CAD PROJEKT K&A

Operation manual

Render Pro

CAD Decor PRO 4.0, Render PRO Module

www.en.cadprojekt.com.pl

INTRODUCTION

This manual describes the functionality of the Rendering Module in the Professional version**.**

We wish you a pleasant and fruitful work with our software!

CAD Project K&A Team

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Visualization - advanced rendering

1. Introductory remarks

The Render PRO module is a modern tool designed for advanced visualization. Its main purpose is to provide high-quality visualizations with shorter calculation times. This is achieved through the interaction of the graphics card processor (GPU) and the multi-core nature of a modern processor (CPU). Reading the manual will help you obtain attractive visualizations. Please note that the calculations are approximate. The main purpose of developing this module was to achieve the optimal balance between calculation time and the quality of the resulting visualizations.

2. General characteristics of rendering algorithms

In the new release of the Render PRO module, you have a choice of two ways to calculate the global lighting distribution: **Radiosity** and **Path tracing**, which we describe in this section..

2.1. Radiosity and Path tracing

Radiosity is an energy-based method used to calculate the lighting distribution for object faces in a scene. The program divides the scene into face vertices, with a default size of 10 x 10 cm, and stores the illumination distribution. It is important to note that the way models are drawn in the .4CAD environment can affect the lighting distribution, particularly if faces are drawn in an inverted direction. In addition to **Radiosity, Ray tracing** is used to calculate reflections and refractions of rays, resulting in a realistic appearance of elements that refract or reflect light, such as glass, translucent materials, mirrors, and metals.

Path tracing analyses random ray paths from light sources for each pixel on the screen individually. The algorithm determines the amount of light that reaches each pixel in the scene and checks how much of it is reflected and reaches the observer (camera), taking into account the degree of absorption of the material. The improved text adheres to the characteristics of clarity, conciseness, objectivity, structure, consistency, formal tone, unambiguous language, sequential logic, coherence, active voice, defined terms, standardized language, precise word choice, grammatical correctness, metrics and units, and removal of non-essential fillers. No changes in content have been made. The impact of inverted surfaces on the final outcome is insignificant. This is because each point on the screen is analysed individually from the observer's (camera) perspective. This method is more precise than **Radiosity** and can produce results that are indistinguishable from real photographs. However, it is also more time-consuming and requires adjusting the number of megasamples (i.e. millions of pixel samples) appropriately, sometimes through trial and error. It is impossible to predict in advance the optimal number of samples for a project. The number of samples depends on various factors, including the number and types of light sources. The program randomises which source will be analysed for a given pixel at a given time. The more light sources there are, the greater the risk of omitting one and obtaining an undesirable effect of 'noise' in the resulting image, i.e. pixels with underestimated lighting).

2.2. Global Illumination calculations(GI)

Indirect light (GI) is light reflected from one surface toward another. Its distribution in the scene is analyzed by both rendering algorithms: **Radiosity** and **Path tracing**.

Most of the light reaching our eyes is just indirect light. They can be divided into two categories:

- light reflected diffusely by rough surfaces (such as paint-covered walls),
- light mirrored by smooth surfaces.

Computers have limited computing power compared to real-world processes, so simplifications are used in rendering to ensure calculations are performed in an acceptable time**. Radiosity** divides the entire scene into small fragments and calculates their vertices, which is a complex process. Calculating the exact distribution of lighting for a scene divided into small fragments with a large number of surfaces can be time-consuming. For instance, if there are 100,000 surfaces, their mutual influence must be analysed, requiring 10,000,000,000 calculations. This example illustrates the reason for the lengthy calculation time. Our method has a significant advantage over other GI calculation methods. Once calculated, the lighting distribution is stored, allowing the scene to be viewed from any angle without the need for additional calculations. This is particularly important for filmmaking. The accuracy of the calculation depends on the number of areas into which the scene is divided. This affects the calculation time and the program's memory requirements.

For Path tracing, GI calculations are performed before analysing ray paths for each pixel visible on the screen in the current view.

2.3. Basic information about the Radiosity algorithm

This method converts data and determines the global distribution of illumination of 3D scenes, improving rendering performance. It considers the reflection and absorption of light by surfaces and objects. The program stores the lighting parameters calculated by this method and uses them to display real-time visualizations, allowing for an accurate representation of the interior. The effects obtained are independent of the observer's position.

To begin the calculation process, press the **START** button. The process consists of two stages: data preparation and cyclic display of the calculated illumination. The results of the calculation are displayed every 4 seconds by default, but you can adjust the frequency using the '**Refreshing**' slider. Remember that less frequent updates will result in lower memory load. The visualization's final appearance is achieved by gradually improving the scene. The progress of the calculation is visible in the bar at the top of the screen.

When the calculation is completed, the **STOP** button will be coloured, while **START** will be greyed out you should then finish the calculation (if the user fails to do so, the program will remind him in a message). However, it is not necessary to wait until this point, you can choose to end the calculation earlier.

During the course of Radiosity's calculations, you can:

- modify global illumination parameters (**"GI precision”**);
- edit the settings of lights: halogen, fluorescent, spot and sunlight, and luminous surfaces (emitters and backlights) in the **"Lights"** tab in the left menu, (lighting will be refreshed when you return to the **"Render”** tab);
- change filters (i.e. color tones);
- apply textures (but only those that are currently visible in the scene); they must first be picked up using the **"Eyedropper Tool"** ("pipettes"), and then applied using one of the two "bucket" options: **"Bucket Tool -applying material to object"** or **"Bucket Tool - Materia Applying material to Layer"** (the material

will transfer along with the properties that were previously given to it, for example. when you copy a texture from a tabletop with a convexity mapping assigned and apply it to a wall, the wall will display the texture with the convexity mapping).

2.4. Basic information about the Path tracing algorithm

Our new method of calculating global illumination for each pixel in the scene separately.

It takes into account the reflection and absorption of light by various surfaces and objects, and traces ray paths from each pixel visible in a given view to light sources. Calculations in the highest quality mode take longer than the **Radiosity** algorithm, but produce even better results.

The appearance of the interior, with the right choice of parameters, can be indistinguishable from a real photo.

Only the current camera view (or any number of pre-set shots with the selected resolution) is rendered when you move the camera, the program will recalculate the new view from the beginning (unless you block view changes, in which case the previous shot will continue to be recalculated).

In the mode of blocking the rendered view during the calculation, you can continue working with the project.

You can also task the program with rendering multiple, previously saved views one at a time (at different resolutions) and, for example, deal with something else at the time.

The calculation process begins with the **START** button and proceeds in two processes: the first is scattered light (GI) calculation, and the second is ray analysis, measured in so-called megasamples (the number of samples converted for a single pixel).

The results of the calculations are displayed in real time in a small preview on the bottom panel, which can be maximized and minimized using the arrows:  .

The final appearance of the visualization is achieved by gradually improving the scene - the progress of the calculations is visible on the bars **"GI calculations"** and **"Samples/pixel"**, which are orange during the calculations and turn green when they are completed(Illustration 1).

Illustration 1 progress bars - on the left: both processes in progress, in the middle: GI calculations completed, on the right: recalculation also samples completed (the "START" button became active again, because the Path tracing calculation process completed)

When the calculation is finished, both of the above bars will be green, a message will appear indicating that the calculation is finished, and the **STOP** button will be grayed out because the program will stop the calculation itself (so the user does not have to stop it, although he can do so before it stops automatically).

Sometimes after the calculation in the **"Path tracing"** panel is completed, the top bar will remain black - this will happen when the GI settings were so negligible that they were done in almost zero time - this can happen when the **"GI precision"** parameter is set to a very low value.

During the course of **Path tracing** calculations, you can:

- properties of textures and tiles present in the project and visible in the current view (however, new ones cannot be applied the **"Materials"** and **"Tiles"** tabs in the left menu are grayed out);
- use the texture picking and applying tools ("pipette" and "bucket") to copy textures and colors seen in the current view to other objects in the scene (view recalculation will automatically start over after each change).

2.5. Render tab - Radiosity panel

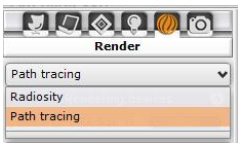

Illustration 3 Choice of algorithm

The Panel **"Render"** in the upper left corner of the screen gives access to two algorithms that calculate global illumination: **Radiosity** and **Path tracing**. The selection of the global illumination algorithm is made in the upper left corner of the screen, in the drop-down list under **"Render"** (Illustration 2).

When the **"Radiosity"** option is selected, the function groups available for it are displayed, divided into panels. The illustration opposite shows the appearance of the **"Radiosity"** panel with all tabs expanded (Illustration 3).

It is a good idea to use the available functions in order from top to bottom (except for some basic options, which can be set at the beginning of the work). All processes that require calculation time are marked with the **"START"** button. Option panels can be collapsed or expanded using the arrows or .

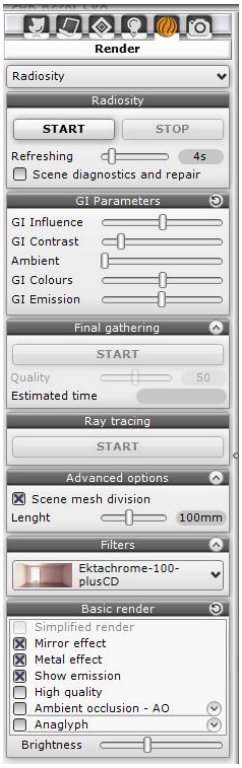

Illustration 2 Render tab, view for "Radiosity" option"

Note: When starting up for the first time, you may encounter a window prompting you to block the program that performs calculations (RenderProcess.exe). To ensure that GI calculations are performed, select the 'Unblock' option. Additionally, after downloading an update, Windows may require you to select the 'Unblock' button again.

Panel	Description
Radiosity	• buttons "**START**" and "**STOP**"- are used to start and stop calculations; • slider **"Refreshing"** - adjusts the frequency of showing the effects of scene enhancement (the more frequent, the slower the whole process, because part of the memory is used to show the results of calculations); • the **"Scene diagnostics and repair"** option - prepares the scene in terms of inverted 3D model surfaces present in it (it detects and inverts them, which is crucial for calculating the lighting distribution using the **Radiosity** algorithm, so this function is enabled by default).
GI Parameters	• they serve to customize the rendering to the individual tastes of the designer; • **"Global illumination"** is a lighting model that takes into account not only the light emitted by the light sources present in the project (as is the case in models using local lighting), but also the rays reflected from objects, walls and floors; • this allows you to get a realistic distribution of light in the room; • changes to the following parameters can be made while the **Radiosity** render calculation is in progress or after it is completed; • GI settings can be reset using the arrow ; ○ **"GI Influence"** - increases or decreases the effect of reflected light on the

	appearance of the scene; moving the slider as far to the left as possible results in a complete lack of effect of reflected light; ○ **"GI Contrast"** - is responsible for how numeric values are translated into RGB color components; ○ **"Ambient"** - refers to ambient (ambient) light, shadowlessly illuminating the entire scene; moving the slider to the right increases the brightness of the entire scene by adding white; a useful feature for scenes that are supposed to be bright and the current settings don't allow it; when using it, it's also a good idea to use the **"Ambient occlusion (AO)"** parameters; ○ **„Color GI"** - changes the reflectance of all surfaces in the scene; moving the slider to the right raises the reflectance (i.e., lowers the light absorption coefficient) - as a result, the image becomes brighter and the phenomenon of color bleeding is more noticeable, i.e., the light takes over the color of the surface from which it was reflected; it is worth using this function when there are a lot of dark materials in the project, strongly absorbing light; ○ **„Emission GI"** - multiplier of all emission materials (emitting light); allows you to quickly change the glow intensity of objects with assigned advanced (real) emission - modifying this parameter for each object individually would be very time-consuming, so we provide a slider, allowing you to carry out the change simultaneously for all of them at once; this function works in the range from 0 to 200% (default 100%) - when you move the slider to the left, the impact of all emission objects in the scene will be zero.
Final gathering	• is an additional scene processing, consisting of extended calculations of lighting distribution on all objects except areas to be tiled (walls and arbitrary elements with the "tiles" option selected), useful when the appearance of some objects is not satisfactory (e.g., objects consisting of many small surfaces that may not be sufficiently illuminated by indirect light); • **"START"** and **"STOP"** buttons - starts and stops calculations (can be stopped at any time); • slider **"Quality"** - allows you to determine the accuracy of the function - the greater, the longer the calculation time; • calculation time is also the longer the more objects are visible from the camera; • option especially useful when the user wants to create an illustration of the project on which a close-up view of a particular object is shown.
Ray tracing	• algorithm for analyzing the refraction and reflection of rays that reach the observer; • Calculates reflections from mirrored and refractive objects (e.g., glass); • supplementing the illumination of the scene with rays omitted from the Radiosity method, which considers only diffuse light; • Among other things, it makes it possible to achieve shine on metal surfaces, realistic light refraction on glass or multiple reflections in mirrors.
Advanced options	• **„Scene mesh division"** - allows the user to decide the density of the scene grid themselves - a value from 20 to 200 mm can be selected; note that decreasing the size increases the number of grids, and thus the time and memory required for calculations. **Please note that the Radiosity algorithm only calculates light distribution for the corners of the object grid in the project. The wall mesh is adjusted to the calculation by default and divided into areas of 100 x 100 mm. Other objects may require modification, such as changing the density of the grid.**
Filters	• list of 23 photographic filters (color tones), allowing you to quickly change the appearance of a scene, for example, to rearrange it in night or day lighting, without having to change many settings; • the filters mimic the way the films of old cameras (e.g., Agfa or Kodak brands) transferred colors relative to the illuminations calculated by the rendering, causing a shift in the range of colors so that the human eye perceives them as more natural;

	• as the tones change the exposure of the scene, it is a good idea to match the intensity of the illumination to a specific filter (e.g. agfa-scala-200xCDPush1 significantly brightens the scene, so the intensity should be lower); • the full list of filters is available after selecting the **Path tracing** algorithm - for **Radiosity** we provide those that work best with this method.
Basic Render	• **„Simplified Render**" – a more memory-economical version of the renderer, which is applicable to computers with weaker specifications and less processing power; it displays the effects in faster time, but the appearance of shadows and relief mapping is less realistic; • „**Mirror effect** – when the lights come on, displays vertical reflections on the objects given them; • „**Metal effect**" – when the lights come on, displays general reflections on the objects given them; • **„Show emission**" – displays the given property of so-called primary emission, i.e. apparent shining (the glow effect, or Light gloom or Glow effect); • **"High quality"** - raises the quality of visualization, if the power of the computer allows it, for example, shadows become softer and better reflect the actual chiaroscuro, and multiple (recursive) reflections in mirrors are displayed; • **„Ambient occlusion - AO"** – that is, the Ambient occlusion method, which is based on estimating how much of an object's surface is exposed to diffused light in the room (ambient light); it is responsible for natural-looking chiaroscuro and gives objects a realistic look; its effect can be adjusted using sliders: o slider **"AO Range" -** sets the range of shadows (moving to the left decreases the range, and moving to the right increases it); o slider **"AO Intensity"**- affects the intensity of the shadows (moving to the left gives softer shadows, while moving to the right gives crisper and darker ones); • **„Anaglyph"** - allows you to create anaglyph images (which give the impression of three-dimensional images when viewed through red-cyan glasses); to get the optimal effect, you can adjust the **"Separation"** and **"Convergence" options":** o slider **"Separation"** - is responsible for adjusting the view to the viewer's eye span (the narrower the monitor, the larger it should be); o slider **"Convergence"**- allows you to set the distance at which the eye axes converge; set it on the object on which you want to focus the viewer's gaze (it will have the smallest red and turquoise "ghosts"); when setting it, you can use the **"Center selected"** option, available under the right mouse button after selecting the object - the convergence will automatically set on the object indicated as the center of the view. • slider **"Brightness"**- determines the degree of brightness of the entire scene and helps control the level of overall contrast.

Illustration 4 Sample visualization obtained with the Radiosity method (Raytracing algorithm was also used)

2.6. Render tab - Path tracing panel

Illustration 5 Choice of rendering algorithm

Algorithm selection is made in the upper-left corner of the screen, in the drop-down list under the **"Render"** tab (Illustration 5). After selecting **Path tracing**, a panel with its functions will open.(Illustration 7). Option panels can be collapsed or expanded using the arrows or .

Illustration 8 Sample visualization obtained with the Path tracing method

Illustration 7 Rendering device" panel information about the card's performance

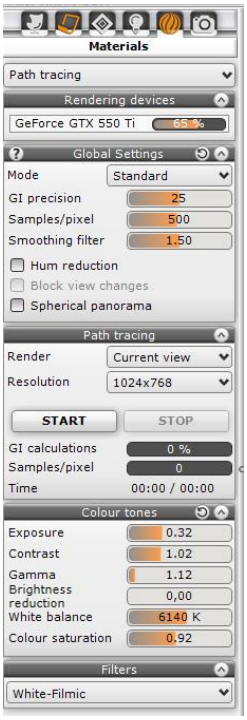

Illustration 6 "Render" tab in the left menu, view for "Path tracing" option

Panel	Description
Rendering devices	▪ the list of NVIDA GeForce graphics cards available on the computer is displayed here (cards from other manufacturers will not appear, because the program does not use them) - if there is more than one, the program will use all the cards visible in this list; ▪ the progress bar gives the amount of memory used for a given card, and if you hover over it, you will see information about the performance of the card, i.e. the level of memory occupancy (e.g. 21% / 2048 MB) (illustration 8) and the number of megasamples per second that can be converted (e.g. 14 Ms/s) (the more, the faster the calculations will run).
Global Settings	▪ contains basic options for the Path tracing algorithm; ▪ for the **"GI precision"** and **"Samples/pixel"** sliders, values can not only be pointed to with the left mouse button, but can also be typed in from the keyboard - after first clicking on the slider with the right mouse button (confirming the value requires pressing**[Enter]**or clicking on another slider); ▪ in the latter case, the entered values can be higher than when pointing with the mouse - the maximums are given below (if the user enters a higher value than the provided maximum, the program will automatically set the allowed maximum); ▪ available options: ○ **„Mode"** - there are three levels to choose from: **"Preview", "Standard"** and **"High quality"**; the choice of mode affects the levels of slider settings, described below, and thus the time required to complete the calculations and the rendering results (the shortest time, and the lowest quality, characterize the preview mode); ○ slider **"GI precision"** - Maximum value that can be specified with the mouse: 50, and by keyboard: 200; this parameter must be increased if the global light does not sufficiently illuminate less exposed areas (e.g. under the edge of a plate, on a hundredle);

	○ slider **"Samples/pixel"**- maximum value possible with mouse: 1000, and with the keyboard: 5000; you have to set this number yourself by trial and error, since it is not possible to determine in advance how many samples will be needed in a given project for the visualization to look optimal; this parameter depends on the number of lights and their types in the scene (the program randomizes which light source is analysed for a given pixel at a given time, and with a large number of lights there is a greater risk that with too few samples any of them will be missed); ○ slider **"Smoothing filter"** - maximum value of 2.00 (regardless of the method of setting), affects the quality of the appearance of edges; ○ **„Block view changes"** - selecting this option causes the view indicated for rendering (visible at the bottom of the screen) to remain unchanged when you move the camera - you can do further work in the project while the selected view is being refined; with the blocking option disabled, each time you move the camera, the view will update and rendering will start over again; ○ the "**Spherical Panorama"** - saves the image as a 360 spherical photo°, which can be posted on social media. The panorama can be viewed in all directions around the starting point (sideways and up and down). In the "**Presentation"** tab, you can also shoot an AVI movie of the spherical panorama (although this is a very time-consuming activity) - while the movie is playing, as the camera moves along the recorded path, you can look around the design.
Path tracing	▪ **„Render"** - here the user selects the views for which Path tracing calculations are to be performed; you can indicate the current view or select views from those previously saved in the **"Scene Settings"** tab in the right panel (description in the box below the table): ○ **"Current view"** - renders the scene as seen by the camera's eye at the moment, at the resolution currently selected in the right panel or from the list below (when you change the resolution in one of these lists, the other is automatically updated-so the same value will always be selected in both places) (Illustration 9); ○ **„Selected Views**" - displays a list of views saved in the **"Scene Settings"** tab on the right menu (Illustration 10) – You can mark with a cross which of them are to be rendered(Illustration 11 and Illustration 12); a preview of the currently rendered view is displayed in the bottom bar - when the calculation for a given view is completed, the image will be automatically saved in the last selected directory; ▪ **"Resolution"** - a drop-down list of available resolutions - from 1024x768, through 1920x1080 and 4K, up to 5760x3240; it is set for each rendered image individually, and not, as in the case of Radiosity, for the whole scene, since Path tracing must be calculated at a specific resolution (the important thing is the number of pixels, which varies depending on the resolution); ▪ **„START"** and **„STOP" –** buttons to start and stop calculations (can be interrupted at any time) (when the calculation is completed, the program will shut down the process by itself, so the "**STOP"** button will grey out on its own; ▪ progress bar **"GI calculation"**- shows the status of the calculation of scattered light in the scene; when the calculation is complete, it displays in green with**"100%"**; in a situation where the parameter **"GI precision"** has been set to zero, this bar remains black (and gives a value of 0%), since in such a situation only direct light (and not scattered light) is taken into account, which is sometimes useful if the user wants to check the correctness of light source settings; ▪ progress bar **"Samples/pixel"** - shows the number of ray path analyses performed for each pixel in the scene; once all user-set samples have been completed, it will display in green with the text "100%". - you should then evaluate whether the number of samples was sufficient (e.g., whether the areas that receive little light are sufficiently illuminated and whether the image shows no graininess ("noise");

	○ If necessary, increase the number of samples in the **" Global Settings"** panel by controlling the slider or typing the value from the keyboard; ▪ field **"Time"** - displays: ○ for rendering the current view: the expected calculation time and the time that has elapsed since selecting the **START** button; ○ in the case of indicating several views to be rendered one after another: the elapsed time from the beginning of the calculation and information about which view is currently being rendered (e.g. 2/5 - that is, the second view of five).
Colour tones	▪ selection of parameters, affecting the appearance of the scene; ▪ available options ○ **„Exposure"** - the degree to which the scene is affected by scattered light - at high levels of this parameter, there may be a loss of detail in the brightened areas ("burned" areas); ○ **„Contrast"** - control the level of contrast; moving to the right makes light parts lighter and dark parts darker, while moving to the left makes the image gray (less pronounced differences between light and shadow and less intense colors); ○ **„Gamma"** – parameter responsible for converting the rendering into an image perceived by the human eye; it is a kind of contrast, standard in all renderings set at 2.5; with some color tones it is necessary to lower this parameter in order not to lead to overexposure of the scene; ○ **"Brightness reduction"** - allowing you to avoid overexposure by minimizing the brightest parts of the scene; ○ **"White balance"** - adjusts the "warmth" of white light - shifted as far left as possible gives an image with warm tones, while shifted to the right results in an un-bleached scene; ▪ color tone parameters can be modified during and after Path tracing calculations.
Filters	▪ list similar to the **"Radiosity"** panel, but more filters are available here; ▪ are the same filters as in many popular renders used around the world, ▪ for many of them it is required to lower the value of the **"Gamma"** parameter to avoid overexposure of the scene; ▪ filters can be changed only for each image individually, and not as in the case of **Radiosity** - for the entire scene; ▪ Filter selection can be made during **Path tracing** or after the calculation is complete.

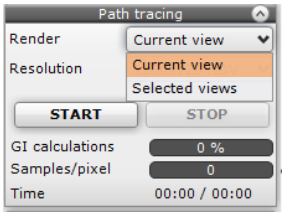

Illustration 9 current view selected for rendering

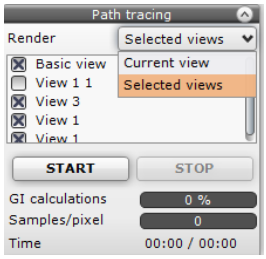

Illustration 10 - selection of "Selected views"

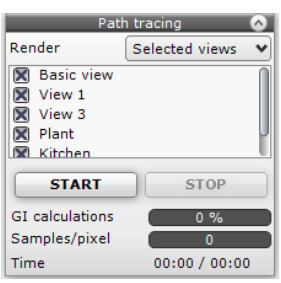

Illustration 11 list of views previously saved in the "Scene Settings" panel in the right menu

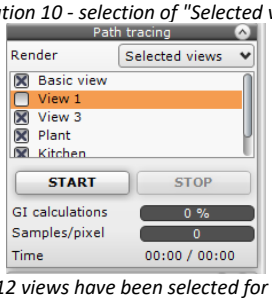

Illustration 12 views have been selected for rendering (views with the selection removed will not be recalculated)

Frequently asked questions about rendering

1. **Question 1. Is it possible to change the intensity of the lights during GI calculations (Radiosity and Path tracing)?**

Yes, this scheme of work is recommended. While the calculation is in progress, you can go to the **"Lights"** tab in the left menu and modify the parameters of the light sources. Refreshing the results of **Radiosity** and **Path tracing** calculations will occur within seconds. In addition, for Radiosity, you can refresh the view using the**[F1]** button.

2. **Question 2. How long does direct computing, Radiosity, Ray tracing, Path tracing last?**

The calculation time of direct, i.e. halogen lights, for example, is usually obtained in a few seconds. In the case of GI lighting, it is difficult to answer this question unequivocally. The duration of GI calculations depends largely on the number of surfaces and the geometry of the scene itself. A message about the insignificance of further calculations will appear after 15 minutes in the case of **Radiosity** (further changes will have minimal impact on the appearance of the scene).

3. **Question 3. Is the calculation of the renderer algorithms done on the computer's processor or on the graphics card?**

The computation of the **Radiosity** and **Final gathering** algorithms is performed entirely on the processor (CPU), while **Ray tracing** and **Path tracing** on the graphics card GPU.

4. **Question 4: Does the Professional Rendering Module use multi-core processors?**

Yes. It can be assumed that the more cores, the proportionally faster the execution time of calculations. This principle will work especially well when using the **Final gathering** method.

5. **Question 5. Is it possible to change the refresh time while the GI calculation is in progress?**

Yes. It is a good practice to set the time at the beginning of the order of 2-4 sec. Then you will already see the preliminary results of the received calculations and you can decide whether to stop the calculations or continue them. If the preliminary results are acceptable then you can extend this time to the maximum to speed up the calculations.

6. **Question 6. Does the rendering program use 64-bit architecture?**

Yes, exclusively.

7. **Question 7. Does the .4CAD environment work on a 64 bit system?**

Yes.

8. **Question 8. When do Radiosity calculations terminate?**

Calculations are performed until the user presses the **STOP** button. When the memory is exhausted or after 15 minutes, a message will appear, reminding the user to finish the calculation.

9. **Question 9. What to do when Radiosity calculations take a long time, and an object that is crucial to the project (e.g., is in the foreground) is still inaccurately counted?**

In this case, stop the **Radiosity** calculation and use the **Final gathering** function. The appearance of the entire scene will then be improved (the exception is tiled surfaces).

10. **Question 10. Is it possible to shoot videos with lighting calculated using the Radiosity method?**

Yes. The calculations once made are remembered in the scene until changes are made and can be used many times later to save frames of the movie or export the scene to files as individual images.

11. **Question 11. How to make a wall division other than the standard 10x10 cm?**

For this, in order to establish the set division, it is best to use tiles of smaller dimensions. For example, you can add a 5x5 cm tile. Apply this tile to the wall or platform of your choice, and then apply any texture and color you want. An additional advantage of working with such a method is the automatic subtraction of adjacent surfaces, which means a better quality of shadows presented in the tops of surfaces.

12. **Question 12. When the STOP button is pressed and the Radiosity calculation is completed, can the parameters of the calculated scene be changed and not lose previous calculations?**

Yes, but only two of them: **"GI impact"** and **"Ambient"**. These parameters can be changed all the time, even after the calculation is completed or interrupted. When you move the **"GI impact"** and **"Ambient"** sliders, the visualization is shown immediately with the new settings.

13. **Question 13. Is the use of the surface inversion algorithm necessary?**

Yes. The question may arise whether it would not be easier to redraw the defective models from scratch, correcting surfaces drawn in reverse. Unfortunately, even with this solution, there remains the issue of user-entered models on their own (e.g., downloaded from the Internet), which may also be drawn incorrectly, or simply inverted from the rest of the objects in the project.

14. **Question 14. Can Radiosity and Path tracing be used simultaneously?**

We do not recommend doing so for reasons of possible GPU memory problems.

Additional information

1. Instructional videos

- Playlist, Visualization | Render"
- Radiosity - stains on objects - diagnosis and repair of the scene and two-sided material
- Glass effect during Radiosity calculations
- Frosted glass effect in Radiosity calculations
- Noise reduction and smoothing filter

2. Shortcuts and commands

The document compares keyboard shortcuts in the .4CAD and visualization environments and lists the most frequently used commands in versions up to 3.Xi/7.X and version 4.X/8.X (both 34 and 64 bit versions of the environment). Find the document at: https://www.cadprojekt.com.pl/zasoby/pdf/opisy-techniczne/shortcuts-4-0-8-0-eng.pdf

This document provides an overview of keyboard shortcuts and commonly used commands in the .4CAD environment for visualization. The shortcuts and commands can be issued using either the mouse or keyboard. It can be accessed at: https://www.cadprojekt.com.pl/zasoby/pdf/opisy-techniczne/shortcuts-4-0-8-0-64bit-eng.pdf

In the above list, LPM and RMB stand for left and right mouse buttons, respectively. A command notation with a + sign (e.g. [Ctrl] + [Z]) indicates that both keys should be pressed simultaneously, while a notation with a >> symbol (e.g. [E] >> [Enter] or [Space]) means that you should first type E and then press [Enter] or the space

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We would like to inform you that we provide training in the use of our programs. For more information, please visit our website: https://www.en.cadprojekt.com.pl/trainings/

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