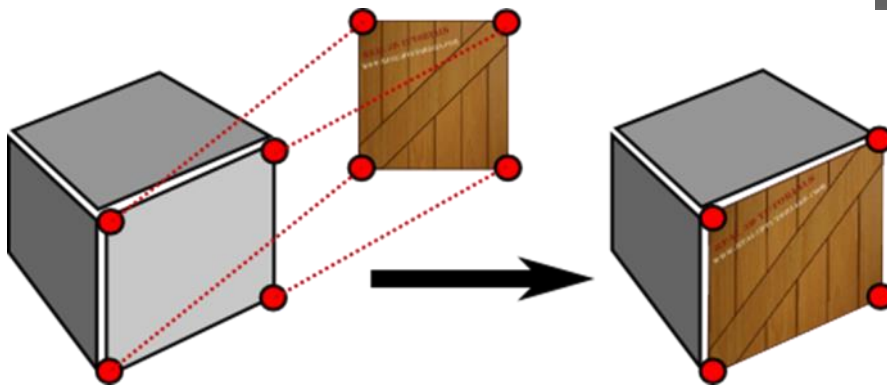


Graphic Rendering

Objects drawn with 3D CAD or other computer-generated models are usually rendered to give them a more realistic look. This theory sheet looks at the different processes you need to know for Advanced Higher Graphic Communication.



Texture Mapping

This is a process whereby a texture is applied to the surface of a 3D CAD model to make it look like a material. The finished surface may look like timber, brick, etc.

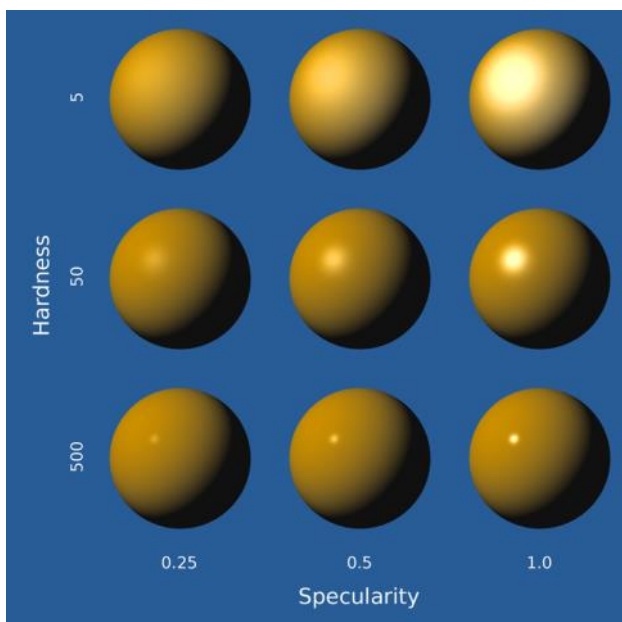
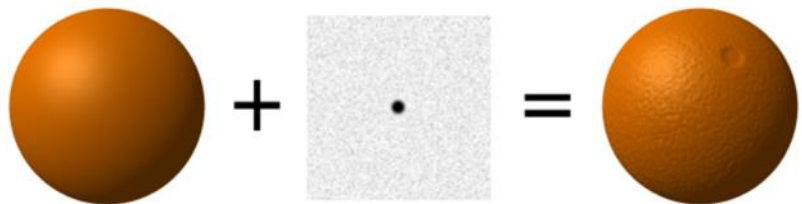
In this example, the surface looks like wood, with a diagonal strap on it.

Bump Mapping

This is a process which improves the visual appearance of the surface. Texture Mapping just makes a visual representation of the surface, whereas Bump Mapping adds an appearance of roughness or tactility to the surface.

The computer software knows how the material would look, and adds small shadows to help in its appearance.

NOTE – Bump mapping still keeps the same Polygon count, ie the surface is still perfectly flat.



Specularity

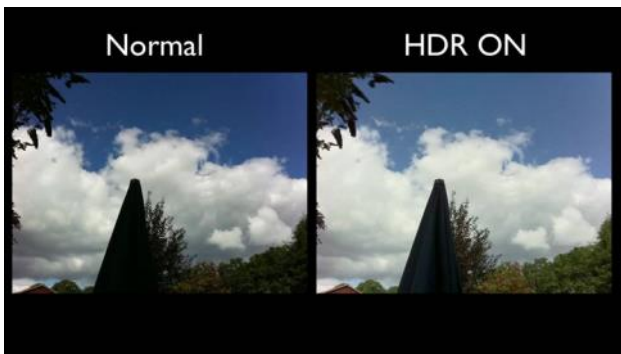
This describes the reflective capacity of a simulated material to create 'rings' of light reflection.

By determining the Specularity of a surface will affect how much light is reflected from a 'material'.

Graphic Rendering**Imaged Based Lighting (IBL)**

This simulates how light and shadows from a real environment would affect the 3D CAD model. The image is taken by a special camera.

e.g. Placing a 3D CAD model in a streetscene would produce different results if it was in Irvine or Athens, if it was at night or during the day, if it was sunny or dull, if it was January or June.

**High Dynamic Range Imagery (HDRI)**

This is a process which takes multiple exposures (usually three) of an picture and then the software combines them to enhance the colour and shadow of the final picture. It is often used in Photography. The three images would be a light, medium and dark exposure, as shown below. The shadow area on the left image is used, but the sign from the right.



A



B



C

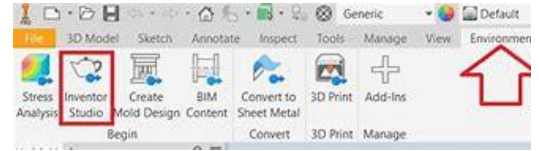
Volumetrics

A method of giving a light source a sense of Volume or Substance. e.g. A light source may be a 40W bulb, 10W LED lamp, Fluorescent lamp, Halogen Lamp, etc.

The light can also be affected by passing through stained glass, obscure glass, smoke, etc.



Graphic Rendering



Using Inventor Studio

Render an image to view a realistic image of the design, with or without an enhanced background. When you select the Shaded render type, it is applied to the entire image. Changes to the applied type must be done as a post process in an image editor. You can use Illustration visual style in modelling environment to get an illustration result. To output an image with a transparent background, for compositing with another image, the PNG with alpha channel must be selected before rendering. The alpha channel option for PNG is hidden when you start rendering.

1 On the ribbon, click Environments tab > Begin panel > Inventor Studio .

2 On the ribbon, click Render tab > Render panel > Render Image.

3 **Set the options on the General tab.** You can see a preview of your selections in the graphics window. When you are satisfied with your selections, click Render.

The rendering progress is displayed in a separate window.

- **Width and Height** Specifies the width and height of the rendered image. To use the Measure command or choose from most recently used values, click the arrow on the input box and select from the menu. You can adjust any value in the input box.
- **Select Output Size** Provides a list of values from which you can select for output size.
- **Lock aspect ratio** When selected, maintains the aspect ratio defined by the current image width and height.
- **Camera** Specifies the camera for the active document. The default is Current View when no camera is specified. Current view, uses the view camera.
- **Lighting Style** Provides a list of lighting styles from which to select. If no lighting styles are available, images are rendered with the lighting style from the modelling environment.

4 Set the options on the Output tab

- **Save Rendered Image** In the Open dialog box, enter a name, select a location, and select a file type.
- Click Options on the Open dialog box to open the Image Save Options dialog box. The file type you select determines the available options.
- Note: To output an image with a transparent background, for compositing with another image, the PNG with alpha channel must be selected in the Save Options dialog box before rendering.
- Click Save in the Save dialog box to save your settings and return to the Output tab.

5 Set the options on the Renderer tab (Render Image only).

- **Render Duration Render Time** Sets the duration of the rendering. The number of iterations (and resulting quality) in a particular time interval depends on CPU speed.
- **Render by iteration** Sets the number of iterations to run. The time interval required to complete the number of iterations depends on CPU speed. **Until Satisfactory** Sets unlimited rendering. The rendering may be stopped manually.
- **Lighting and Material Accuracy—Mode** Sets the duration of the rendering. The number of iterations (and resulting quality) in a particular time interval depends on CPU speed.
- **Image Filtering** (Antialiasing) Determines how multiple samples are combined into a single pixel value to soften or sharpen the final image.

6 Click Render.

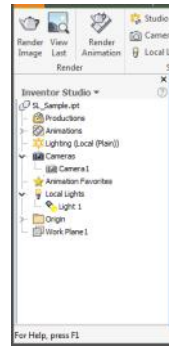
7 In the upper-right corner of the rendered image window, click:

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Graphic Rendering

- Pause to pause the rendering.
- Save and save the output to BMP, JPEG, TIFF, PNG, or GIF format.



Note: The Ground plane and shadow effect settings specified in the View tab will display in the rendered model.

Lighting Styles

Use Lighting Styles to illuminate scenes. A Studio lighting style is based on one Environment lighting source and, optionally, one or more studio lights. Studio lights can be directional, point, or spot type. Set environment light parameters Source, Exposure, Rotation, and Scale. If you add Studio lights, adjust light parameters to meet your needs. Inventor Studio provides several lighting styles for your use or you can create new ones.

Cameras

Cameras are used to establish the viewing angle for the scene. Careful consideration with respect to the viewing angle and camera type improves the rendered image. Cameras can be animated in a variety of ways, such as a camera turntable, animated along a path, and freeform (non-path).

You can create and maintain as many cameras as you want in the scene. Cameras are saved with the model and can be recalled during any Inventor Studio session. Cameras may also be deleted from the scene.

There are two types of cameras, orthographic and perspective. Orthographic cameras are typically used to produce standard and isometric style images. Perspective cameras are used when you want the impression of depth in your image or when the rendered output is combined with a photograph. Use various camera parameters, such as orthographic and perspective, camera roll, zoom, and depth of field to achieve the results you need for your images and animation.

Camera Settings

The zoom angle of the camera, and distance from the target to the position determine the width of the square. The height of the square respects the aspect ratio defined by the stored rendering settings. For example, if the rendered image size is 640 x 480, the height of the square is 3/4 the width. A shape that is a combination of a truncated pyramid and a box is displayed at the position point. The roll marker, a small black vertical line at the middle of the top edge of the view volume square, indicates the up direction of the camera and is also a handle used to adjust the roll angle.

Depth of Field

Depth of field has two parameters, Near and Far, represented as planes. Objects situated between those values are in focus. Objects outside the values become increasingly out of focus the farther they are from the Near/Far values.

You can use the output from one or more cameras, either still or running shots, to compose a video animation.

Local Lights

Local lights provide the means to create lighted objects, such as lighted switches, panel lights, and so on. Some limitations apply.

Note: The most notable limitation is that for local lights to display and affect the results, they must be added at the level you are rendering in the scene. Thus, panel lights that you want illuminated, would need to be placed at the scene level and not component level.