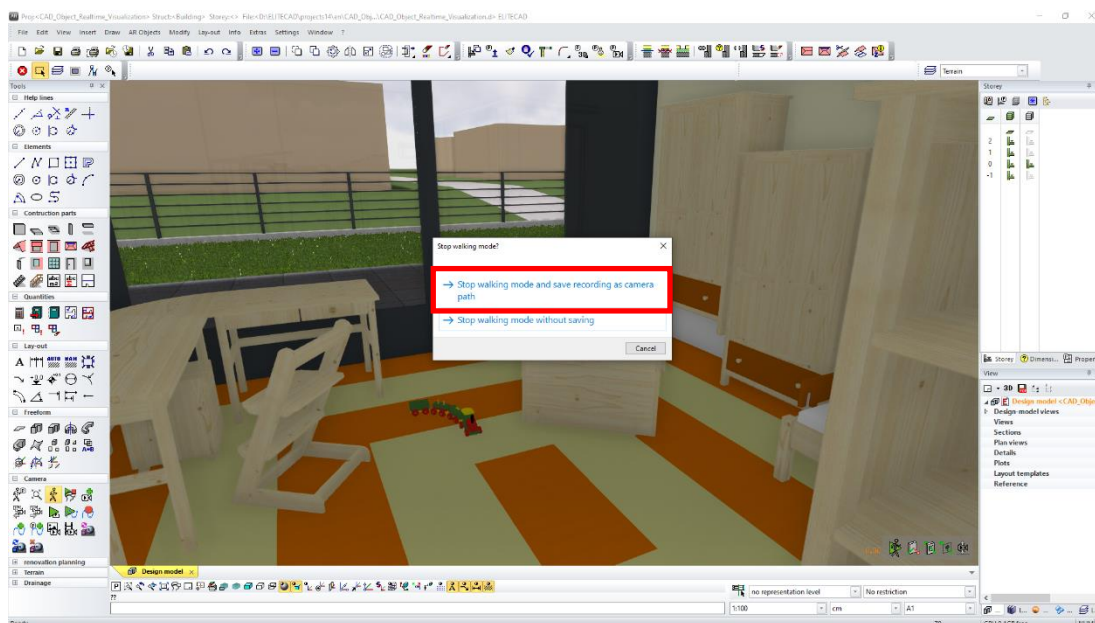


Afterwards we continue walking around the pool until the pool entry ladder. We press the button RESTART RECORDING.

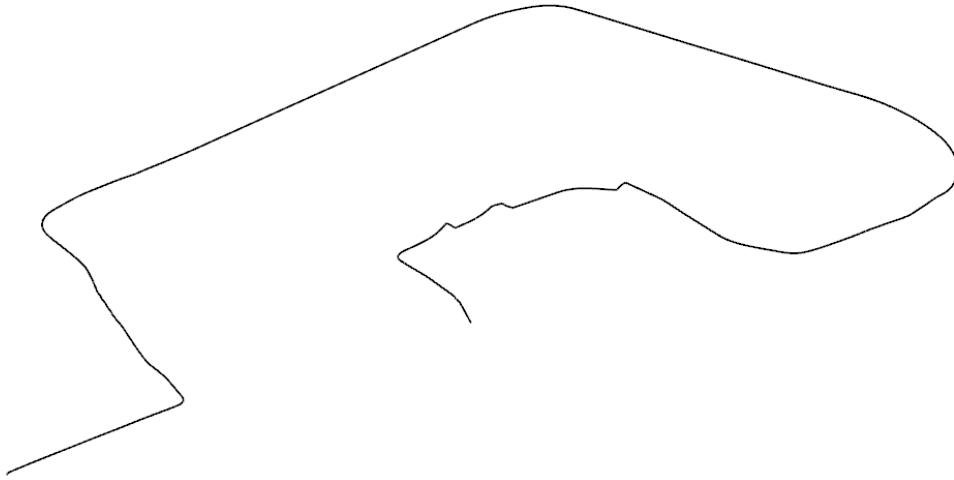




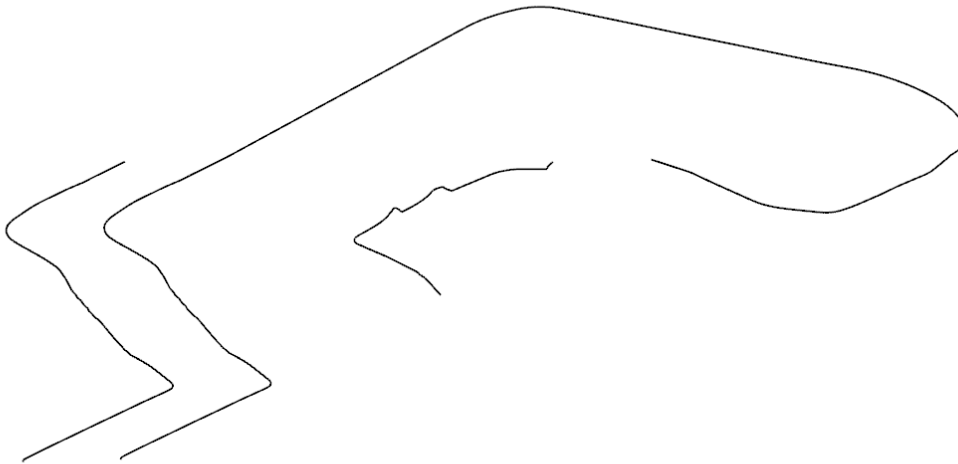
Finally, we walk left into the house, through the living room and the hallway into the kid's room. Here we stop the WALKING MODE and thus save the camera path.



We are now back to CAMERA MODE ROTATE/MOVE and only activate the layer "camera". Afterwards we should see an image similar to this one:

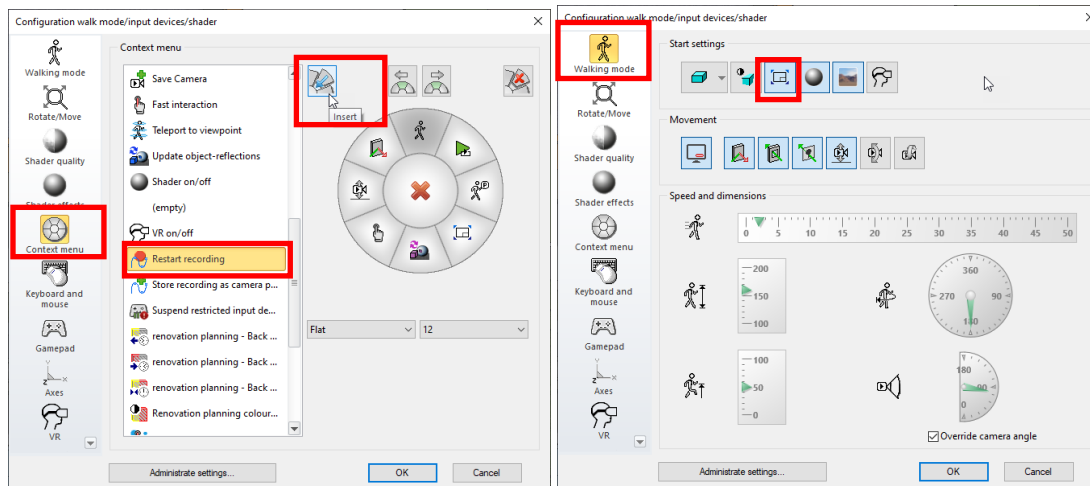


In order to get a better picture of the three generated camera paths, the next image shows them shifted a little bit, so you can see the individual paths.

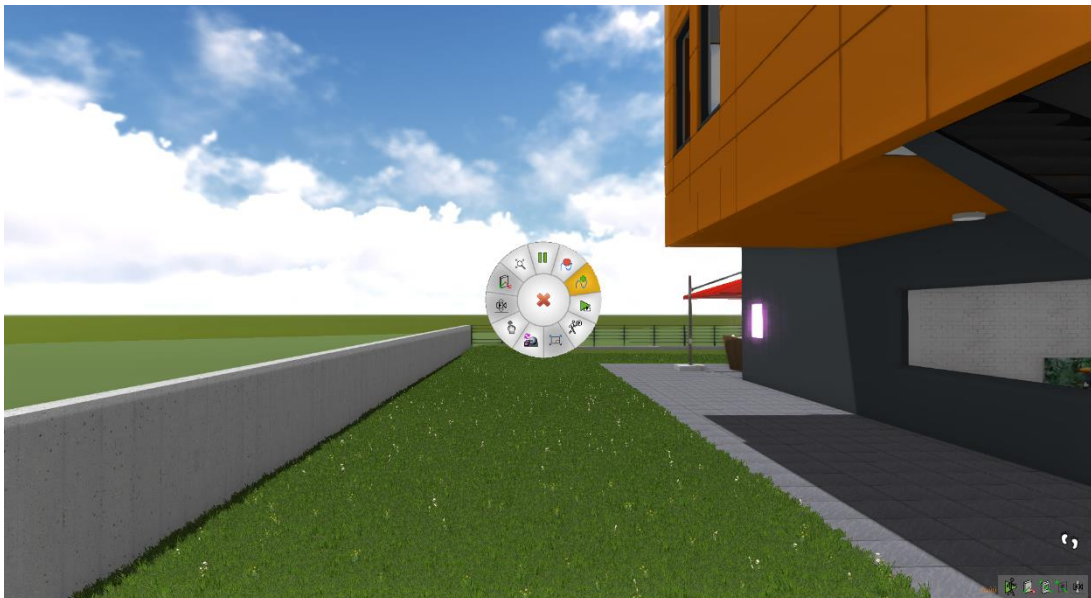


If we want to generate the same camera paths without using the CAD user interface, we have to add more functions to our context menu: `RESTART RECORDING` and `STORE RECORDING AS CAMERA PATH`. In order to do this, we need to open the parameter dialog for the `WALKING MODE CONFIGURATION` and add the two functions in the tab context menu. In addition, we change the start parameters of the walking mode to full screen.





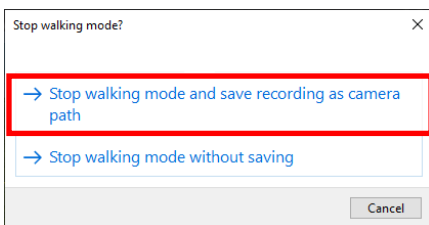
Let us start again at the position “start outside” and switch on WALKING MODE. We walk towards the building and go up the stairs to our left. Besides the building, we take a stop and activate the function STORE RECORDING AS CAMERA PATH.



Afterwards we take a walk around the pool to the ladder and activate the function RESTART RECORDING.



After we have reached the children’s room again, we stop the WALKING MODE and save the camera path.



Now we have reached the same result, but without using the CAD user interface like before.

**WORKSHOP END ▲▲▲▲**

**TIP**

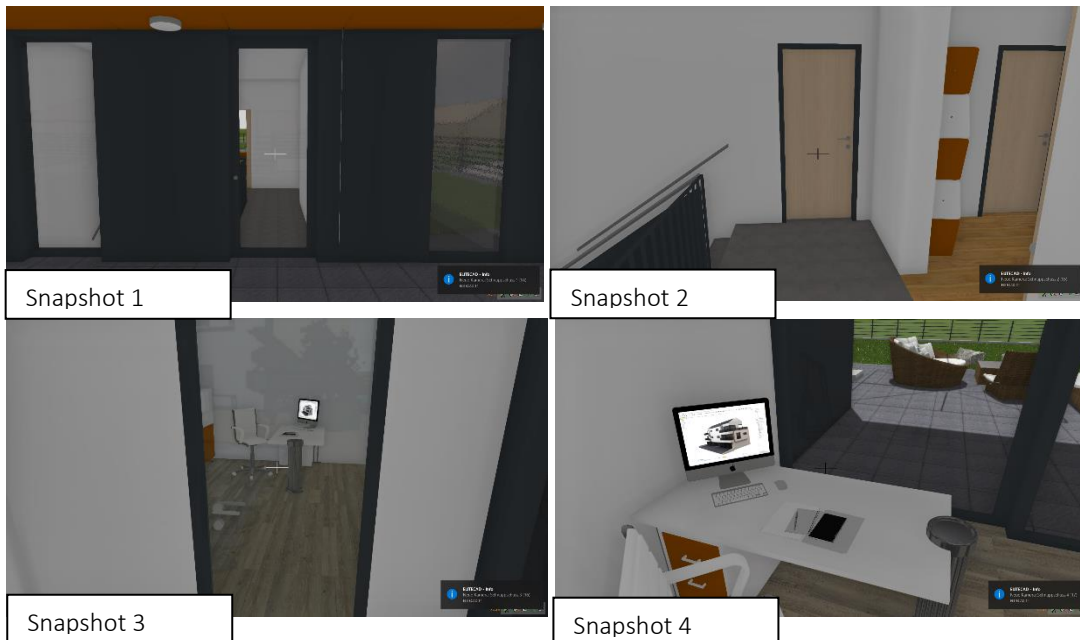
If you add the functions restart recording and store recording as camera path to your gamepad, you can create camera paths even quicker.

▼ ▼ ▼ ▼ **WORKSHOP START**

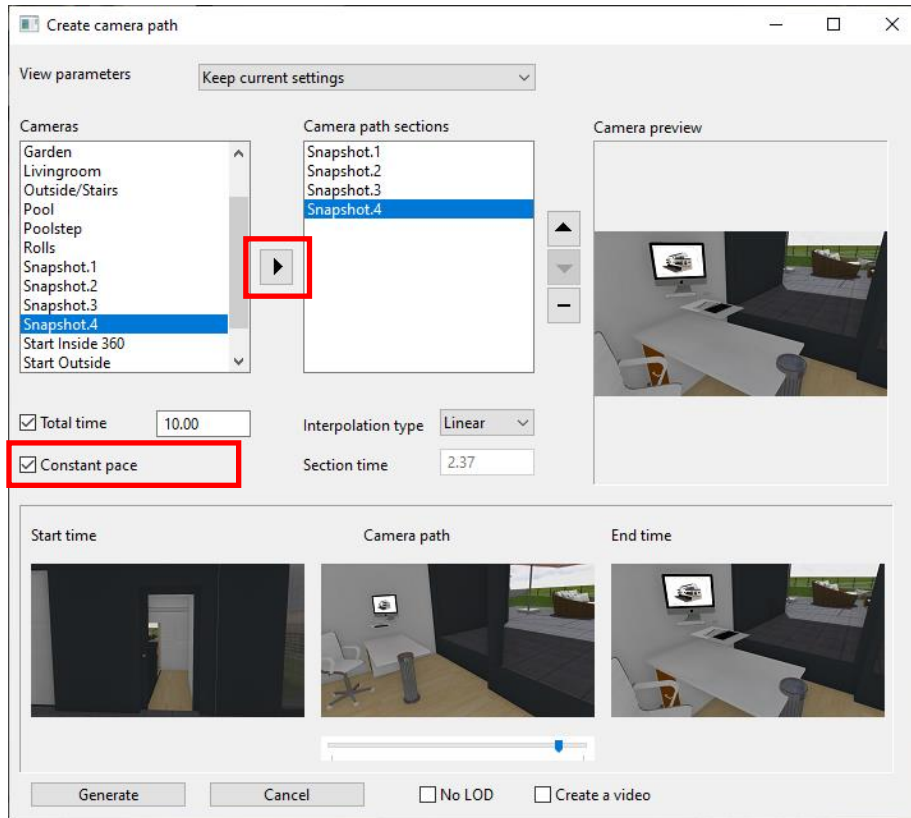
## Definition of camera paths

Camera paths can also be generated by linking multiple stored camera positions (snapshots) together. After choosing the fixed camera positions, the system interpolates between these positions and the user can choose the overall duration or the time between the individual snapshots. With only a few clicks, it is possible to create a sequence based on snapshots, which results in a configurable camera path. This easy way of defining camera paths is the basis for the creation of stable videos with smooth camera movements.

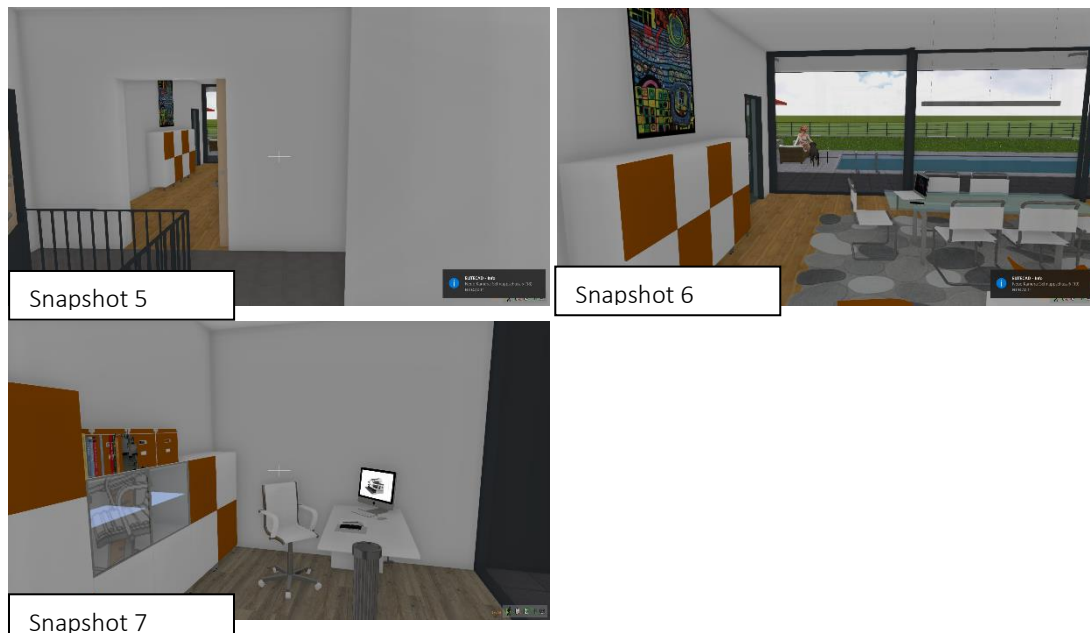
Let us position ourselves at the entrance of the building, switch to **WALKING MODE** and create the first snapshot. The name, which was assigned to the camera position, is displayed at the bottom right corner of the screen. We continue walking through the building and create further snapshots at the staircase, the living room, in front of the office room and in the office in front of the desk.



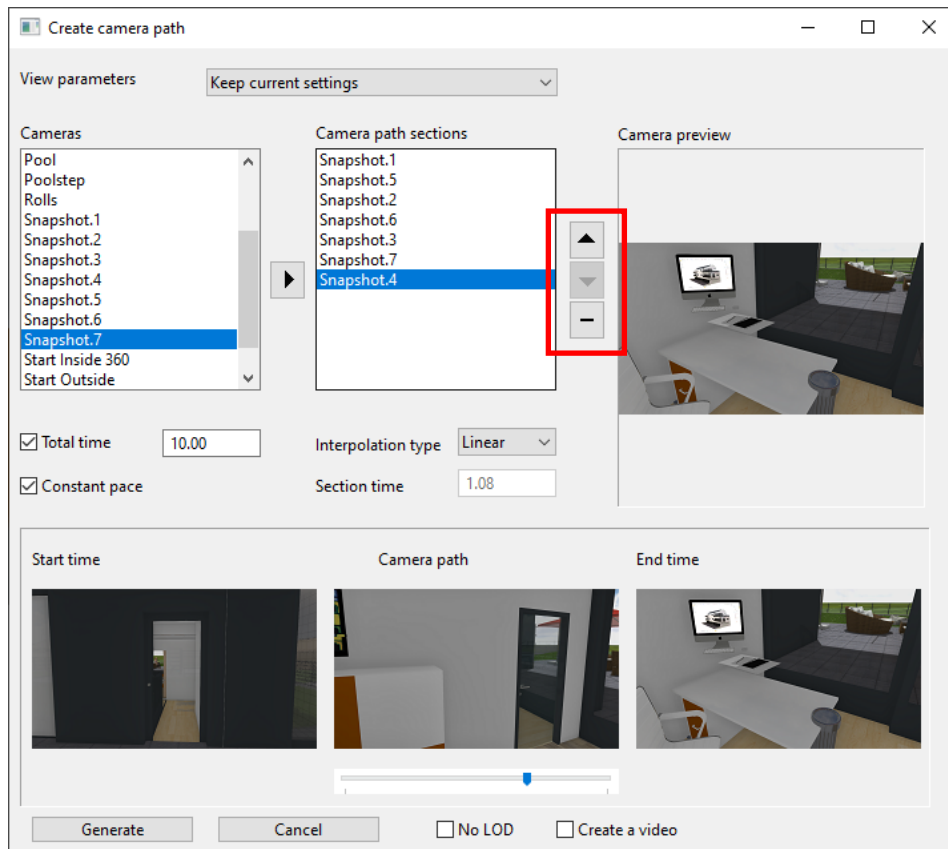
After we have defined and saved our snapshots we activate the function **CREATE CAMERA PATH**. The following screen appears and we move our snapshots to the field **CAMERA PATH SECTIONS**. By clicking the checkbox “constant pace”, we can choose, whether the individual sections have the same duration or if a constant pace should be calculated.



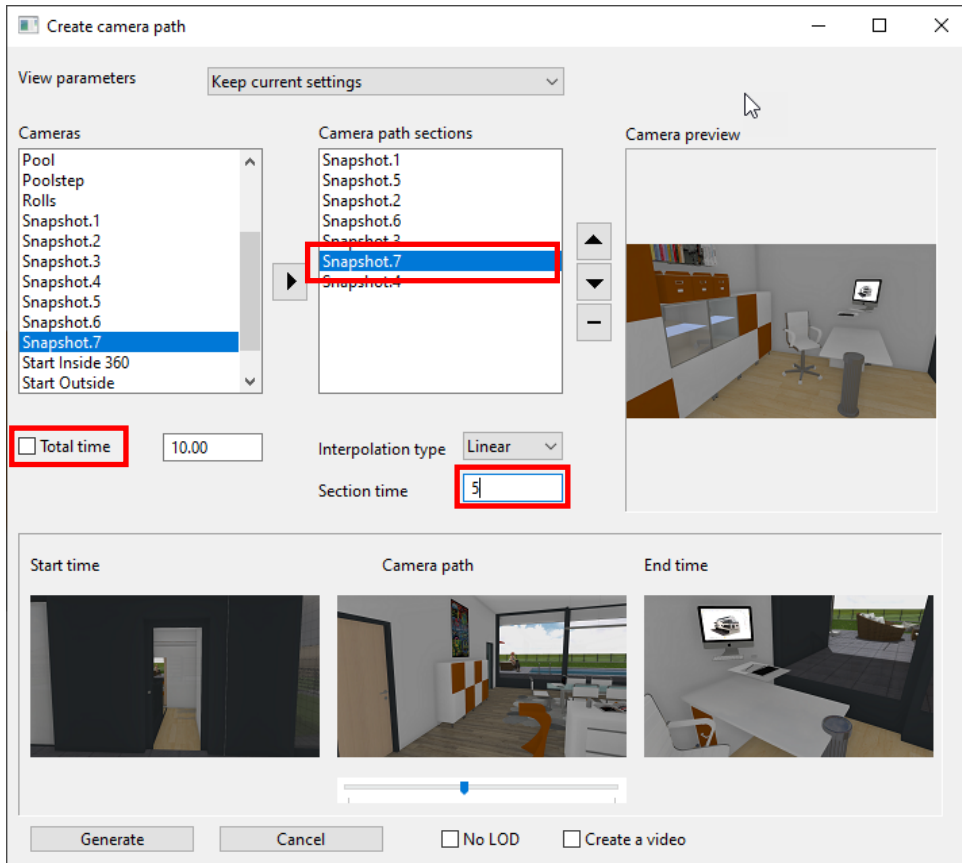
If we look at the CREATE CAMERA PATH dialog and observe the preview in the bottom centre, we can see that our camera path is not very smooth. By adding more positions in-between, we can refine the result and create a smoother and optimal camera path. So let us define three more snapshots at the entrance, in the living room and in the office.



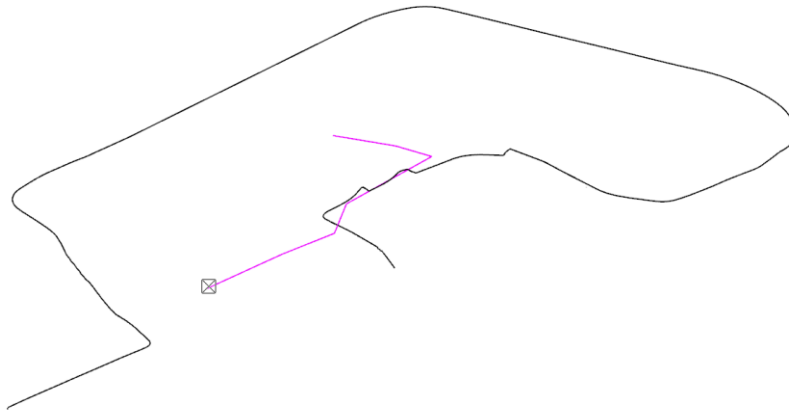
We insert the new snapshots at the appropriate positions and follow the result in the preview window. Of course, it is also possible to remove added snapshots from the list again.



The next step is to remove the checkmark at the checkbox for total time, so that way we can configure the individual times between the sections. That means we can assign a specific timeslot to every section in the video and the total time will be calculated as a result. Let us now define a duration of five sections for the second snapshot (Snapshot 2) and for the second last snapshot (Snapshot 7). To all the other snapshots, we assign a time of 2 seconds, so in the end we get a total time of 18 seconds.



After we have reached our desired result we can click **GENERATE** to create the new camera path. If we now only show the layer “camera”, we can inspect the newly generated camera path.



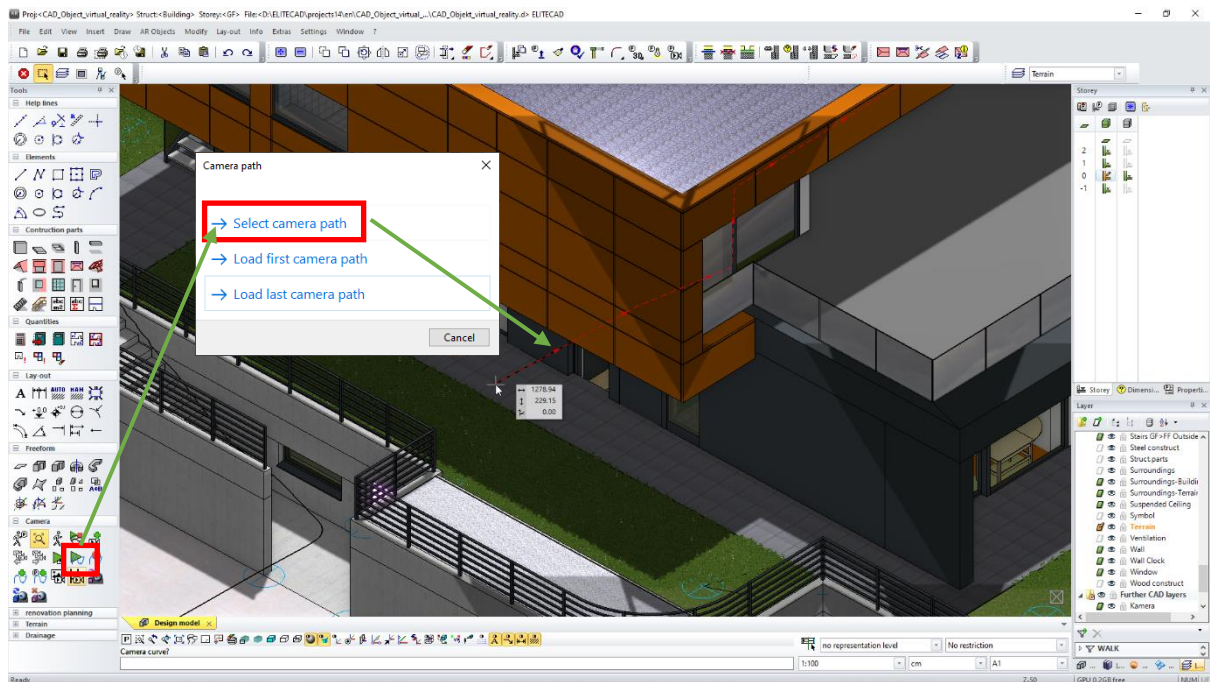
**WORKSHOP END ▲▲▲▲**



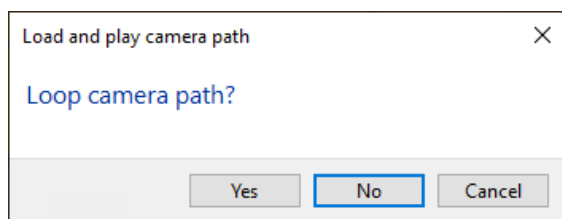
▼▼▼▼ WORKSHOP START

## Play videos

Using the function `LOAD AND PLAY CAMERA PATH`, we can select the desired camera path and it will be played during walk mode. The selected camera path is depicted with a red dotted line with arrows, and we only need to confirm our selection.



Afterwards we can select whether the selected camera path should be played in an endless loop or just once.



After we have made the selection, our camera path will be played in `WALKING MODE`.

### Safari

While the camera path is being played, it is always possible to interrupt the video using [ESC]. Analog to a real safari, it is possible to walk around during a stop and take snapshots. If we want to continue the camera path, we can just click `CONTINUE REPLAY` in the context menu and the journey through the model will continue from the last position. If the replay of the camera path was interrupted, all movements and actions are recorded again and can be saved as a new camera path as well.





### Save camera



During the camera path replay, we have the possibility to use the snapshot functionality. Without opening the save camera dialog, a new snapshot will be created automatically using previously defined quality settings. Furthermore, this snapshot is automatically added to the list of cameras. That way it is possible to switch back to interesting positions later on.

WORKSHOP END ▲▲▲▲

# Create snapshots

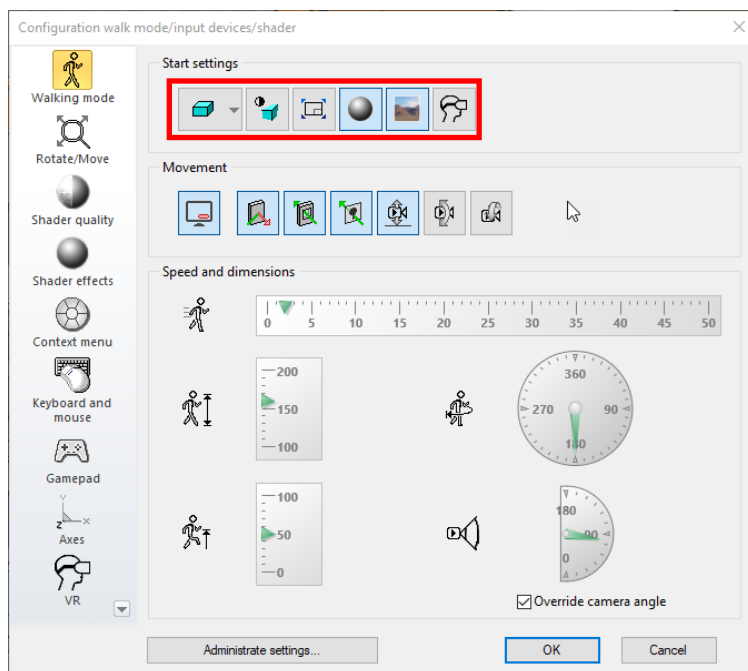


Using the function `CREATE SNAPSHOT` it is possible to create high quality images of our model.

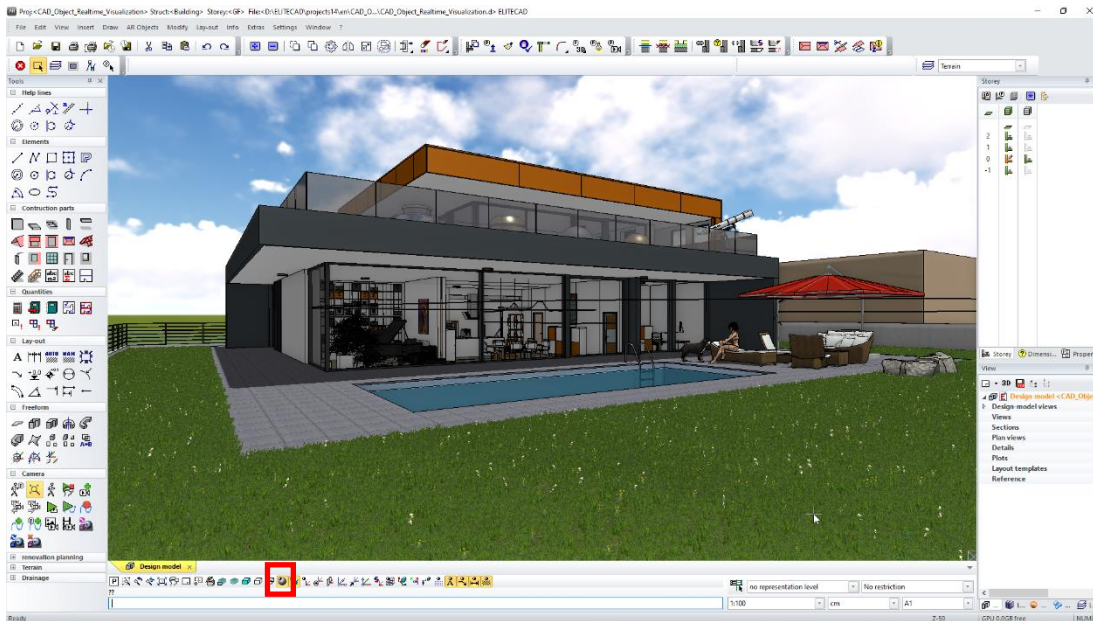
## WORKSHOP START

## Create images

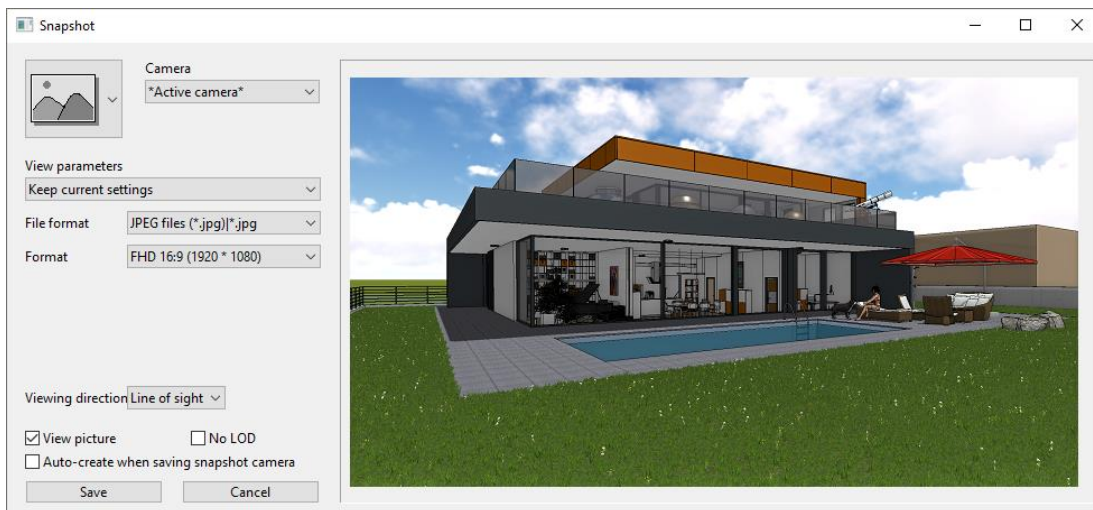
After we have loaded the file `CAD_Object_Virtual_Reality_01.d`, we activate the `WALKING MODE CONFIGURATION` and change the following parameters accordingly.



It is important that the full screen mode is deactivated. After that, we switch to `WALKING MODE` and position ourselves to the position „pool“ using the function `LOAD NEXT CAMERA`. The name of the camera position is shown in the bottom left corner as a status message. After we also activate the shaders, we should see the following image on our screen.



The next step is to activate the function CREATE A SNAPSHOT. The dialog shows the current configuration for generating snapshots.



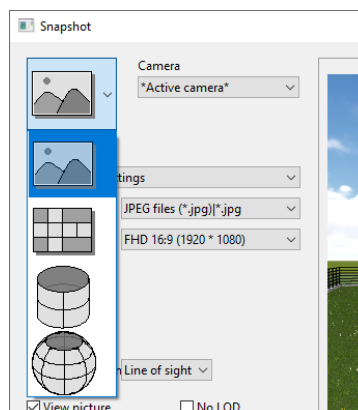
Here we could select the type of snapshot, but we keep the setting for creating a 2D image. If we want to create background images or panorama images, we can do this by setting the corresponding configuration.

Snapshot (2D image)

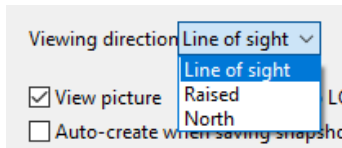
Cubemap (box)

Panorama (cylindrical)

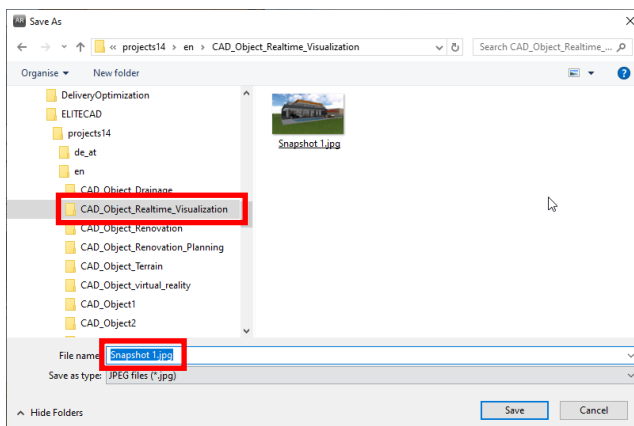
360°Panorama (spherical)



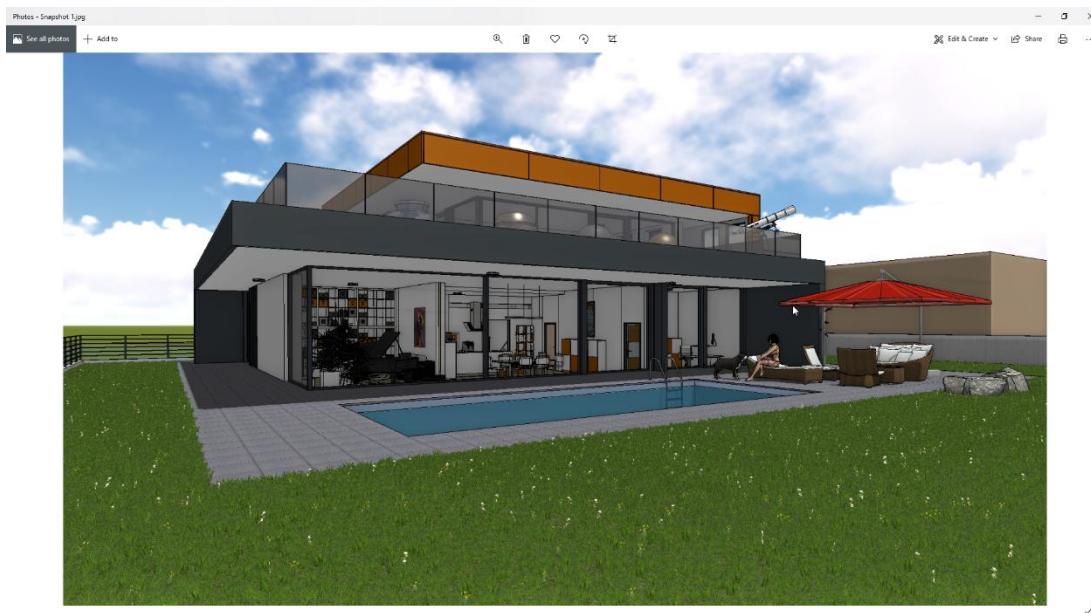
It is important to also configure, whether the viewing direction should be the line of sight or raised, since the raised viewing direction compensates for perspective errors when the head is kept straight.



We use the configured parameters to save the generated image in the project folder \\Projects\CAD\_Objekt\_Virtual\_Reality and assign the name *Snapshot01.jpg*. After clicking the save button, a dialog opens where we can set the path and name for the file.



We have now created our first image and it will be shown to us using the windows standard tool for opening images, which in our case is the windows tool “Photos”.



In the next workshop, we will learn about more parameters.

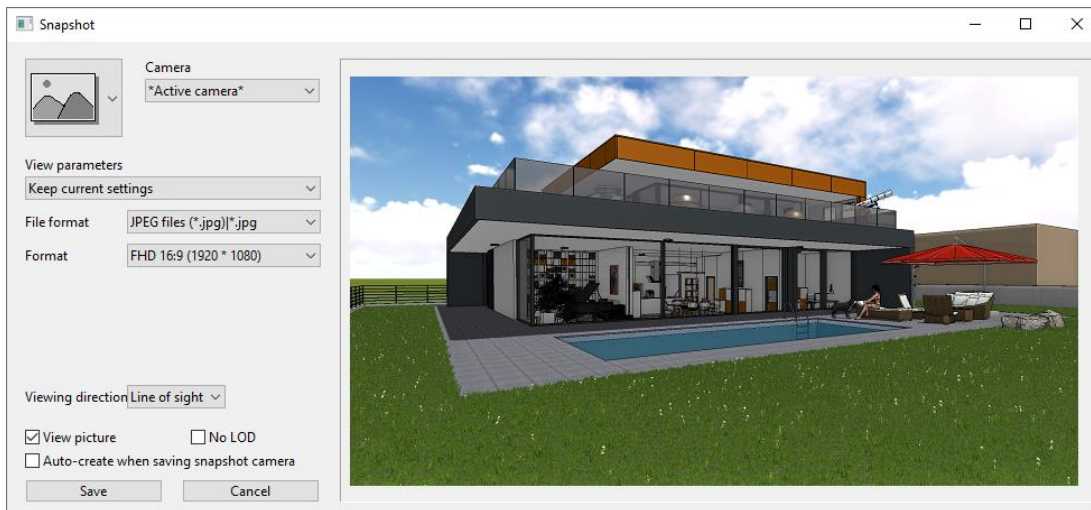
**WORKSHOP END** ▲▲▲▲

▼ ▼ ▼ ▼ WORKSHOP START

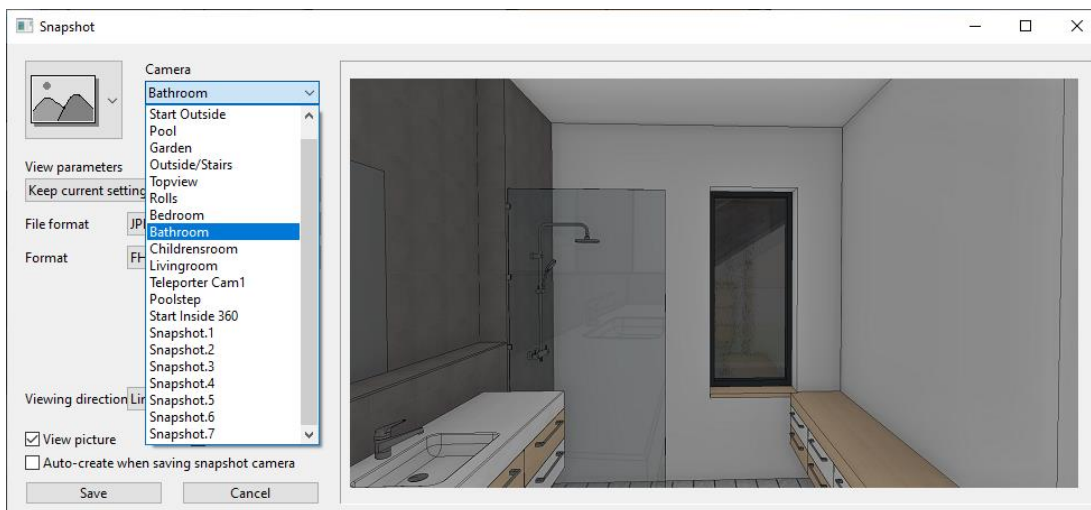
## Create images extended



We leave the settings as they are and once again open the dialog CREATE A SNAPSHOT, where we can see the currently active settings.

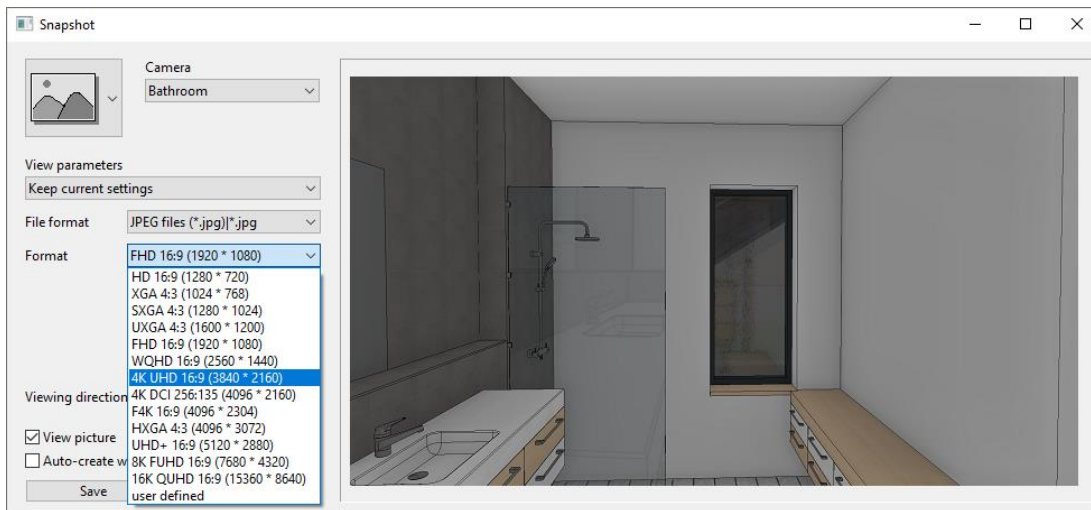
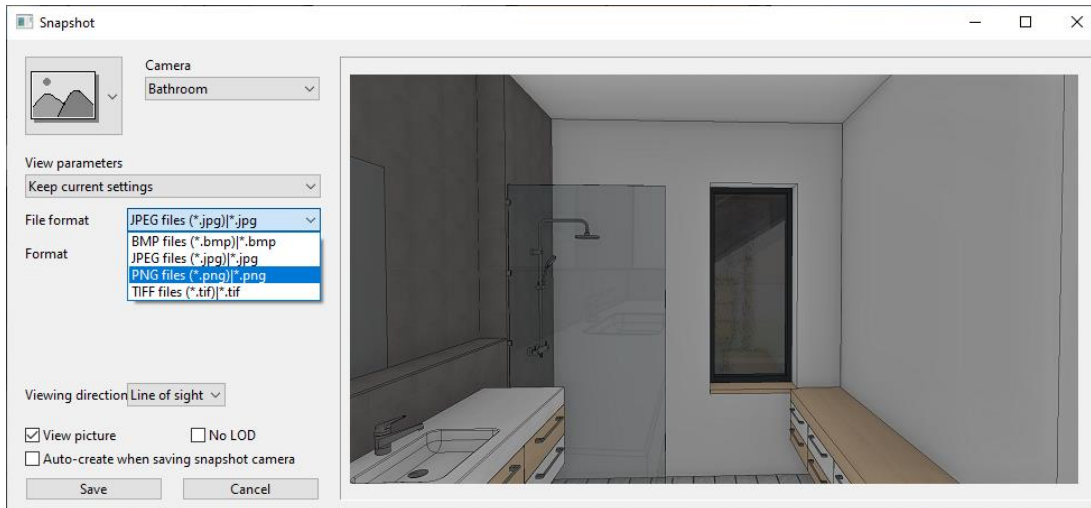


Now let us select a predefined position (snapshot “bathroom”), from which we want to create a new image in PNG format with 4K UHD resolution. In the next step, we select the desired camera position from the pulldown menu “camera”.

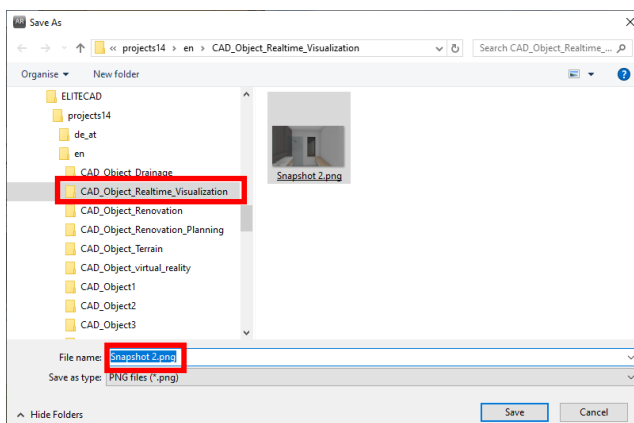


Afterwards we select the desired file format as well as the image format.



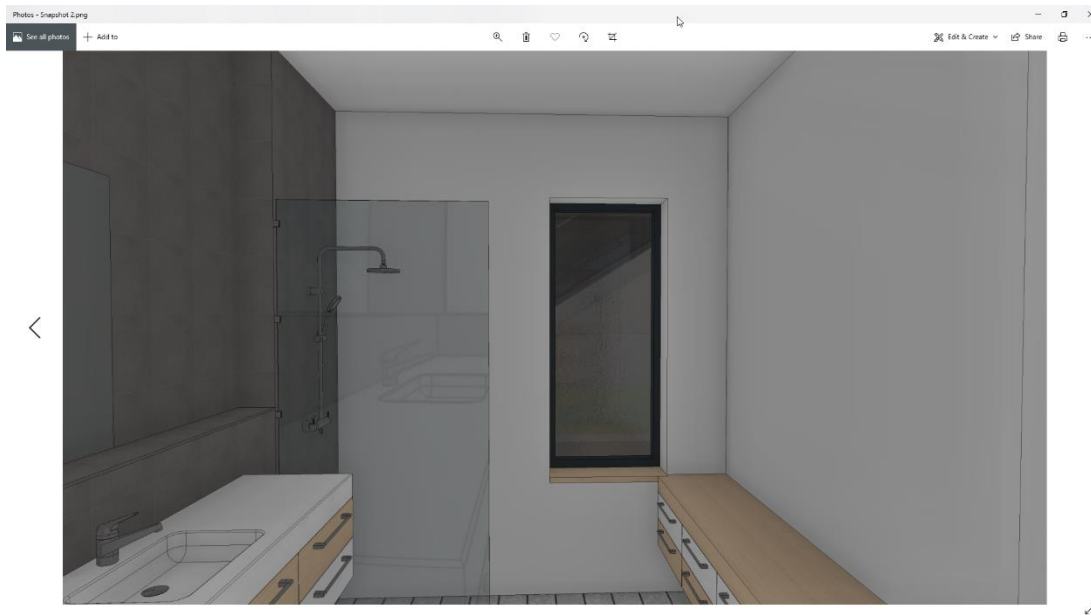


We use the parameters, save the generated image in the project folder `\\Projects\CAD_Objekt_Virtual_Reality`, and assign the name `Snapshot02.png`. After pressing `SAVE`, a window opens where we can set the path and name of the generated file.



We now have created our second image, and it will be displayed by the windows application Photos again.





WORKSHOP END ▲▲▲▲

### TIP

If we use higher resolutions and formats, we have to take care that there is enough disk space available. Using high resolutions (4K, 8K, 16K) will increase the file size dramatically. In general, the function `CREATE A SNAPSHOT` can be used to create various images (2D, views, model, sections etc.) in high quality.

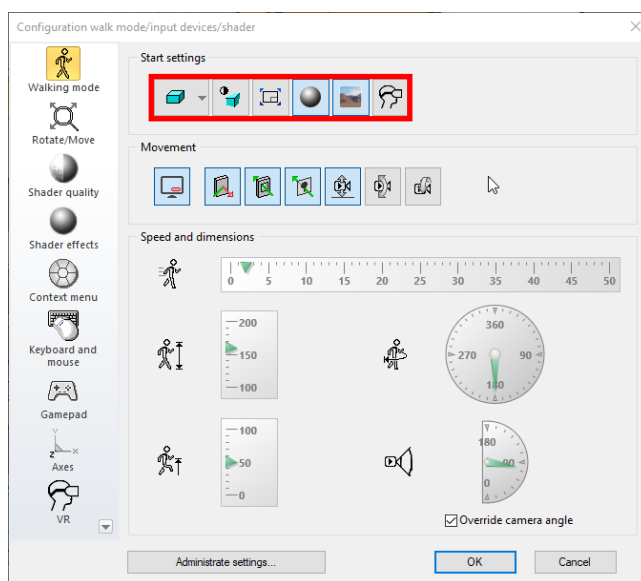
# Create videos

Your walkthroughs in the walking mode can be saved as intelligent camera paths, which can then be used to generate videos with numerous graphical effects.

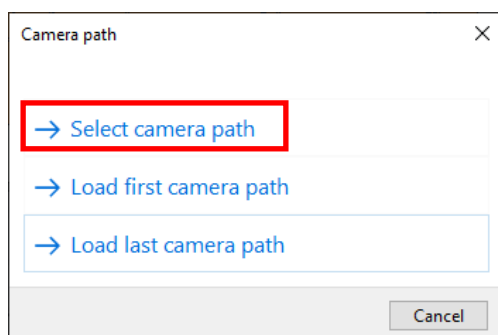
## ▼ ▼ ▼ ▼ WORKSHOP START

## Create videos

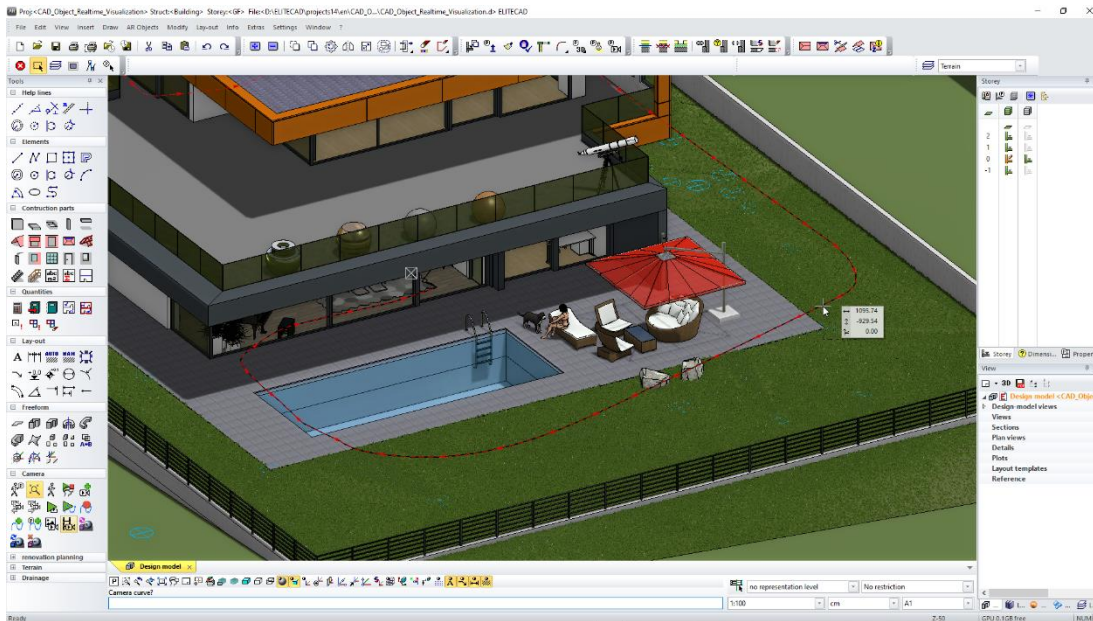
After loading the model *CAD\_Object\_Virtual\_Reality\_01.d*, we open the WALKING MODE CONFIGURATION and set the following parameters.



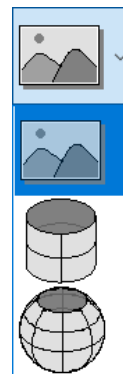
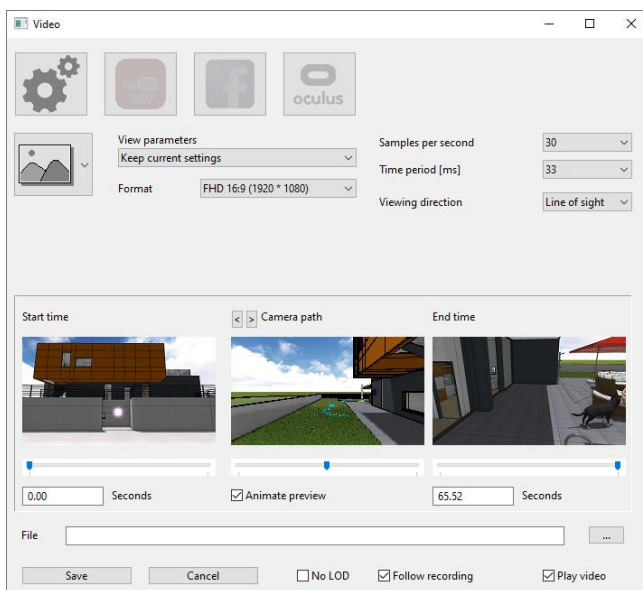
It is important that the full screen mode is disabled. Afterwards we start the WALKING MODE and activate the function CREATE A VIDEO. If currently there is no camera path selected, the selection menu appears and we can select an existing camera path. There are three options to choose from: the first one, the last one or any other camera path.



We choose the option “select camera path” which will display the marked camera paths under the hair cross. Let us select the camera path that leads around the pool.

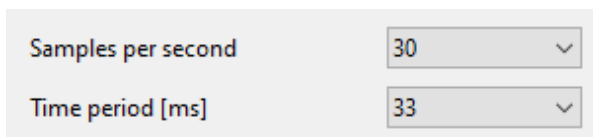


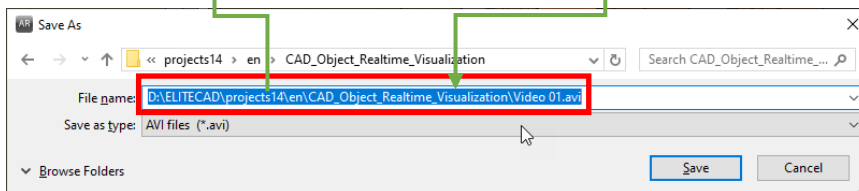
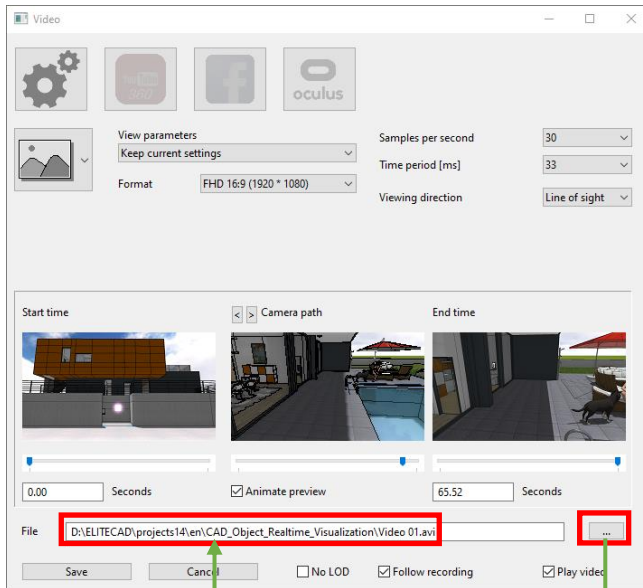
In the newly opened dialog, we see the currently active parameters as well as the starting and end point and a preview of the camera path. Afterwards we configure the type of video we want to create. Here we have the choice between “normal video”, “panorama video” and “360 panorama video”. We would like to generate a normal video and select the corresponding configuration.



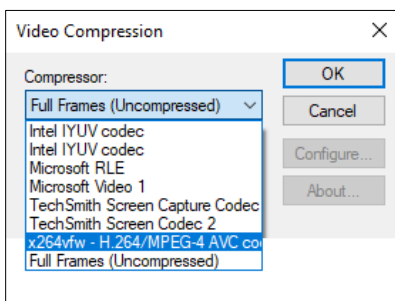
- Normal video
- Panorama video
- 360°-Video

The framerate settings influence the quality of the video. The two parameters `SAMPLES PER SECOND` (images generated per second) and `TIME PERIOD` (time between images) are dependent on each other, so any change to one of those values has direct effect on the other one. It is important to note, that a higher framerate not only increases the quality of the video, but also drastically increases the file size and the time needed to generate the video.



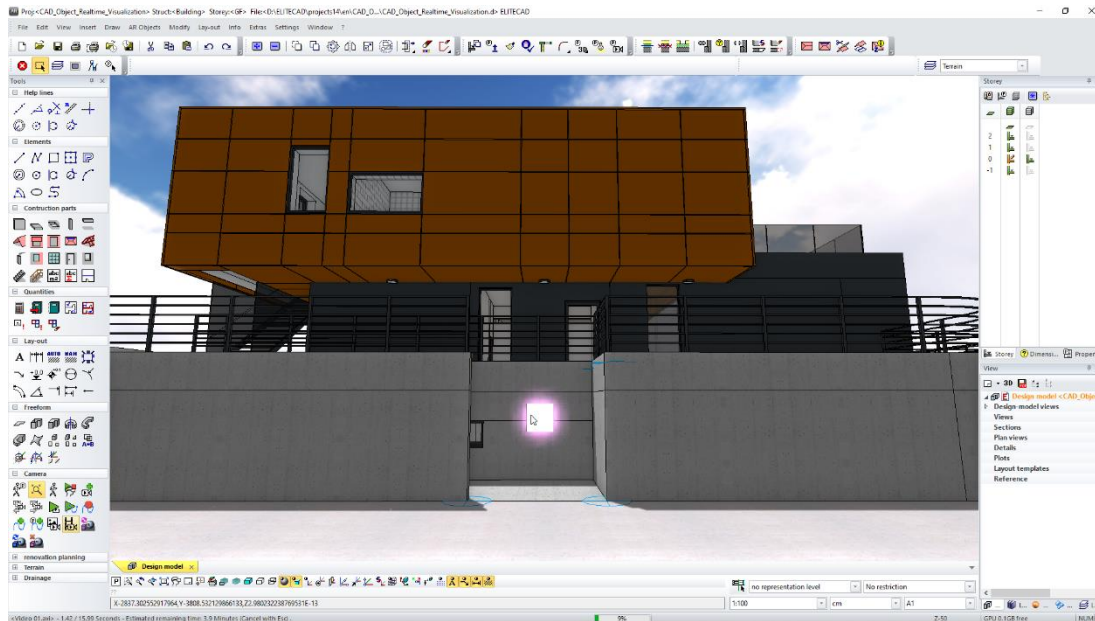


Furthermore, we need to add a filename and the desired path where the video should be stored, which in our case will be `\\projects\CAD_Object_Virtual_Reality`. After we click **SAVE**, a new window appears which lets us choose the codec for video generation.



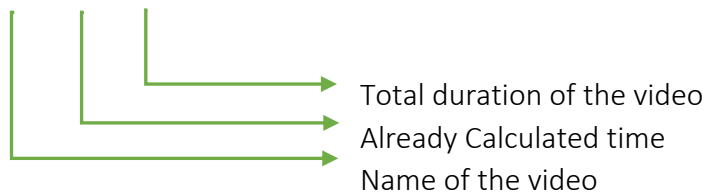
Information about the selected codec.

After we confirm the codec, we return to the ELITECAD user interface and the video will be generated using the selected parameters.

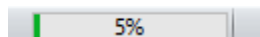


The status bar shows information about the process and duration for the video generation.

<Video 01.avi> - 1.42 / 15.99 Seconds - Estimated remaining time: 3.9 Minutes (Cancel with Esc) .



Furthermore, the overall progress for the generation of the video is displayed in percent in the centre of the status bar.



After the calculation is finished, we have generated our first video, which will be automatically opened and played by the windows standard tool for videos.



WORKSHOP END ▲▲▲▲

**NOTE**

The selected *x264vfw-H.264/MPEG-4 AVC codec* and VLC media player are not part of the ELITECAD installation.

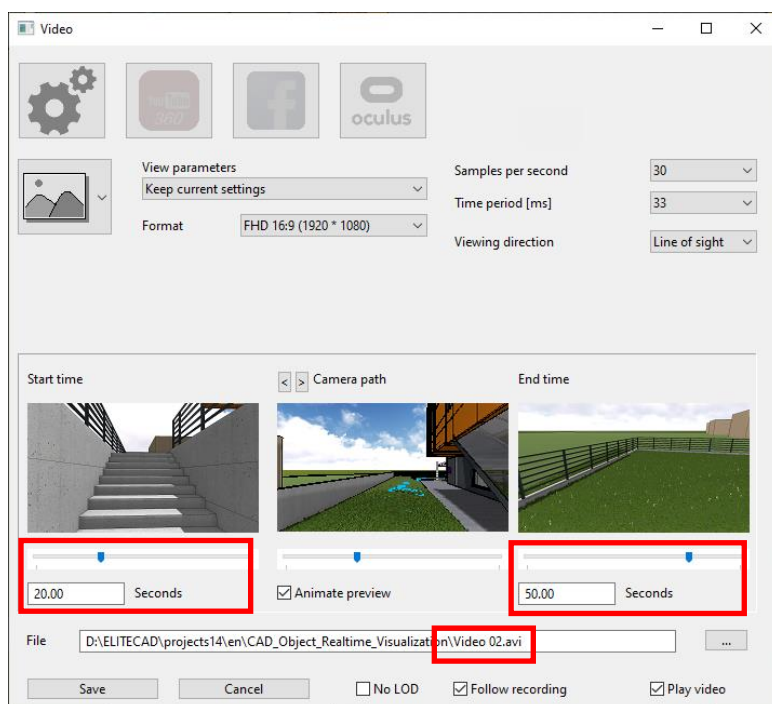
The codec can be downloaded and installed from the internet (e.g. [www.sourceforge.net](http://www.sourceforge.net)). It is also possible to use windows standard codecs, but the quality will be lower and the file size higher.

The video tool VLC can be downloaded from the internet and plays mp4 files besides the windows standard formats.

▼ ▼ ▼ ▼ **WORKSHOP START**

## Editing of videos

We can adjust the length of the video directly in the parameter dialog. If we want to create a video from second 20 to second 45, we can just adapt the necessary parameters either using the sliders or directly entering the values.



We change the first and last image of the video and adapt the file name to *video 02* and save the video to our hard drive.

**WORKSHOP END** ▲ ▲ ▲ ▲

**NOTE**

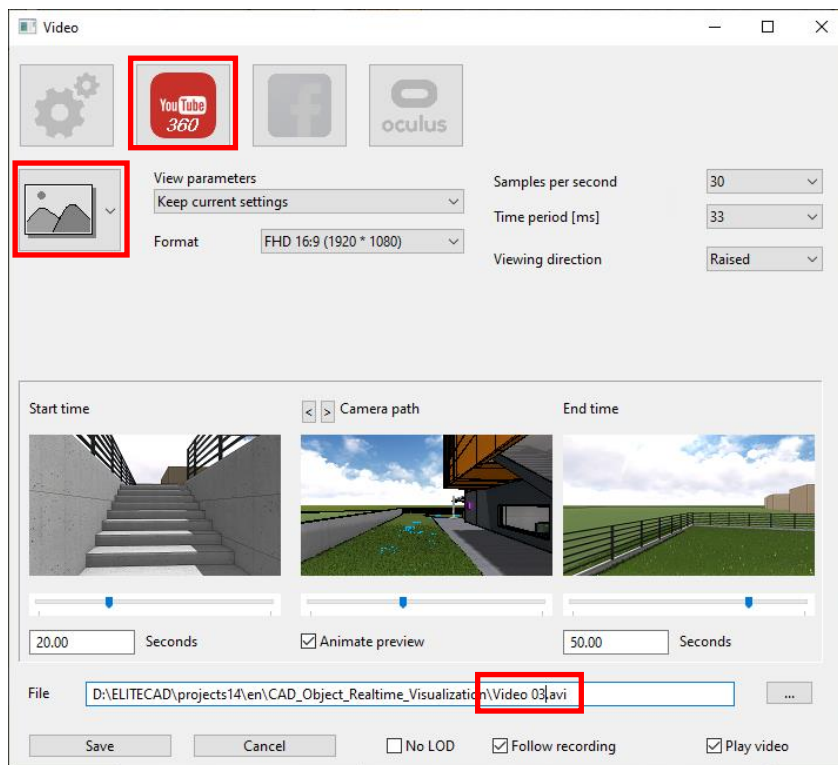
If you want to make more detailed adaptations on your video, please use a dedicated video editing software.



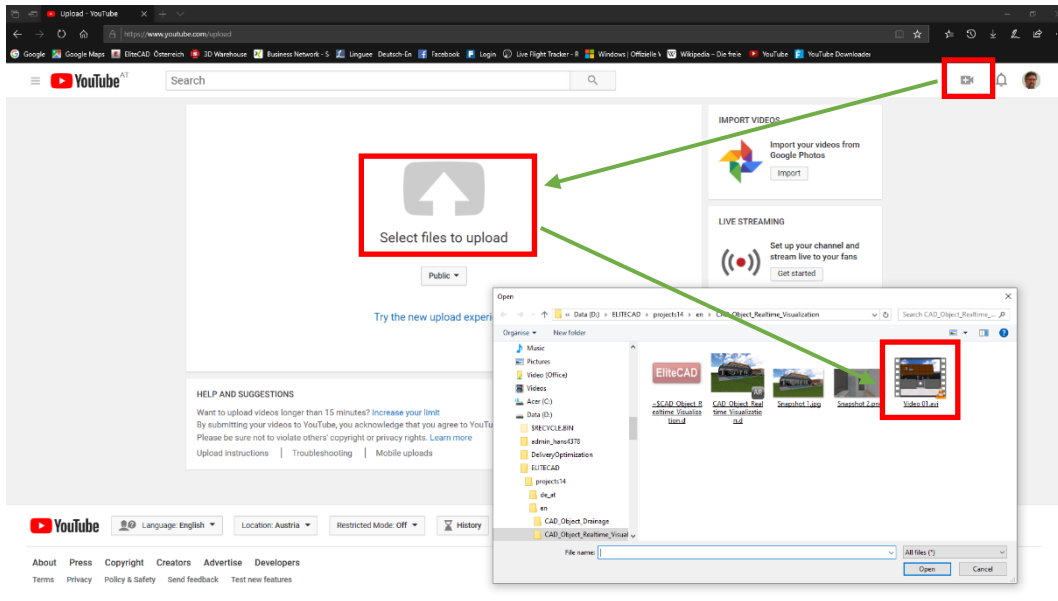
## ▼ ▼ ▼ ▼ WORKSHOP START

## Generating special videos

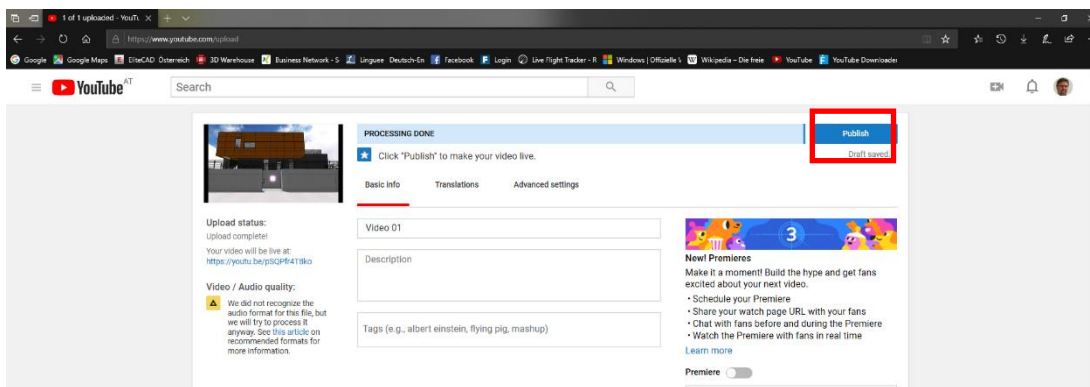
ELITECAD contains several presets for various online platforms, so it is easy to publish videos to services like YouTube or Facebook. Let us assume we want to create a video and publish it on YouTube. For this, we need an account for YouTube. We keep all parameters and set the presets to YouTube. Since we do not want to upload a 360-degree image, we switch back to normal view. The name of the video should be changed to “Video 03”.



Now we save the video just like before to our hard disk. Next, we can use the generated video to upload it to YouTube.



After verifying the video and the configuration of the parameters, we can publish the video.



WORKSHOP END ▲▲▲▲

**NOTE**

In order to publish videos to YouTube or Facebook you need to register an account on those platforms.

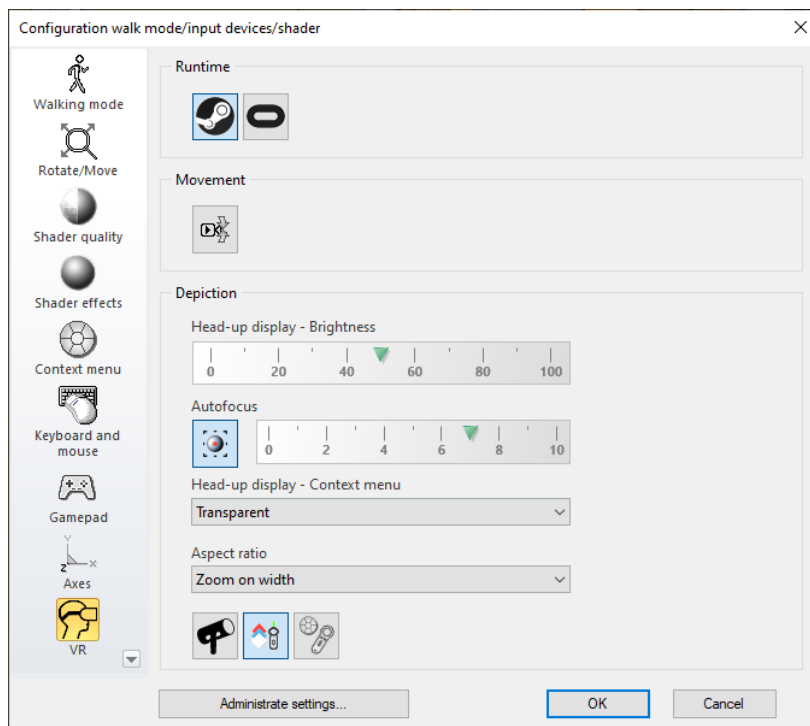
# Virtual Reality

ELITECAD contains the integration of STEAMVR. STEAMVR and OPENVR are vendor independent runtime libraries, which can be used to control VR devices like the Oculus Rift, HTC Vive and Windows Mixed Reality. In order to be able to use STEAMVR it is necessary to register an account. Furthermore, the runtime libraries have to be installed and activated in the input device settings. The document „VR-Setup“ describes the installation procedure for VR devices step by step. The document is located in the folder `<installation-path>\u<version>\doc\en\cad` of the ELITECAD installation. In this tutorial, we want to use the Oculus Rift S, which does not need external sensors, since the position location is done using integrated cameras.

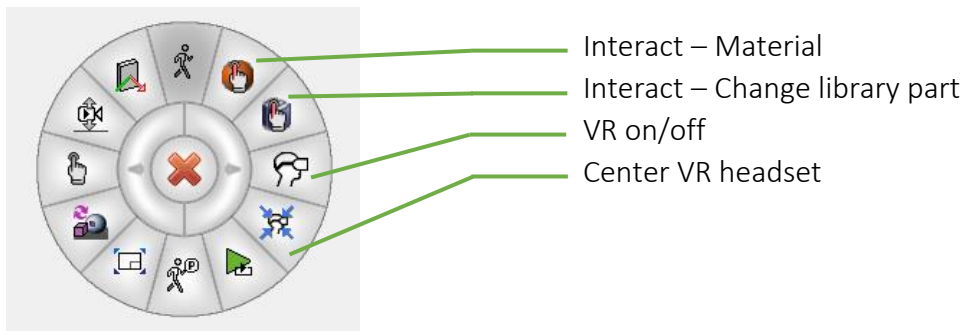
## ▼ ▼ ▼ ▼ WORKSHOP START


## Prepare the Oculus Rift S


Now let us use the Oculus Rift to freely move around in the building using everything we have learned in this course unit. For this purpose, we connect the Oculus Rift S to our DisplayPort and USB port. This allows us to have a 360-degree view in combination with the detailed real time visualisation, which provides a realistic feeling of being inside a building model. Using the WALKING MODE, we can gauge the proportions of the rooms just like in reality, which allows us to spot errors in an early planning stage. The following settings should be set on your system.




The context menu should now also feature the following functions.



 The preparations for the use of VR are now completed and we can start experiencing VR by using the VR on/off button and putting on the glasses.

 If we want to stop the virtual walkthrough and afterwards continue again, we can also use the VR quick start button from the toolbar.

## Navigation with the gamepad

Turning the head in VR also changes the viewing angle, which corresponds to the behaviour in real world. Turning the body can be done by using the controllers. The left joystick controls the direction of movement and the right joystick controls the rotation of the body. All functions, which can be used in the WALKING MODE, can also be used in virtual reality mode. If we lose the orientation we can use the  function `CENTRE VR HEADSET` to restore a defined state.

## Direction interaction in viewing direction

Interactions in VR are especially impressive, because they can be by the users inside the VR mode without switching to the CAD user interface. Changing materials or library parts can be done directly in VR, by looking at the object to change. We can use functions like `INTERACT – MATERIAL` or `INTERACT – CHANGE LIBRARY PART` from the context menu. You can also use the functions `INTERACT` or `QUICK INTERACT` directly with the controller.

Now use the controller to walk through the building in VR and apply everything you have learned in this course unit.

WORKSHOP END ▲▲▲▲

**TIP**

Sometimes we tend to lose the reference to the real world, so it is recommended to be in a safe position when you enter the virtual reality mode. We recommend using VR only when sitting to avoid any injuries.

If you feel dizzy, please stop using the VR for a while.

**NOTE**

If the runtime libraries are not yet installed on your system, please contact your IT support. There is an installation guide, but the setup requires IT knowledge and unrestricted access to the system. Once SteamVR is installed, you can use the Oculus Rift S or any other VR device.