

## **AUTODESK INVENTOR A SOFTWARE FOR MOTION SIMULATION**

EDUARD EDELHAUSER

Abstract. The aim of this paper is to emphasize on the simulating assembly motion via Autodesk Inventor Studio (AIS), which is one of the most powerful tool for a designer engineer. As ever, the starting point is your part or assembly model, as it's this you're rendering up. As with almost all rendering systems, there are key components to any rendering 'scene'. The part geometry should already be complete or at a stage that you're ready to do some views. You also need to define materials, lights and the scenery/background.

### **1. NEW! AUTODESK INVENTOR STUDIO AUTODESK INVENTOR IS A WIZARD WHO CAN PRODUCE MOTION SIMULATION INSIDE A CAD SOFTWARE?**

New brand area to Inventor 10 is Inventor Studio. Autodesk has a rather large stake in the rendering and animation market with its recently renamed Autodesk Media and Entertainment division. But despite the wealth of knowledge and expertise within the company, there has never been a real rendering solution for Inventor from Autodesk – with the company preferring to push its Autodesk Wizard or 3D Studio Max applications to those users looking to create photorealistic renders and animation. This has now changed with the introduction of Inventor Studio. Essentially, this a set of fully integrated rendering tools built directly into the Inventor interface, based on the mental ray rendering engine.

An area that has been requested by many CAD users is the ability to make photo realistic renderings of their models. Now with Inventor Studio which comes standard with either the Series or Professional version you can generate these State-of-art photo-realistic rendering and animations directly within the design environment. Reduce prototyping costs by creating high-quality photorealistic renderings and animations.

AIS not only define the appearance of your parts within the modeling environment, but also the physical/material properties. If you haven't done this or need to adapt them to specific purposes, this can be done through the Studio interface. Once done, you're ready to create the rendering specific items. The good news is that a great deal of these parameters can be set by selecting them from the library of presets for both lighting set-ups and scenery/background. When you enter the Inventor Studio (available from the Application pull-down menu), you're presented with an Inventor Studio panel that contains links to the dialog boxes for each. For example, clicking the Scenery icon brings up a dialog from which you can select from a number of pre-set scenes and backgrounds. The same is true of the Lighting dialog. Both scenes and lighting set-ups can also be created from scratch using the clear tools or you can use a pre-set to build a specific variation. The camera controls are also worth a note as they're particularly easy to define – particularly when you use the Set Camera to View. This allows you to set-up the orientation of the model using the standard view port manipulation tools then create a camera that matches that view. This is then available in the rendering and animation tools. Once you have your model in position and the rendering requirements set-up, the final stage is to click the Render Image button. This provides you with both global controls over the scene as well as the image output, such as anti-aliasing quality (higher quality anti aliasing means more compute time) and image resolution. As with most rendering processes, you're most likely to start with a rough, low-res renders, then commit to a higher-resolution when the scene is just as you want it. The benefit here is that because the various cameras are parametrically linked and editable, you can quickly store potential views and return to them to make minor modifications. Combined with the reasonably quick render times (or so we found), you can create some pretty compelling imagery in very little time.

One of the powerful capabilities of 3D design software such as Autodesk Inventor is support for creation of 3D images of proposed designs. When you can present intuitive renderings of design ideas before any prototyping or production takes place, you save costs and time to refine concepts to meet customers' approval.

From the Inventor 10 Professional side the enhancements come in the form of incorporating user feedback and maturing existing modules. This can be seen in little changes such as the ability to use frictionless supports when running stress calculations, or the fact that piping is now part of the new content



Figure 1: The Autodesk Inventor Studio control panel includes tools for rendering and animation effects



Figure 2: AIS create compelling images and quickly illustrate concepts using this methods

center and not stored as separate data. Inventor 10 Professional continues to close the loop on the engineering solution set that allows for minimal prototyping and maximum success the first time out.

Autodesk Inventor Studio Environment tool reduce prototyping costs by creating high-quality photorealistic renderings and animations. Improve communication by quickly illustrating concepts for presentations. With Autodesk Inventor Studio you produce state-of-the-art rendering and animations directly in the design environment. Now you have streamlined access to this specialized and typically expensive functionality without having to learn a separate application.

The software includes basic tools to complete the following tasks: Definition and application of textures and materials that show reflections, bump maps, surface qualities and color, Definition and setting of lighting, including omni, spot and directional effects with shadow maps or ray-traced shadows, Definition of the environment or studio standard for representing objects, Rendering and viewing designs. Additionally, advanced tools help you set the duration and format of animation, and automate animation of subjects including: Moving parts, Component transparency, Assembly constraints, User parameters and Camera motion.

Autodesk Inventor Studio is designed for convenience and not only by allowing you to render ideas within the same application environment. Pre-set studio and lighting effects can make it fast and easy to choose characteristics that give your image the quality and realism you want to present. What's more, Autodesk Inventor Studio automatically integrates your definitions of materials, textures and colors from Autodesk Inventor as a starting point for your rendering, saving even more time and effort to prepare the image.

When it is time to simulate assembly motion, Autodesk Inventor Studio offers a suite of key frame animation tools. Designers can utilize their design constraints and parameters or create new motion paths with the animation tool set. The key frame grid provides an intuitive timeline for managing animations as they are created and include controls for camera, lights, position, orientation, and visibility. The animation playback controls include all the standard options along with sliders which can be edited for effects.

One of the powerful capabilities of 3D design software such as Autodesk Inventor is support for creation of 3D images of proposed designs. When you can present intuitive renderings of design ideas before any prototyping or production takes place, you save costs and time to refine concepts to meet customers' approval.

Now Autodesk Inventor 10 lets you create high-quality, photorealistic renderings and animations within the Autodesk Inventor design environment. New, special tools help you define lighting, camera angles, animation parameters and background style to make images that best present your ideas.

## 2. A FEW STEEPS FOR MOTION SIMULATION

Rather than launching a new application to create photorealistic images of your designs, all you have to do is switch to the Inventor Studio Environment

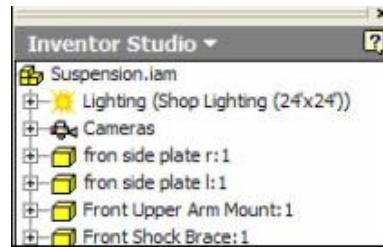


Figure 3: The browser view of Autodesk Inventor Studio shows an alternate view of rendering and animation controls

by selecting Inventor Studio from the Applications pull-down menu. Autodesk Inventor loads the Inventor Studio application, and the user interface shows a new command panel with rendering and animation tools (figure 2).

The software includes basic tools to complete the following tasks:

- Definition and application of textures and materials that show reflections, bump maps, surface qualities and color
- Definition and setting of lighting, including omni, spot and directional effects with shadow maps or ray-traced shadows
- Definition of the environment or studio standard for representing objects
- Rendering and viewing designs

Additionally, advanced tools help you set the duration and format of animation, and automate animation of subjects including:

- Moving parts
- Component transparency
- Assembly constraints
- User parameters
- Camera motion.

For those who prefer the browser view, these functions are displayed in a new information tree (figure 3).

To establish standards to ensure your presentation images are consistent, you need to adjust the Background and Floor settings in Autodesk Inventor Studio. Images, environment maps and color effects such as gradients between two colors offer interesting backdrops to set off your design. Select Scene Styles and click on the Background tab. The background is preset to X-Z Reflective



Figure 4: Click on the Gradient icon, and then choose colors to create the effect shown in the lower left preview box

GP (tan). Preview other pre built studio styles with a right-click on any of the options in the scroll-down list and select Activate.

#### **Adjust the Background Setting.**

- Choose a background effect by clicking on any of the Type icons.
- Create a gradient by choosing that option and editing the top and bottom colors; in this example, shades of blue-gray make a simple and neutral background (figure 4).

**Adjust the Environment.** To refine the background effect, click on the Environment tab to display your options for the direction of gradient, the degree of contrast and other effects (figure 5).

- Choose the X-Z plane direction for a vertical gradient effect, and enter a value that is close to the location of the floor. In this example, a value of -1.21 works well.
- Check Show Shadows and set a value of 33 percent, for a natural-looking blend from object shadows to the floor of the image space.
- Choose Show Reflections to create this effect on the floor of the image space. A value of 10 percent provides just a hint of a reflection, adding interest and drama to the scene.

**Set the Pre-Defined Views.** When the Camera isn't real, it's shorthand for a great way to set up pre-defined views that you can use again and again

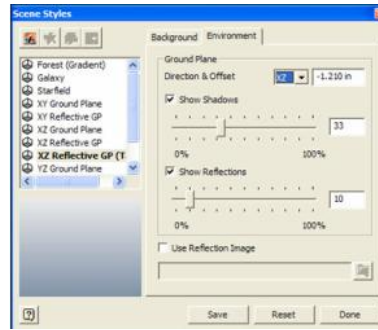


Figure 5: Set Environment options to create visual interest in your rendering studio

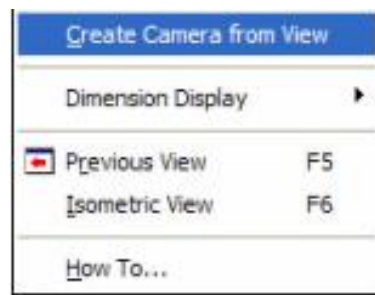


Figure 6: Choose Create Camera from View to establish specific, consistent presentation of objects

as your design changes or evolves. Here are steps to create a view that is close to isometric and fills the frame with the design, presenting as much detail as possible.

- Position the model where you want it to be.
- Right-click on the background in the Inventor Graphics window, then select Create Camera from View (figure 6).

**Set Lighting.** Lighting is vital to the quality and realism of your design rendering, but it can be the hardest step to get right. Autodesk Inventor Studio includes pre-created lighting effects to make this work easier.

- Open the Lighting dialog box. You can preview the pre-defined lighting options by activating any of them in the scroll-down box (figure 7).
- Adjust shadow type and quality by clicking on the appropriate icons,

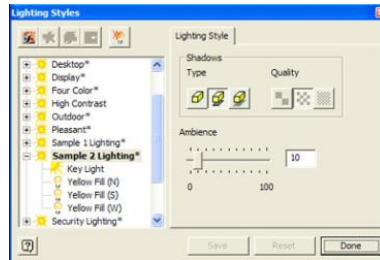


Figure 7: Select from a wide range of lighting effects, and then customize shadows and ambience for even greater realism

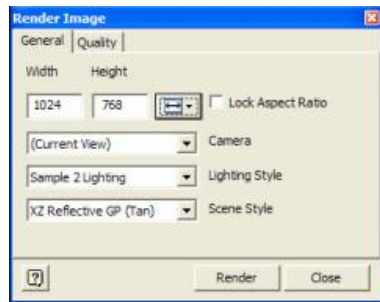


Figure 8: Verify the parameters you've set for your scene before you render it

and adjust the ambience level for the desired effect. Ambient lighting lets you adjust the global lighting of the scene. If your rendering is too dark or too light, use the ambient lighting to adjust for your desired results.

**Render Your Scene.** Now you're ready to render your scene.

· Click the Render command and make sure that the scene selections and specifications are correct (figure 8).

### 3. CONCLUSIONS

We can say that Autodesk Inventor Studio is designed for convenience, and not only by allowing you to render ideas within the same application environment. Pre-set studio and lighting effects can make it fast and easy to



choose characteristics that give your image the quality and realism you want to present. What's more, Autodesk Inventor Studio automatically integrates your definitions of materials, textures and colors from Autodesk Inventor as a starting point for your rendering, saving even more time and effort to prepare the image.

High-quality, compelling presentations of complex design concepts and animation of parts interaction can be an indispensable tool in communicating your ideas to customers and coworkers who are not engineers. By reviewing the form and function of your designs in virtual format, you save prototyping costs and get to the right design for your customer more quickly.

#### REFERENCES

- [1] Badut Mircea, *The AutoCAD in three snaps*, Polirom Publishing House, Iași, 2004
- [2] Edelhauser Eduard, *Computer aided design tutorial*, Universitas Publishing House, Petrosani, 2004
- [3] Edelhauser Eduard, *Autodesk Inventor an engineer who knew a lot of mathematical formulas and physical theories or a wizard who can produce motion simulation*, Bulletins for Applied and Computer Mathematics (BAM), PAMM Balmadi, May 2005
- [4] Harrington David J., *AutoCAD 2005*, Teora Publishing House, Bucuresti, 2005
- [5] Schneider Kevin, *Inventor In-Depth: Create lifelike renderings with Autodesk Inventor Studio*, Cadalyst Magazine, May 15, 2005

Eduard Edelhauser  
Petrosani University, Petrosani, Romania  
email: [edi1ro2001@yahoo.com](mailto:edi1ro2001@yahoo.com)