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Techniques for Rendering Realistic Models in Inventor

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Learning Objectives

- Manipulate Inventor appearances for effective visuals
- Create model geometry for more realistic renderings
- Configure Inventor Studio settings for high quality imagery
- Produce a rendered animation of a model in Inventor

Description

This class will focus on how to use Inventor software to create realistic rendered images and videos. A good rendering is as much about details in the model geometry as it is with the rendering setup. First we will look at some tips to prepare a model so it will be a good candidate for a high-quality rendering. Then the class will run through the tools available in Inventor software and the improvements made to help create a rendering without leaving the Inventor software environment. After a quick look at the realistic view tool and its options, the class will enter the Inventor software Studio environment to set up and create an improved rendering. Once a single image has been, mastered the class will turn to video by animating moving parts and other environment settings.

Your AU Experts

David Ponka received his bachelor of industrial design degree from Carleton University in Ottawa, Ontario, Canada. He is currently a senior applications expert for IMAGINiT Technologies, where he provides consulting services and teaches fundamental and advanced courses for Autodesk, Inc., applications. David began work as a mechanical designer of telecommunications products for in-building radio equipment, and he was then an industrial designer at Mitel Networks. In years prior to working for IMAGINiT, David also worked in the office furniture industry as a product engineer, where he not only designed new product but also helped develop CAD to CAM workflows for wood and fabric CNC (computer numerical control) machine automation. In recent years David has become a mentor on a community FIRST Robotics Team focusing on teaching CAD, mechanical design, and robot construction to high school-aged students.

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Introduction

Inventor Studio is the built-in rendering tool in Inventor. The Studio environment has been around for a long time in Inventor and has become a bit dated but did receive a refresh for the 2016 release. This update has improved the ease in which a user can set up lighting environments while at the same time producing better rendering results. The update also improved the back-end rendering engine and can now create more realistic renderings more easily.

Why Inventor Studio

Before starting the class it is important be clear on what Inventor Studio is and what it is not. Inventor Studio certainly has its advantages and disadvantages when it comes to creating a rendered image or animation. Unfortunately these differences are less shades of grey and more night and day.

What Inventor Studio is good at is reusing your existing model geometry without reloading, reconfiguring it or exporting it. Perhaps its greatest advantage over other applications is that an Inventor user can be up to speed and comfortable with Studio rather quickly. While other applications have advantages they will all have a learning curve beyond that of an Inventor tool set. Things like manipulating constraints, changing appearances and even rotating/orbiting your model may seem insignificant but these capabilities need not be relearned in Inventor Studio as they would be in another application.

On the other hand this familiarity comes at a cost of time and quality of rendered imagery. This is a harsh reality and you might ask why would I bother with Studio? Well, aside from the pros listed above, you may not have another option. Autodesk certainly has other rendering tools available for use. You may have a suite in which case you have access to 3DS Max or Showcase. Both of these will yield better results but 3DS Max is a heavyweight program that requires training and significant knowledge to be able to command. Showcase is much easier than Max but will also require learning new software and it cannot reuse Inventor assets like constraints/joints, parameters, etc. to the degree in which Studio can.

Realistic Views vs. Inventor Studio

The updated rendering engine in Inventor Studio for 2016 will be immediately familiar to users since it renders images in passes much like the Realistic View tool with Ray Tracing on. In fact similar results can be achieved for static images rendered in a ray traced realistic view as with Inventor Studio. When it comes to rendering static images however Studio adds more configurability and a potentially greater quality rendering.

Tip: Realistic Views and Inventor Studio are not available when using express mode.

New Features & Updates

Inventor Studio is an older Inventor environment that has been unchanged for some time. The environment finally received some updates in Inventor 2016 and while they have not transformed the environment they have given users the ability to produce much better results in less time than before.

The update was more a feature refresh than an entire environment revamp but it has done a lot to improve the quality of renderings possible directly in Inventor. No longer do you need to setup point

lights, spot lights or directional lights and painstakingly adjust them to illuminate your model. This was perhaps Studio greatest drawback as it made it extremely difficult and time consuming to achieve a realistic rendering.

Lighting & Environments

The good news is that the updates while small in number make a large impact in usability. The first and most noticeable update is the addition of Image Based Lighting or IBL environments. An IBL environment is basically a hemispherical image that provides a background image for the modelling environment and also uses the image itself to illuminate the model for rendering. This technology is no longer considered new and has been sorely missed in Inventor Studio until now.

With the addition of the IBL environments and a selection of HDR images, the scene setup has been eliminated and the old lighting styles are only included in the form of local lights.

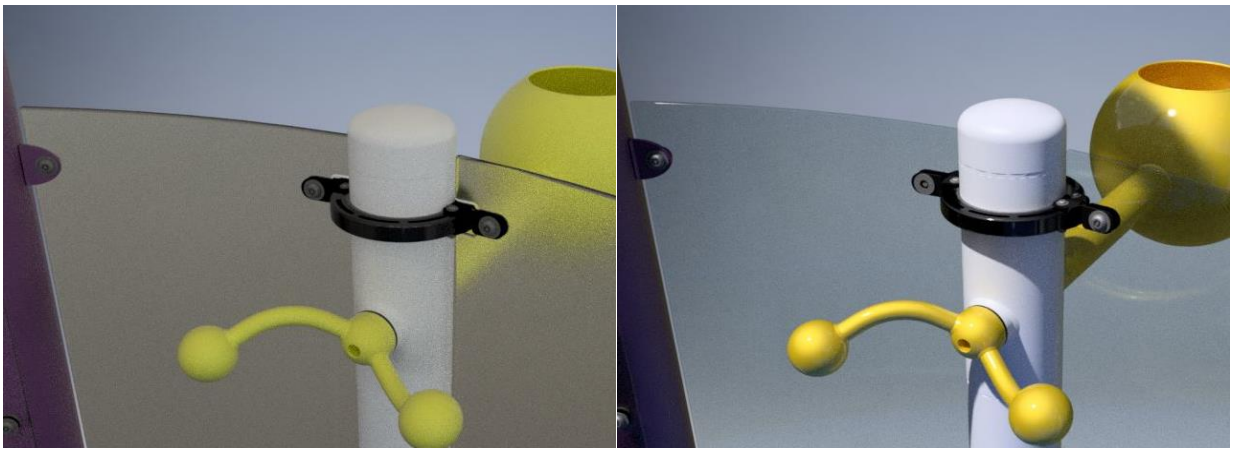
Rendering Engine

The other major update to occur in Inventor Studio was the rendering engine itself. Previously each core of the computer doing the rendering would render a tiny square of the image. All cores would be used simultaneously but all rendering different areas of the image. With the update all cores remain in use but the image is rendered in passes. Each pass improves the detail seen in the rendered image.

Manipulate Inventor appearances for effective visuals

There are a number of key areas that should be considered when creating Inventor Studio renderings. The first thing to consider are appearances that are applied to your model. Appearances are a critical part of creating a realistic view of your model in a rendering. A good appearance can be the difference in a picture of a foggy yellow glass pane vs. a clear one with a slight refraction or blur. It is the difference between surfaces that look like plastic instead of a quality painted finish.

We could spend an entire class, and beyond, looking at appearances alone. There is a ton of configuration available when creating them. However there are a lot of pre-made appearances that are quite good and can be tailored to individual needs with slight adjustments.

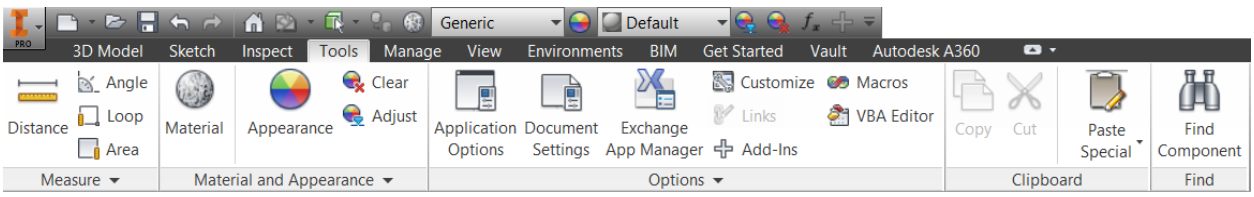


There are three out-of-the-box libraries that appearances can be selected from in the appearance browser: The Inventor Material Library, the Autodesk Material Library and the Autodesk Appearance Library. The two primary distinctions should be made between the Inventor Material Library (which contains appearances) and the Autodesk Appearance Library which includes all the appearances from the Autodesk Material Library plus much more. Additionally the Inventor Material Library can have additions, deletions and changes made and saved to it while the Autodesk libraries are read-only. However materials and appearances can be copied from the Autodesk libraries, modified and saved in the Inventor library if desired. New custom libraries can also be created and saved in the Design Data folder and specified for use in an Inventor project file if desired.

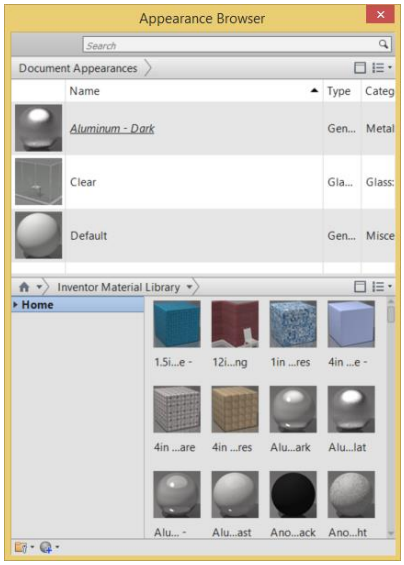
Materials VS. Appearances

There can be confusion between materials and appearances in Inventor because both settings, when selected, will change the look of a part. While the behavior may seem similar these are two distinctly different settings.

When you apply an appearance to a part or a surface you are only apply the 'look' of that selection. The appearance is like a wallpaper only. On the other hand, materials can only be applied to an entire part (not faces) and they contain physical information such as density, stress and thermal properties as well as an appearance.



Appearance Bowser & Appearance Editor

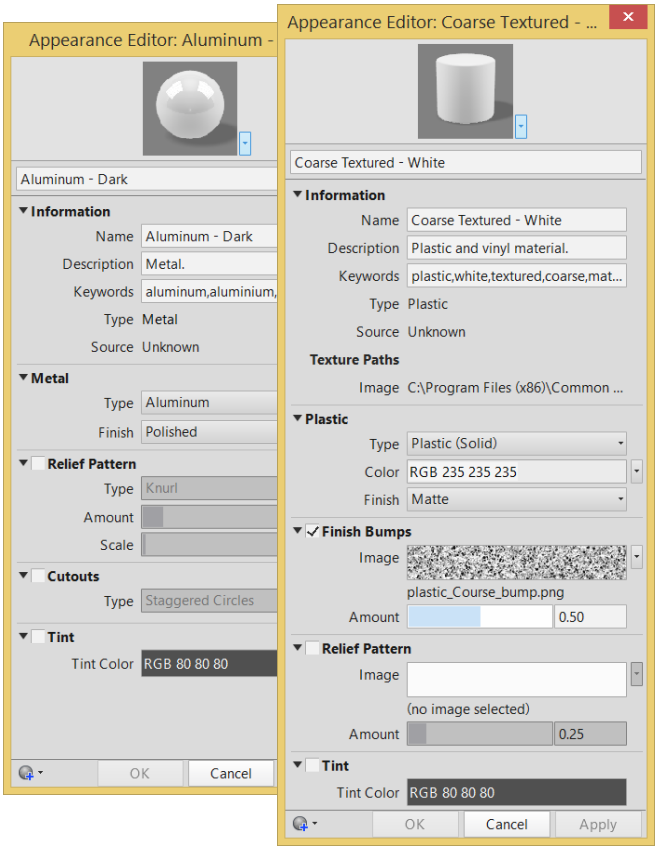


Sometimes an appearance applied to a part is close to the look needed but not quite right. The appearance settings can be edited via the Appearance Editor. The editor is accessed from the Appearance Browser by clicking the button either in the quick access toolbar or on the ribbon.

Once loaded, the browser displays the list of available library appearances in the lower section and a list of the appearances that have been added to the current part/assembly file in the top section. This top area of the appearance browser dialog box is where the document appearances are stored. Document appearances are stored locally, inside the part file, when saved.

Before an edit can be performed on an appearance it must be added to the document appearances. This can be done in two ways:

1. They are automatically added when applied to a part or face.
2. Drag and drop from the library area to the document appearances area.
3. Right-clicking an appearance from the lower section and manually selecting Add To > Document Materials.



Once an appearance is added to the document appearances area it can be copied, modified and/or saved to a library via the right-click menu. An appearance is edited by right-clicking on it in the Document Appearances area and selecting Edit. This brings up the Appearance Editor where detailed changes can be made.

Appearance Categories

One worthwhile note to make before creating or editing an appearance is regarding appearance categories. Every appearance belongs to a category such as ‘Metal’ or ‘Ceramic’ or ‘Plastic’ etc. This selection is made when an appearance is created and cannot be changed thereafter.

The category setting includes the base configuration for an appearance – like a template – and contains all the applicable setting groups for a particular category. For example, ‘Aluminum – Dark’ (shown to the left) includes Metal, Relief Pattern, Cutouts and Tint setting groups while a plastic categorized appearance replaces the Metal group with

Plastic and also contains an additional setting group called Finish Bumps. Even with similarly named groups such as Relief Pattern – that are in both categories – there are different options available.

Tip: The category selection, when creating an appearance, does not place the appearance into the appropriate library folder. There is no link between the two. The library folder is purely organizational while the category of the appearance itself is a definition.

Editing Appearances

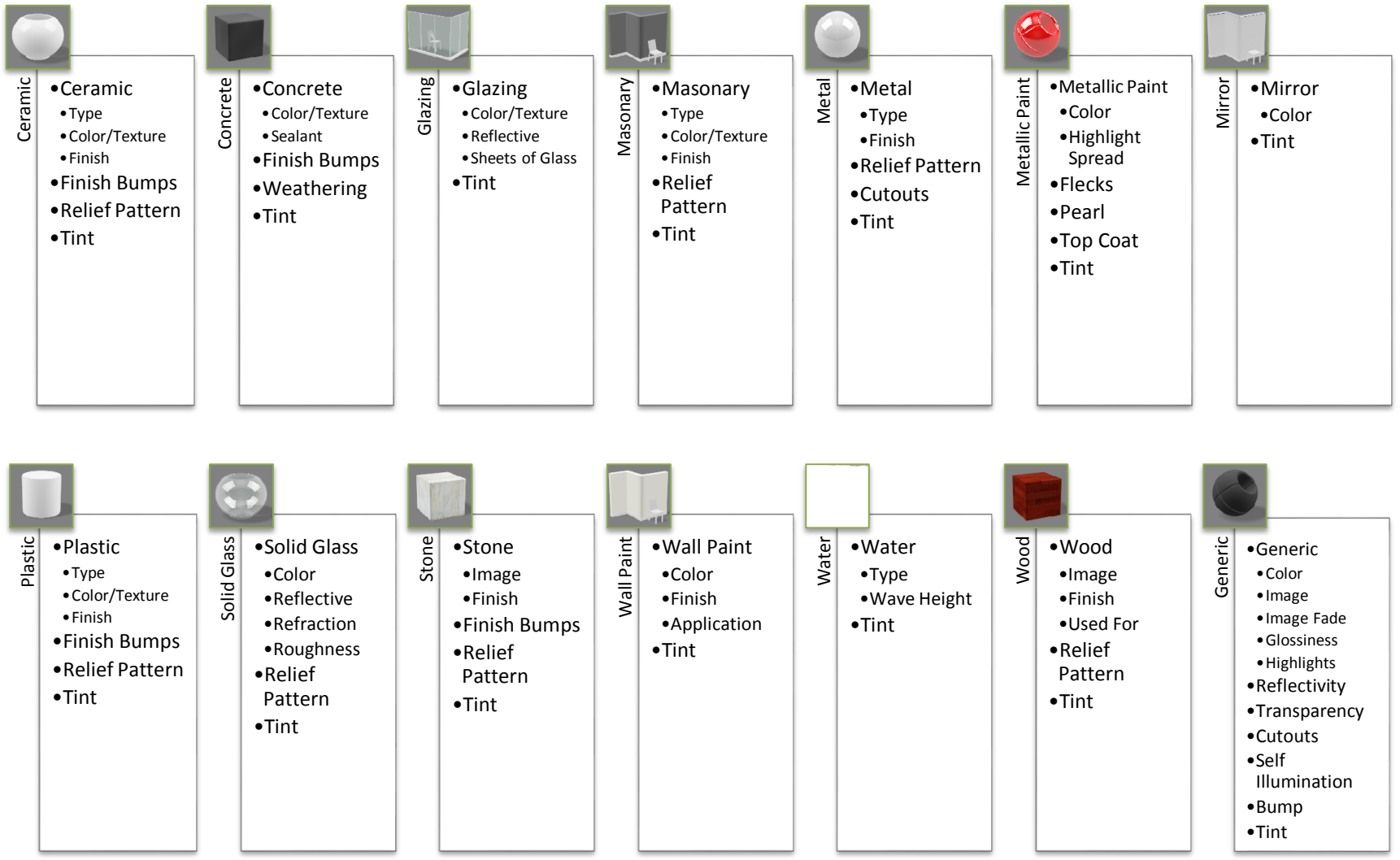
There are a few things to keep in mind when editing appearances that can make your life easier.

1. Turn on the Realistic view, with Ray Tracing off, while making appearance changes. Not all appearance settings are rendered in a standard shaded view. Some, like transparency settings, are not even displayed unless ray tracing is turned on.
2. Apply the existing or newly copied appearance to an object or face on screen so that you can view changes as they are being made. The appearance editor is not a modal window so selections can be made from the model browser or on screen while the editor is open.
3. There is no undo when editing appearance settings. If in doubt, duplicate the appearance first and try some changes. If they do not work out you can revert to the previous appearance style before it was copied.
4. There is a much larger selection of appearances from the Autodesk Library than the Inventor Library. If you find an appearance from the Autodesk Library that is more appealing you can copy it to the document appearances and edit it if needed.

Settings Cheat Sheet – By Category

Once an appearance category has been chosen the settings available to that type of appearance become available in the editor for adjustment. Some of the settings and the functionality between appearance types overlap and are available for more than one appearance. Settings like tint and relief pattern are used in most appearances whereas settings such as cutouts, self-illumination and top coat are specific to an individual appearance type.

Below is a list of all the appearance options available by category. The specific detail of what each setting does is beyond the scope of this course but most are named with a descriptive name and can be tested before application. Changing the 'Type' field under the material specific settings will often change the subsequent options that are available.


Ceramic
•Ceramic
•Type
•Color/Texture
•Finish
•Finish Bumps
•Relief Pattern
•Tint
Concrete
•Concrete
•Color/Texture
•Sealant
•Finish Bumps
•Weathering
•Tint
Glazing
•Glazing
•Color/Texture
•Reflective
•Sheets of Glass
•Tint
Masonary
•Masonary
•Type
•Color/Texture
•Finish
•Relief Pattern
•Tint
Metal
•Metal
•Type
•Finish
•Relief Pattern
•Cutouts
•Tint
Metallic Paint
•Metallic Paint
•Color
•Highlight Spread
•Flecks
•Pearl
•Top Coat
•Tint
Mirror
•Mirror
•Color
•Tint
Plastic
•Plastic
•Type
•Color/Texture
•Finish
•Finish Bumps
•Relief Pattern
•Tint
Solid Glass
•Solid Glass
•Color
•Reflective
•Refraction
•Roughness
•Relief Pattern
•Tint
Stone
•Stone
•Image
•Finish
•Finish Bumps
•Relief Pattern
•Tint
Wall Paint
•Wall Paint
•Color
•Finish
•Application
•Tint
Water
•Water
•Type
•Wave Height
•Tint
Wood
•Wood
•Image
•Finish
•Used For
•Relief Pattern
•Tint
Generic
•Generic
•Color
•Image
•Image Fade
•Glossiness
•Highlights
•Reflectivity
•Transparency
•Cutouts
•Self Illumination
•Bump
•Tint

Appearance Effects

Some very real effects can be created using special appearance settings. Self-illuminating features can create the look of backlit surfaces or objects like LEDs and electroluminescent faces. Transparent surfaces can be given a refraction value to simulate the look of things seeing light through water or diamond. When self-illuminating objects are shown behind transparent faces, additional effects can be achieved like blur and glow through the transparent medium. These effects will add to the realism of a model. To achieve a realistic glow some blur is desired even though it may not occur in the real product.

Tip: There is no specific setting for the diffusion of light in a transparent appearance/material but moving the transparency setting in an appearance slightly below 100% will help to create this effect.

Interesting settings and tips:

- Metal has cutout option which will allow to see through cuts in metal and cast shadows
- 'White' only appears white when rendered through Inventor Studio
- Consider using self-illumination to add light to a low contrast area of a model and increase the rendered detail.

Create Model Geometry for More Realistic Renderings

While the environment, appearances, lighting and render settings have a lot to do with the quality of a rendered image there are other aspects to consider as well. Often times models lack detail that makes a good rendering. Certainly, a model made for manufacturing should only contain the detail required to represent a manufactured product but there are times when adding detail to a model specifically for renderings will yield better results. This could be done in a number of ways such that physical changes for rendering purposes will not affect your manufacturing CAD model. iLogic, Save Copy As or Derived/Shrinkwrapped components should be considered if necessary.

Edges and Corners

One area that can significantly improve the way your models look in a rendered image is by adding fillets and rounding off corners. This will create a highlight on the edge of a model which catches the eye and improves realism.

Without rounded edges or corners there is no opportunity for a transition of light or a highlight to hit and reflect off a curved surface. This creates a lack of visual definition in renderings and makes it difficult to perceive depth and the variation of adjacent surfaces relative to each other. The visuals bleed together to the viewer's eye looking 2D and flat.

The reality is that even if there is a sharp corner produced by a manufacturing process between adjacent faces, a rendering, will produce better results if even a small fillet is applied.

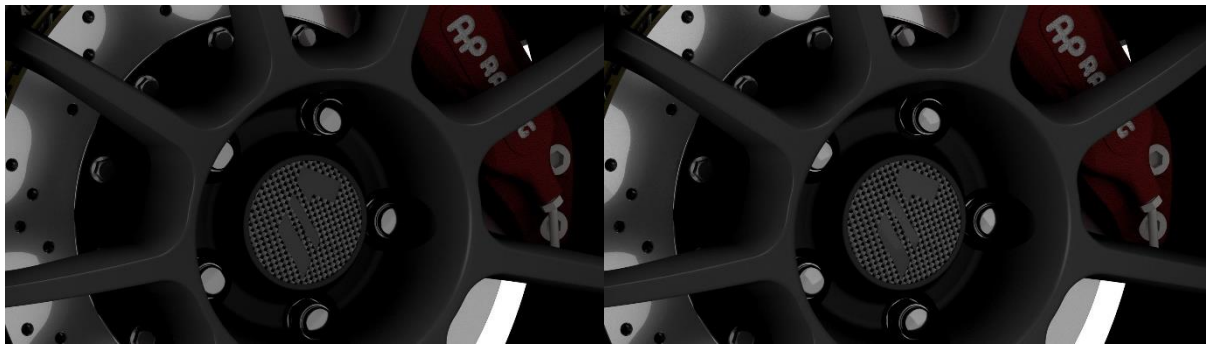
Flat Surfaces

Similar to adding fillets to create highlights between adjacent surfaces, a large continuous flat surface can cause a loss of definition in a rendering as well. The effect is similar but the reflection seen on a surface that is curved can create soft gradients to crisp highlights. Depending on lighting and the surface curvature this effect can increase the visual appeal of an image.

Zero Thickness Geometry

Most work in Inventor is geared toward modeling solids that represent a product with mass. Surface geometry is normally used in workflows to achieve a solid mass by stitching surfaces together or thickening them etc. However, another interesting use for surface geometry is in rendering. A surface, added to a model can be used to reflect or add light onto a feature to increase the visibility of a feature. And. It can also be used to simulate real material in a rendering by applying an appearance to it.

An example of using a surface to increase the visible detail on a rendering is shown below. By applying an appearance from the Generic category and adding a self-illuminating value the light emitted by the surface can be used to indirectly illuminate detail in a low contrast area of the model.



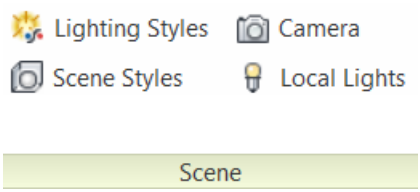
Tip: Using surface geometry will only produce rendered results with ray tracing enabled in the modelling environment.

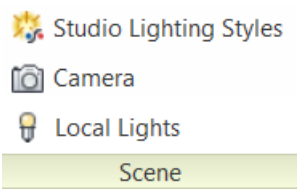
Tip: If a rendering that you are attempting to make shows detail inside a cavity or surrounded by other geometry a similar technique can be used by assigning an appearance override to the underside of a face inside the cavity.

Configure Inventor Studio for High Quality Imagery

Thanks to the updates to Inventor Studio for 2016 there is much less effort required to create an appealing environment to render models in. Previously configuring the environment and lighting setup consumed a lot of time through trial and error. It was extremely difficult to set up an environment to achieve good rendering results.

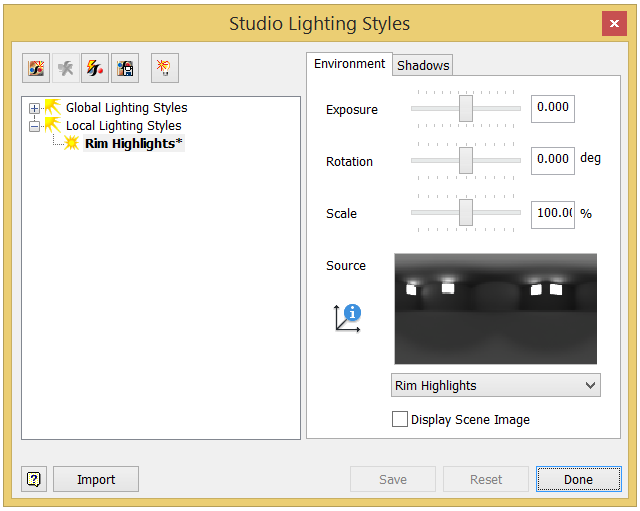
Along with the reduction in set up time, the number of configuration options has also been greatly reduced to simplify the process of creating an environment. The previous Scene Styles and Lighting Styles have been combined in the new Studio Lighting Styles menu. Both the lighting and the environment are set up using the same options.





Environment & Lighting Setup

The new Studio Lighting Styles dialog box is where you can create and edit lighting styles for your rendering. Like appearances a lighting style is activated from a library style listed under the Global Lighting Styles node. Once activated it is automatically copied to the Local Lighting Styles node where it is saved with the file. Any changes to the lighting scheme used for a rendering are done to the style under the local style node.



Recall that the new IBL environments are now what Inventor uses to illuminate your model in space. This image that wraps around your model has three primary settings: exposure, rotation and scale. Bright spots and reflections that are cast on to the model in space are created by the IBL image, these are not directly controllable and if the desired model illumination is not what is desired the best method forward is to try different lighting styles.

- **Exposure** only controls the overall level of brightness in the environment.
- **Rotation** turns the IBL image on an axis about the model. This adjustment can allow light from the image to be cast onto the model differently.

- **Scale** controls the size of the IBL image. Sometimes this needs to adjusted up or down to suit the size of the model being rendered.

The final option, **Display Scene Image**, is a toggle to turn on the IBL image and render it along with your model. Instead of simply lighting the model, displaying the IBL image will render the picture as a background to provide context or a physical environment.

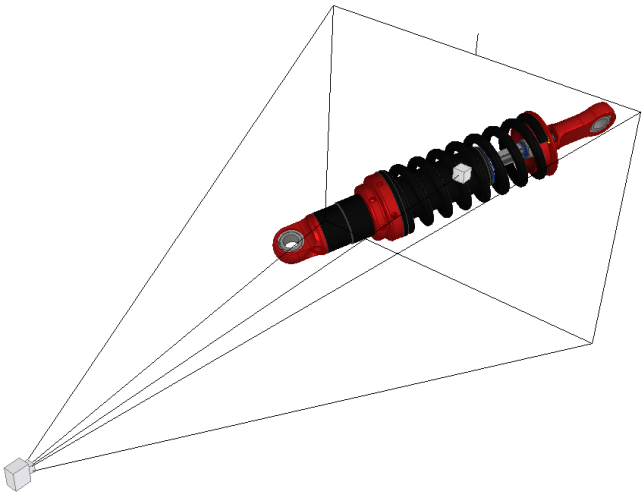
Tip: If a rendering includes the scene image in the background, the default exposure setting will often need to be adjusted to suite the perceived brightness in the IBL image.

Note: While IBL environments have replaced the previous lighting schemes, individual spot lights, point lights or directional lights can still be added by selecting **New Light** at the top of the dialog box. Use these sparingly as they can lower the realism of the rendered image. They are useful though to create highlights and increase light in high detail areas.

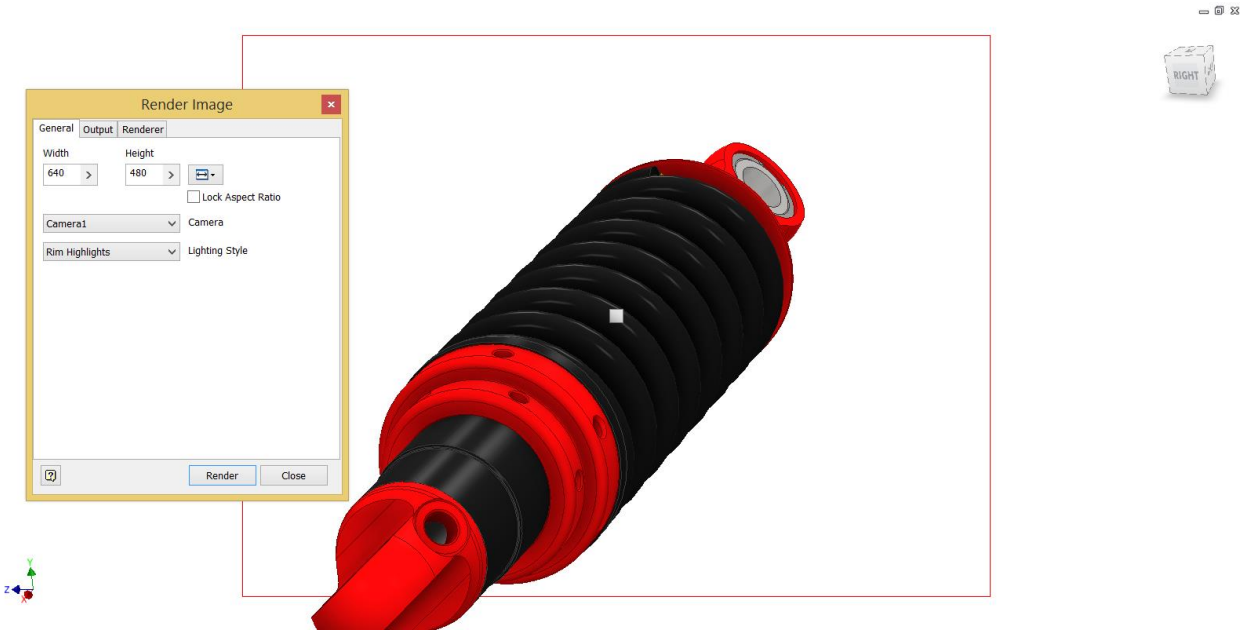
Cameras

Every rendered image should be rendered from the point of view of a camera. The current view option can be used for an orientation on screen for a quick rendering but there is more adjustability and control available when a camera is used. A camera can be created from the current view by right-clicking on the camera node in the model browser and selecting **Create Camera from View**.

Once you have a camera created it contains its own view settings for the rendering of the model. If the camera has been created manually or from a view of the model setting the target is recommended to ensure that the focus point of the camera is set somewhere on the model geometry.



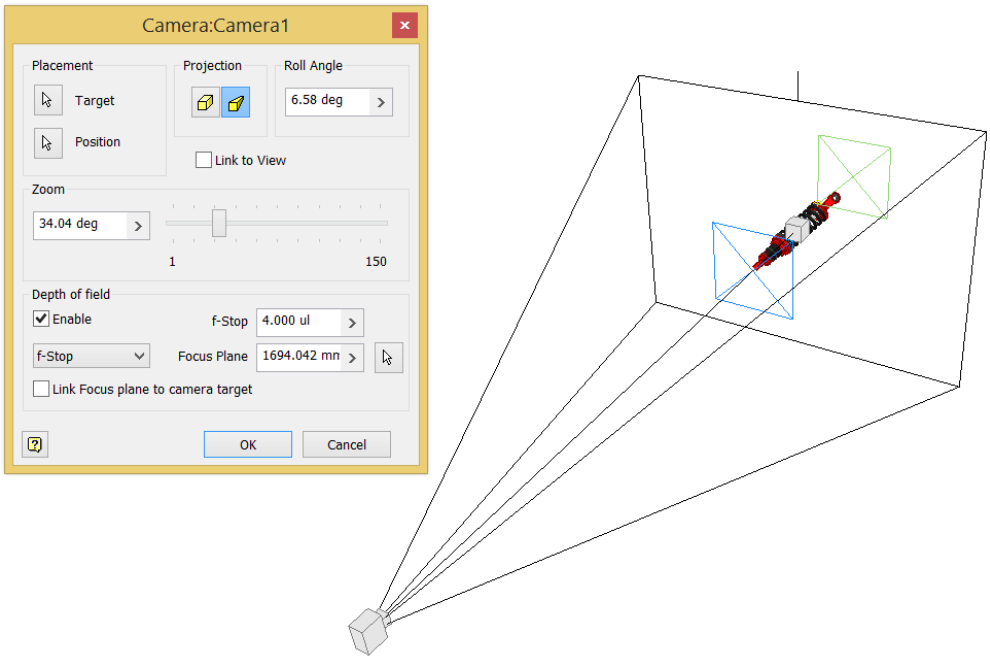
Watch for the camera view boundary preview when rendering an image. This shows what is included in the rendering. It is rarely the same as what is currently visible on the screen.



Depth of Field

A depth of field effect can be included in rendered scenes to improve realism and increase the visual impact of a rendered model. The depth of field will add blur to the model and also the environment background image if one is shown. The main drawback to adding depth of field to a rendering though is the significant increase in rendering time required versus the same image without it.

When activated the focus point will initially be the same as the camera target. It can be moved anywhere away from the target position if desired such as to the model foreground. Once the target is set the actual depth of the area in focus can be adjusted by setting the focus limits or by adjusting the equivalent f-stop value. Prior to rendering, the area in focus can be seen in the camera preview when editing the camera. The depth of focus is indicated by the blue and green plane indicators.



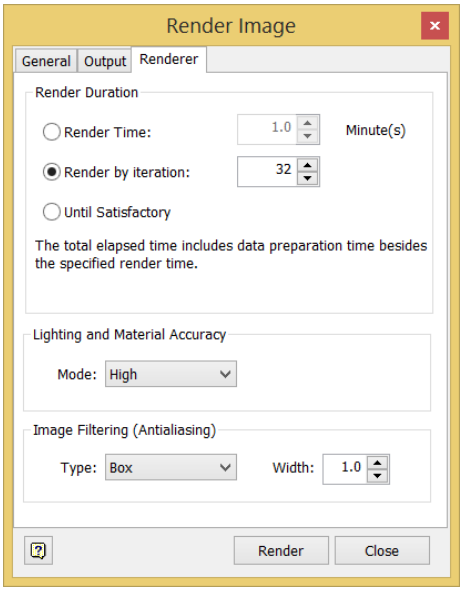
Tip: One thing to keep in mind with depth of field settings is that you often have to exaggerate the blur effect. The warning is that a slight blur will look accidental and detract from a render quality while a more pronounced blur from an f-stop setting will make the effect obvious and more appealing to the viewer's eye.

Render Settings

Once your appearances have been applied, the model geometry finished, the environment and cameras set, it is time to render the image. With the updates to this year's release come a simplified rendering dialog box. On the General tab, the image size, camera and environment settings are selected as before.

The Output tab is the location to automatically save the rendered image when it finishes (The image can always be saved after rendering as well).

Tip: If time permits create the image larger than needed and scale down to blend pixel detail together

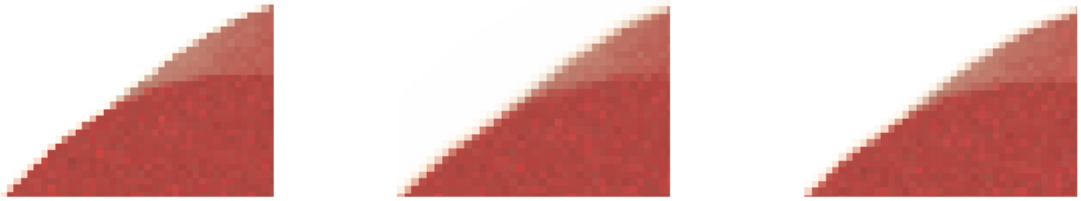


The Renderer tab contains a few new settings. First we select the render duration. There are three settings to choose from: Render Time, Render by Iterations, and Until Satisfactory (go until I say stop). It really comes down to time which directly affects the quality of the finished image. More time equals more passes and will yield a higher quality image. There will normally be a tradeoff here however. Since Inventor Studio has no way of sharing the processor burden across multiple machines the CAD machine performing the render will use 100% of all processors available essentially wiping out the ability to do much else with it. Don't plan on using your computer much while a rendering is taking place.

In the next area of this dialog box; Lighting and Material Accuracy is a familiar setting to control the accuracy of the rendered materials and lighting (this also affects shadows and reflection accuracy). Options available are low, draft and high. There is rarely a reason, even in test renders, to use any setting lower than high because their accuracy is not enough to gauge whether your settings will be satisfactory.

Finally, the Image Filtering (Antialiasing) area sets how much surrounding pixels will affect a pixel being rendered. Changes here are difficult to notice without zooming in to the final rendered image and seeing how edges blend together.

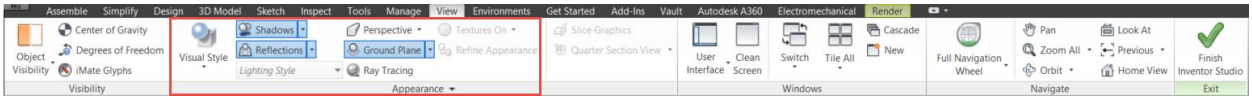
The Type dropdown list contains a selection of methods to blend (or blur) surrounding pixels into a rendered pixel. Box, Triangle, Gaussian, Lanczos and Mitchell are all different methods for averaging/combining surrounding pixel colors into any one pixel. The width sets the range of pixels to average that will control the pixel being rendered. A smaller width will create a crisp edge while a large area will create a softer edge. Some experimentation here should be performed before a final render to see the best results based on the environment and appearances in the model.



Shadows, Floor and Reflections

You may be wondering where shadow settings have gone. Shadows and their sharpness were previously a part of the render settings dialog box. In Inventor Studio 2016 there is no control for shadows directly in the render dialog box. There is a single environment setting to control shadow softness but there is no on/off control here.

Shadows are now enabled in Inventor studio by using the shadow controls on the view tab. Shadows, reflections and/or the ground plane can be enabled/disabled and configured from the view tab whether or not the studio environment is on.



Produce a Rendered Animation

When the goal in using Inventor Studio is to create a render quality animation there are a few things to keep in mind before starting. Producing an animation, while easy to configure, will take MUCH more time to render than a static image. This is because a static image is one single render operation versus an animation that will need an image rendered for each frame. If you render an animation at 20 frames per second (fps) then for each second the animation runs 20 images will have to be rendered. For a 10 second animation that's 200 images.

At HD resolutions a quality rendering, depending on transparency, reflections, depth of field etc., may take 5-10 minutes per frame to get a decent quality output. Being conservative, a 5 minute per frame render will take over 16 hours to complete. If an HD quality animation is your goal, and you would like to use your computer again for work, I strongly suggest another rendering tool such as 3DS Max.

If a short rendering is all that is needed to illustrate a particular movement or if the resolution of the video will be quite small then Studio might be a good fit.

Animation Types

The nice thing about Inventor Studio animations is that they do not take a lot of extra effort to setup beyond your initial modelling work. You can use existing constraints, parameters, positional representations, etc. to help setup the animation.

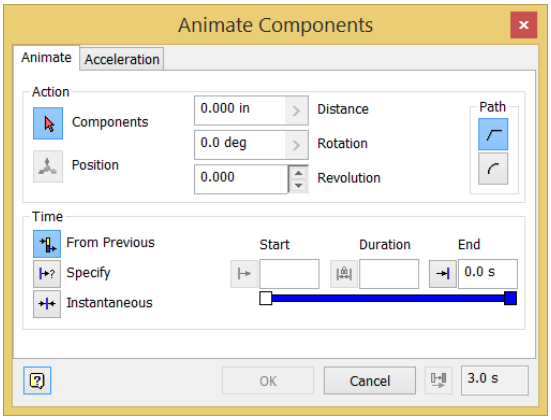
If you have setup a static rendering and your model appears satisfactory then you can move on and begin creating an animation. Before a specific animation sequence can be added you must right click on the animation node in the browser and create a new animation. Like a design view multiple animations can be saved here and then compiled together using the producer. Once an animation exists in the model browser specific animation sequence types can be added.

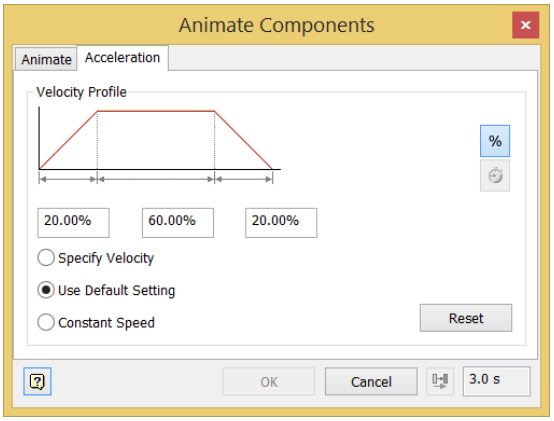
Animate Dialog Boxes

Part of what makes Inventor Studio animations easy to produce is the consistency of the animate dialog boxes. For each dialog box there are typically two tabs. On the first tab, in the top section, are the animation control settings for that particular type of animation. This is where the bulk of the animation sequence work is done.

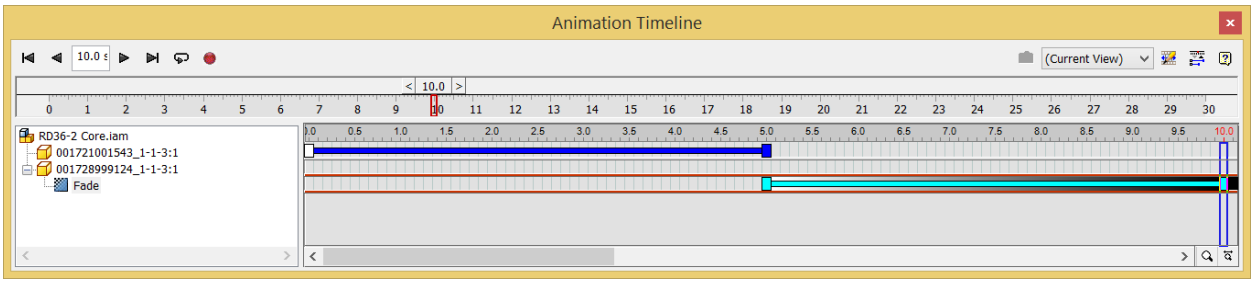
In the lower half of the first tab are the timeline controls (i.e. when and how long the animation runs in the animation timeline). Here you can set when an animation sequence starts and when it ends. The 'From Previous' options appears to be broken for Inventor 2016 but the way it is supposed to work is

that it will add an animation sequence to start at the end of the previous sequence. The workaround here is to use the Specify option and set the start time and then duration or end.





Tip: if you aren't sure what the time settings for an animation should be they can always be edited. The easiest way to edit the timing is to drag the start or end keyframes in the animation timeline.



The second tab, Acceleration, controls the speed of an animation over its run time. How an animation accelerates during the start and decelerates to a stop. There is a global setting for this in the animation timeline options and also in each animation dialog box if you wish to override the default setting.

Tip: setting a period of acceleration/deceleration add realism to animation sequences.

The following section is a brief overview of the animation options available.

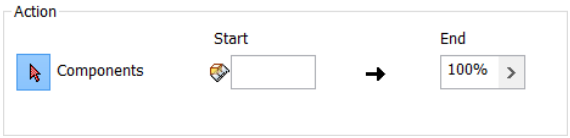
Components

The component animation dialog allows for the movement (linear or rotational) of a selection of components in the model. These components can only be moved within their degrees of freedom using the Animate Component tool. If there are constraints placed on components then movement is restricted by the constraints applied.

First select the components to include in the sequence then select the position button. With the position button enabled you can either enter values directly in the dialog box to control the animation's movement or click and drag the triad that is displayed on screen.

Fade

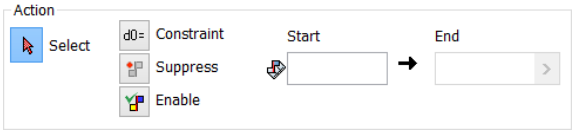
The fade animation tool will change the transparency of a selection of components. Simply select the components to change the transparency and select the ending visibility percentage. 100% is fully visible and 0% is fully invisible. The starting visibility is not selectable as it is set automatically by the current state of the component selected when the fade animation sequence starts in the timeline. If a component is invisible and you would like to make it visible, select it from the model browser and set the ending visibility to 100%



Tip: the fade function was broken in the RTM release of Inventor 2016. In order to get this tool to work you must install Inventor 2016 SP1

Constraints

The constraint animation tool works similar to a drive constraint. You select the constraint to animate and you can either animate the offset value parameter producing a motion sequence or you can enable/suppress the constraint.

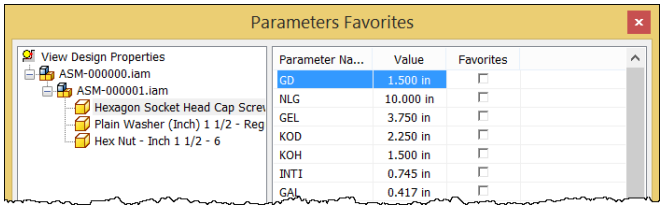


Tip: To use the Component animation tool, described above, with a constrained object you could suppress the constraint first here then move a component using the component animation tool.

Parameters

The parameter animation tool can be used to animate motion of any user parameter in the component. It can animate a constraint parameter or a model parameter and is perhaps most useful to simulate flexible parts (like adaptivity). You can animate springs and similar elastic components with this tool.

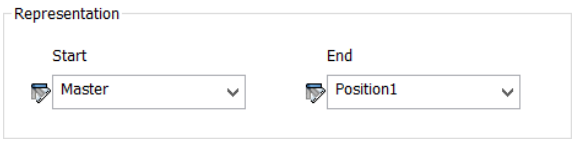
This tool only works on with user parameters that are set as favorites prior to entering the parameter animation dialog box. To set a favorite parameter hit the Parameter Favorites button on the Render tab in the Manage panel. In the dialog box check off parameters from the list to set as favorites.



Favorite parameters are then selected from the Animation Favorites node of the model browser when configuring a parameter animation.

Pos Reps

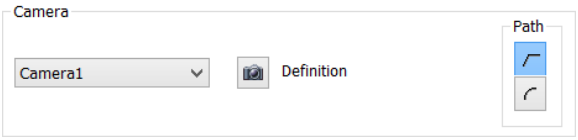
Positional representations in an assembly can be used in an animation. Simply select the starting positional representation and the ending positional representation and Inventor Studio will animate the motion in between.



Camera

Every rendering should ideally have a camera setup to view the model and render it from. Recall that the camera settings include the camera position, target, roll, zoom and depth of field settings. These can all be animated from their initial setting to a final setting.

When animating a camera select the camera from the drop-down list. Selecting the Definition button will present the edit camera dialog box. The settings you are configuring here are the ending settings of the camera. The animation will start from the initial setting to the settings set in the animation dialog.



Camera animations have an additional Turntable tab in the dialog. A common animation type is to have a model perform a full rotation in front of a camera to give the viewer a clear view of all sides of a model. A turntable animation can be selected by checking the Turntable option and then setting the rotation axis, direction and number of revolutions or revolutions per minute/second.

Light

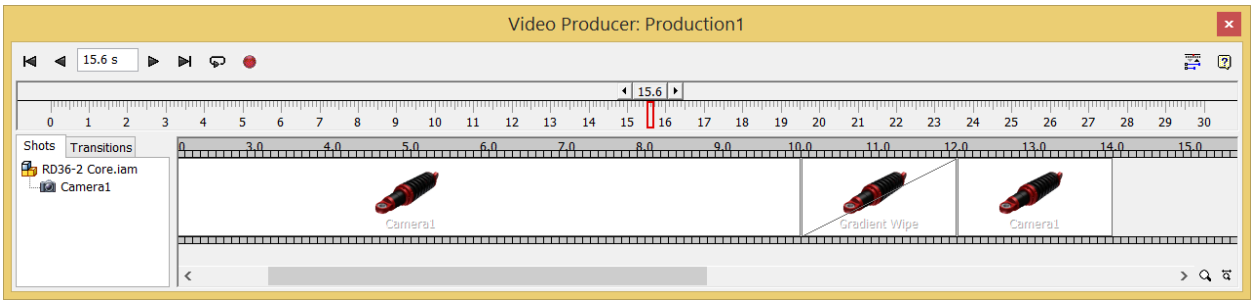
The final animation type is the light animation. If you have configured a local light or a traditional light in the environment you can animate it using this tool. Similar to the camera animation, the light animation starts the animation from the initial light settings and then creates the animation based on the adjusted settings used from the light animation dialog box.

Unfortunately this tool will not animate the environment IBL image itself, only the historical local/environment lights that have been added to the scene in addition to the environment.

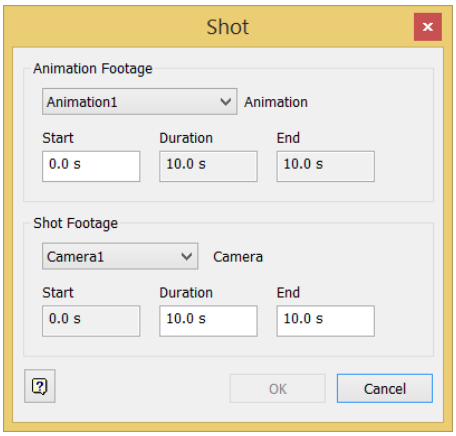
Video Producer

The video producer can be used to create an animation sequence using multiple shots from different cameras and the different animation sequences that you might have created in studio. Every camera

available is listed automatically on the left hand side of the producer. To add it to a production drag it into the desired spot in the timeline. The length of time each animation shot runs can be changed by dragging the sides of the camera shot inside the production timeline.

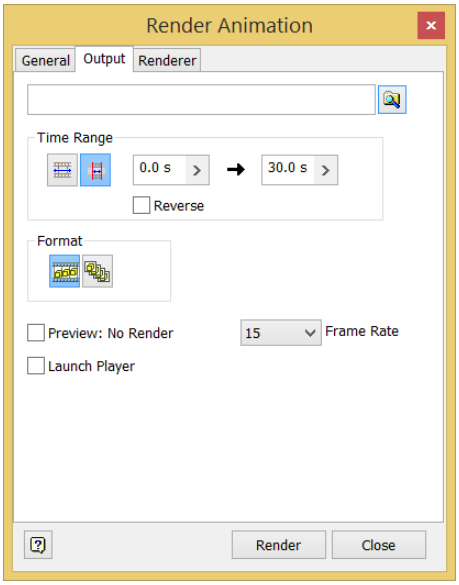


If you have multiple animations setup they cannot be directly selected from the production timeline. Instead add the camera shot that will have a different animation. Then right-click on the camera shot in the timeline and in the Shot dialog box you can select the animation sequence and/or the camera. You can also use this dialog to set the start/duration/end timing of a shot.



Tip: If you have a video editing tool other than Inventor such as Camtasia or iMovie (there are a wide variety available from free to professional quality) it is recommended to animate each animation separately in studio and create a production with transitions etc. inside a 3rd party video editing software.

Render Settings



Finally you are ready to render your animation. After setting up your model, your appearances, test rendering static images and then adding your animation sequences you are ready to set your computer to muscle through producing a video.

The **Render Animation** button opens the render dialog for creating video files. The only thing different here than from the Render Image dialog that we looked at earlier is the Output tab. Here you can select the file save location and format (WMV or AVI) and some other video options.

What is being rendered

If you have multiple productions or multiple animations or both how do you know what is being rendered when you hit the Render button? Studio works like this; if you have a production and multiple animations then the production automatically gets rendered. If you have multiple productions then the active production, in the model browser, will be rendered. On the other hand if you have no productions and only animation sequences then the active animation sequence in the model browser will be what is rendered. You can always double check this before committing to hours of rendering work by selecting the **Preview: No Render** option and clicking Render.

If you have created a production the time range of the rendered video will be automatically set to the total length of the production. If you only have animation sequences then you will have to set the render end time to the end of your animation sequence manually.

In the format area you select whether to output a video file or each rendered image individually. The set of images can be compiled by a 3rd party software package into a video later if desired to create different effects.

The frame rate setting has a significant impact on your render quality and processing time. To create a smooth animation you need over 20 frames per second as a minimum. The tradeoff here however is that a small change, from say 10 fps to 20fps will double your rendering time.

Tip: Render test videos with a low frame rate to verify the animation results then increase the frame rate for the final rendering commitment.

Final Thoughts

As you have no doubt seen throughout the demonstration, Inventor Studio is has an uncomplicated interface and is immediately familiar to Inventor users. The time to learn the studio environment is fairly low and users comfortable with Inventor can be up to speed and creating quality renderings with minimal time spend learning the new tools.

There are notable limitations however and the Studio environment certainly does not fit all applications. If you are rendering a lot of animations, have long video productions, are in need a physics engine, gravity simulation or want to share the processing burden across a network to reduce rendering time then Inventor Studio is not likely a good fit for you. On the other hand if you are an Inventor user who needs a quality rendered image or small animation then Inventor Studio may be the best fit.

Things to Keep in Mind

- Always use perspective mode and the realistic view when working in the studio environment.
- Transparent, reflective and self-illuminating appearances will all increase the render computation time.
- Use self-illuminating surface geometry to add brightness and maintain physical model characteristics.
- Scale down larger rendered images to create a softer image.
- Modify geometry specifically for renderings using fillets, curved surface, etc. to achieve highlights.