11.3 Compositing - Input nodes

Input Nodes

Input nodes produce information from some source. For instance, an input could be:

- Taken directly from the active camera in a selected scene,
- from a JPG, PNG, etc. file as a static picture,
- a movie clip (such as an image sequence or video), or
- just a color or value.

These nodes generate the information that feed other nodes. As such, they have no input-connectors; only outputs.

- Render Layers Node
- Image Node
- Movie Clip
- Mask
- RGB Node
- Value Node
- Texture Node
- Bokeh Image
- Time Node

- Track Position

Render Layers Node

Render Layers Node

This node is the starting place to getting a picture of your scene into the compositing node map.

This node inputs an image from a scene within your blend file. Select the scene and the active render layer from the yellow selection list at the bottom of the node. Blender uses the active camera for that scene to create an image of the objects specified in the *RenderLayer.*

The *Image* is input into the map, along with the following data:

- *Alpha* (transparency) mask

Depending on the Renderlayer passes that are enabled, other sockets are available. By default the Z is enabled:

- *Z* depth map (how far away each pixel is from the camera)

The example shows that two other passes are enabled:

- *Normal* vector set (how light bounces off the surface)
- *Speed* vector set (how fast an object is moving from one frame to the next)

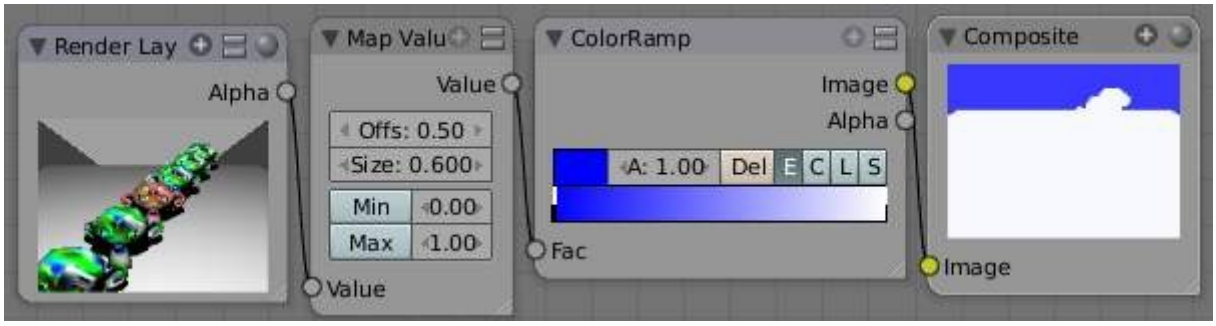
Use the re-render button (Small landscape icon - to the right of the Renderlayer name) to re-render the scene and refresh the image and map.

You may recall that a .blend file may contain many scenes. The Renderlayer node can pick up the scene info from any available scene by selecting the scene from the left-hand selector. If that *other* scene also uses the compositor and/or sequencer, you should note that the scene information taken is the raw information (pre-compositing and pre-sequencing). If you wish to use composited information from another scene, you will have to render that scene to a multilayer OpenEXR frameset as an intermediate file store, and then use the Image input node instead.

Using the Alpha Socket

Using the *Alpha* output socket is crucial in overlaying images on top of one another and letting a background image “show through” the image in front of it.

In a Blender scene, your objects are floating out there in virtual space. While some objects are in front of one another (Z depth), there is no ultimate background. Your world settings can give you the illusion of a horizon, but it’s just that: an illusion. Further, some objects are semi-transparent; this is called having an Alpha value. A semi-transparent object allows light (and any background image) to pass through it to the camera. When you render an image, Blender puts out, in addition to a pretty image, a map of what solid objects actually are there, and where infinity is, and a map of the alpha values for semi-transparent objects. You can see this map by mapping it to a blue screen:



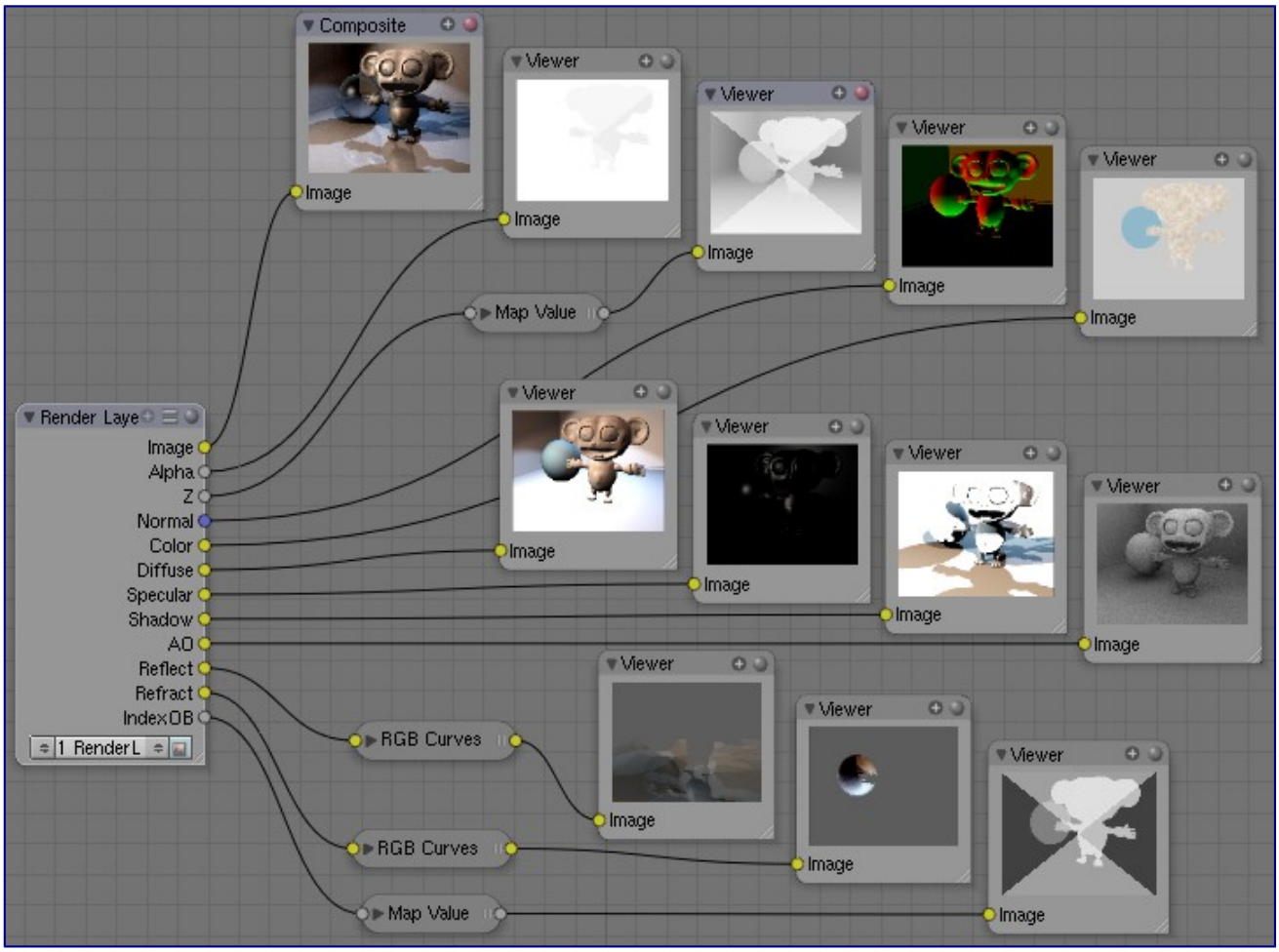
Viewing the Alpha values

In the little node map above, we have connected the Alpha output socket of the RenderLayer node to a Map Value node (explained later, but basically this node takes a set of values and maps them to something we can use). The Color Ramp node (also explained later in detail) takes each value and maps it to a color that we can see with our eyes. Finally, the output of the Color Ramp is output to a Composite viewer to show you, our dear reader, a picture of the Alpha values. Notice that we have set up the map so that things that are perfectly solid (opaque) are white, and things that are perfectly transparent (or where there is nothing) are blue.

Optional Sockets

For any of the optional sockets to appear on the node, you MUST have the corresponding pass enabled. In order for the output socket on the RenderLayer node to show, that pass must be enabled in the RenderLayer panel in the Buttons window. For example, in order to be able to have the Shadow socket show up on the RenderLayer input node, you must have the “Shad” button enabled in the Buttons window, Scene Render buttons, Renderlayer panel. See the RenderLayer tab (Buttons window, Output frame, Render Layers tab, Passes selector buttons) for Blender to put out the values corresponding to the socket.

For a simple scene, a monkey and her bouncy ball, the following picture expertly provides a great example of what each pass looks like:



The available sockets are:

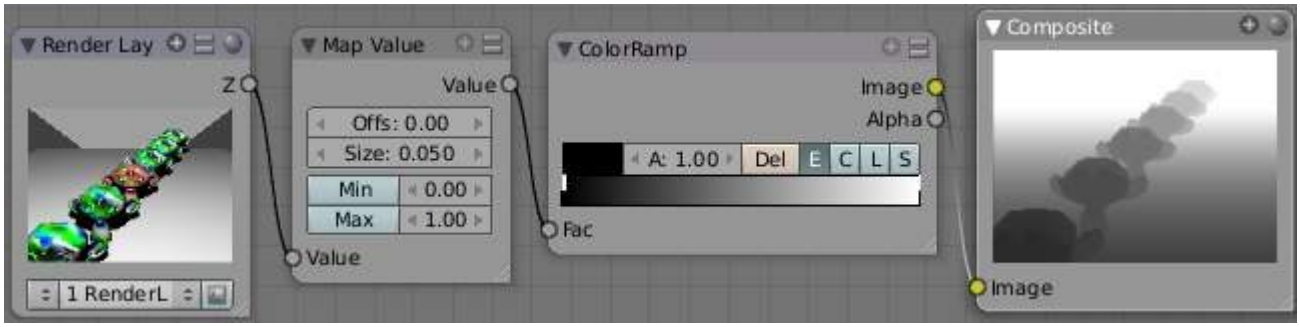
- Z: distance away from the camera, in Blender Units
- Normal (Nor): How the color is affected by light coming from the side
- UV: how the image is distorted by the UV mapping
- Speed (Vec): How fast the object is moving, and in what direction
- Color (Col): the RGB values that color the image that you see
- Diffuse: the softening of colors as they diffuse through the materials
- Specular: the degree of shininess added to colors as they shine in the light
- Shadow: shadows cast by objects onto other objects
- AO: how the colors are affected by Ambient Occlusion in the world
- Reflect (Ref): for mirror type objects, the colors they reflect and are thus not part of their basic material
- Refract: how colors are bent by passing through transparent objects
- Radio (Radiosity): colors that are emitted by other objects and cast onto the scene
- IndexOB: a numeric ordinal (index) of each object in the scene, as seen by the camera.

Using the Z value Socket

Using the *Z* output socket is crucial in producing realistic images, since items farther away are blurrier (but more on that later).

Imagine a camera hovering over an X-Y plane. When looking through the camera at the plane, Y is up/down and X is left/right, just like when you are looking at a graph. The camera is up in the air though, so it has a Z

value from the X-Y plane, and, from the perspective of the camera, the plane, in fact all the objects that the camera can see, have a Z value as a distance that they are away from it. In addition to the pretty colors of an image, a RenderLayer input node also generates a Z value map. This map is a whole bunch of numbers that specify how far away each pixel in the image is away from the camera. You can see this map by translating it into colors, or shades of gray:



Viewing the Z values

In the little node map above, we have connected the Z output socket of the RenderLayer node to a Map Value node (explained later). This node takes a set of values and maps them to something we can use. The Color Ramp node (also explained later in detail) takes each value and maps it to a shade of gray that we can see with our eyes. Finally, the output of the colorramp is output to a Composite viewer to show you, our dear reader, a picture of the Z values. Notice that we have set up the Map Value node so that things closer to the camera appear blacker (think: black is 0, less Z means a smaller number) and pixels/items farther away have an increasing Z distance and therefore get whiter. We chose a Size value of 0.05 to see Z values ranging from 0 to 20 (20 is 1/0.05).

Using the Speed Socket

Even though things may be animated in our scene, a single image or frame from the animation does not portray any motion; the image from the frame is simply where things are at that particular time. However, from the *Render Layers* node, Blender puts out a vector set that says how particular pixels are moving, or will move, to the next frame. You use this socket to create a *blurring effect.*.

Image Node

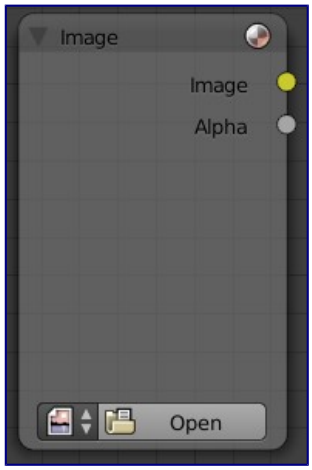


Image Node

The *Image* node injects any image *format that is supported by Blender.* Besides inputting the actual image, this node can also input *Alpha* and depth (*Z*) values if the image has them. If the image is a MultiLayer format, all saved render passes are input. Use this node to input:

- A single image from a file (such as a JPG picture)
- Part or all of an animation sequence (such as the 30th to 60th frame)
- Part or all of a movie clip (such as an AVI file)
- the image that is currently in the UV/Image Editor (and possibly being painted)
- an image that was loaded in the UV/Image Editor

Animated image sequences or video files can also be used. See Animations below.

To select an image file or generated image from the UV/Image Editor, click on the small arrow selector button to the left of the name and pick an existing image (e.g. loaded in the UV editor or elsewhere) or click on *LOAD NEW* to select a file from your hard disk via a file-browser. These images can be e.g. previously rendered images, matte paintings, a picture of your cat, whatever. Blender really doesn't care.

If the image is part of a sequence, manually click the Image Type selector to the right of the name, and select *Sequence*. Additional controls will allow you to define how much of the sequence to pull in (see Animations below). If the file is a video file, these controls will automatically appear.

Image Channels

When the image is loaded, the available channels will be shown as sockets on the node. As a minimum, the Image, Alpha, and Z channels are made available. The picture may or may not have an alpha (transparency) and/or Z (depth) channel, depending on the format. If the image format does not support A and/or Z, default values are supplied (1.0 for A, 0.0 for Z).

Alpha/Transparency Channel

- If a transparency channel is detected, the *Alpha* output socket will supply it.
- If it does not have an Alpha channel (e.g. JPG images), Blender will supply one, setting the whole image to completely opaque (an Alpha of 1.00, which will show in a *Viewer* node as white - if connected to the *Image* input socket).

Z/depth Channel

- If a Z (depth) channel is detected, the *Z* output socket will supply it.
- If it does not have a Z channel (e.g. JPG or PNG images), Blender will supply one, setting the whole image to be at the camera (a depth of 0.00). To view the Z-depth channel, use the Map Value to ColorRamp noodle given above in the Render Layer input node (see Using the Z value Socket).

Note

Formats

Blender supports many image formats. Currently only the OpenEXR image format stores RGB (color), A (alpha), and Z (depth) buffer information in a single file, if enabled.

Saving/Retrieving Render Passes

Blender can save the individual Render Layers and specific passes in a MultiLayer file format, which is an extension of the OpenEXR format. In this example, we are reading in frames 50 to 100 of a RenderLayer that were generated some time ago. The passes that were saved were the Image, Alpha, Z, Specular and AO passes.

To create a MultiLayer image set when initially rendering, simply disable Do Composite, set your Format to MultiLayer, enable the Render Layer passes you wish to save over the desired frame range, and Animate. Then, in Blender, enable Compositing Nodes and Do Composite, and use the Image input node to read in the EXR file. When you do, you will see each of the saved passes available as sockets for you to use in your compositing noodle.

Image Size

Size matters - Pay attention to image resolution and color depth when mixing and matching images. Aliasing (rough edges), color *flatness*, or distorted images can all be traced to mixing inappropriate resolutions and color depths.

The compositor can mix images with any size, and will only perform operations on pixels where images have an overlap. When nodes receive inputs with differently sized Images, these rules apply:

- The first/top Image input socket defines the output size.
- The composite is centered by default, unless a translation has been assigned to a buffer using a *Translate* node.

So each node in a composite can operate on different sized images, as defined by its inputs. Only the *Composite*

output node has a fixed size, as defined by the *Scene buttons* (Format Panel). The *Viewer* node always shows the size from its input, but when not linked (or linked to a value) it shows a small 320x256 pixel image.

Animations

To use image sequences or movies within your composition, press the face or little film strip button located to the right of the selector. As you click, a pop-up will offer you four choices:

- Generated - a image generated from the *UV Editor*
- Sequence - a sequence of frames, each frame in a separate file.
- Movie - a sequence of frames packed into a single `.avi` or `.mov` file
- Image - a single frame or still image in a file

A Movie or Image can be named anything, but a Sequence must have a digit sequence somewhere in its filename, for example fire0001set.jpg, fire0002set.jpg, fire0003set.jpg and so on. The number indicates the frame.

If a Sequence or Movie is selected, an additional set of controls will appear that allows you to select part or all of the sequence. Use these controls to specify which frames, out of the original sequence, that you want to introduce into the animation you are about to render. You can start at the beginning and only use the beginning, or even pick out a set of frames from the middle of an existing animation.

The *Frs* number button is the number of frames in the sequence that you want to show. For example, if you want to show 2 seconds of the animation, and are running 30 fps, you would put 60 here.

The *SFra* number button sets the start frame of the animation; namely, at what point in the animation that you *are going to render* do you want this sequence to start playing. For example, if you want to introduce this clip ten seconds into the composite output, you would put 300 here (at 30 fps).

The *First* number button sets the first number in the animated sequence name. For example, if your images were called “credits-0001.png”, “credits-0002.png” through “credits-0300.png” and you wanted to start picking up with frame 20, you’d put 20 here.

To have the movie/sequence start over and repeat when it is done, press the *Cycl* ic button. For example, if you were compositing a fan into a room, and the fan animation lasted 30 frames, the animation would start over at frame 31, 61, 91, and so on, continuously looping. As you scrub from frame to frame, to see the actual video frame used for the current frame of animation, press the auto button to the right of the *Cycl* ic button.

Generated Images

Using the Nodes to modify a painting in progress in the UV/Image window Blender features Texture Paint which works in the UV/Image Editor, that allows you to paint on the fly, and the image is kept in memory or saved. If sync lock is enabled (the lock icon in the header), changes are broadcast throughout Blender as soon as you lift the mouse button. One of the places that the image can go is to the Image Input node. The example shows a painting session going on in the right-hand UV/Image Editor window for the painting “Untitled”. Create this image via Image?New in the UV/Image Editor. Refer to the texture paint section of the user maual for more info on using Texture Paint.

In the left-hand window, the Image input node was used to select that “Untitled” image. Notice that the Image type icon is blank, indicating that it is pulling in a Generated image. That image is colorized by the noodle, with the result used as a backdrop in the Node Editor Window.

Using this setup and the Generated Image type is like painting and post-processing as you continue painting. Changes to either the painting or the post-pro noodle are dynamic and real-time.

Movie Clip

Mask Node

TODO - see: https://developer.blender.org/T43469

Mask

Mask Node

TODO - see: https://developer.blender.org/T43469

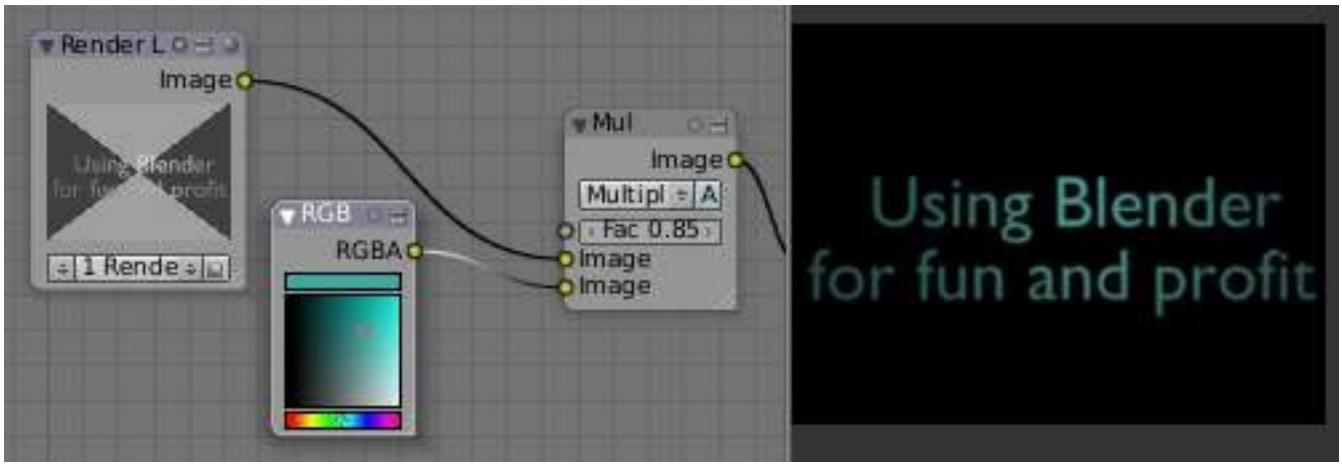
RGB Node

RGB Node

The RGB node has no inputs. It just outputs the Color currently selected in its controls section; a sample of it is shown in the top box. In the example to the right, a gray color with a tinge of red is slected.

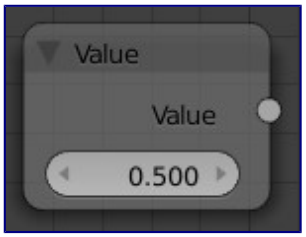
To change the brightness and saturation of the color, LMB click anywhere within the square gradient. The current saturation is shown as a little circle within the gradient. To change the color itself, click anywhere along the rainbow Color Ramp.

Example



In this example, our corporate color is teal, but the bozo who made the presentation forgot. So, we multiply his lame black and white image with our corporate color to save him from embarrassment in front of the boss when he gives his boring presentation.

Value Node



Value Node

The Value node has no inputs; it just outputs a numerical value (floating point spanning 0.00 to 1.00) currently entered in the NumButton displayed in its controls selection.

Use this node to supply a constant, fixed value to other nodes' value or factor input sockets.

Texture Node

Texture Node

The *Texture* node makes 3D textures available to the compositor.

The Texture node makes 3D textures available to the compositor. A texture, from the list of textures available in the current blend file, is selected and introduced through the value and/or color socket.

Note

Please read up on the Blender Library system for help on importing and linking to textures in other blender files.

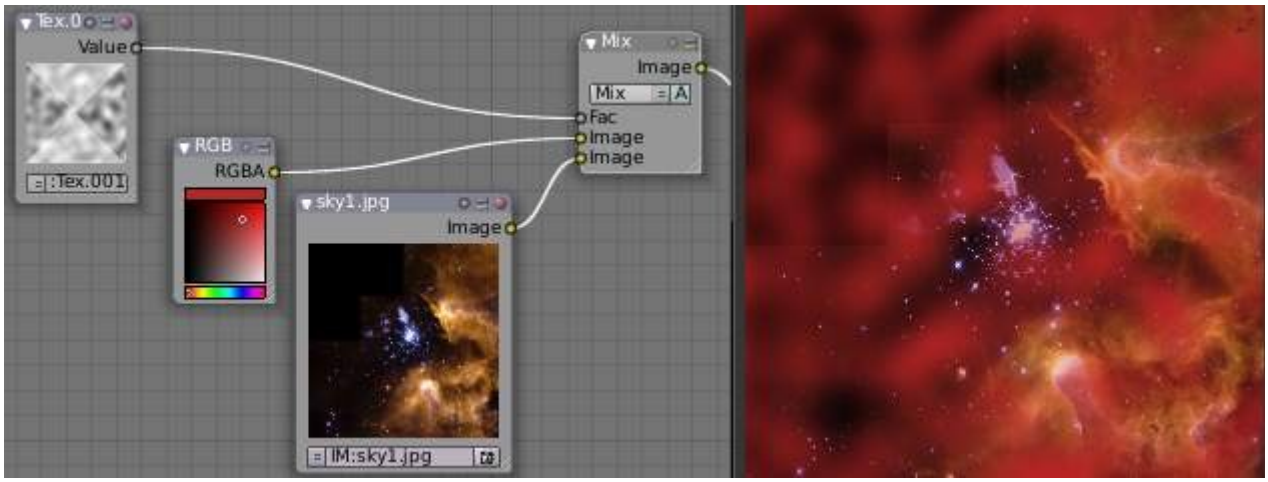
Note

You cannot edit the textures themselves in the node window. To use this node, create and edit the texture in the normal texture buttons, then select the texture from the menu button on the node.

You can change the *Offset* and a *Scale* (which is called Offs XYZ and Size XYZ in the Materials Texture Map Input panel) for the texture by clicking on the label and setting the sliders, thus affecting how the texture is applied to the image. For animation, note that this is a vector input socket, because the XYZ values are needed.

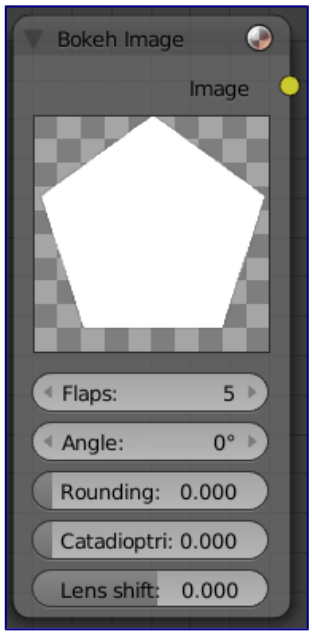
Texture nodes can output a straight black-and-white *Value* image (don’t mistake this for alpha) and an image (*Color*).

Example



In the example above, we want to simulate some red plasma gas out there in space. So, we fog up an image taken from the Hubble telecscope of Orion and take the ever-so-useful Cloud texture and use it to mix in red with the image.

Bokeh Image



Bokeh Image Node

Bokeh Image generates a special input image for use with the *Bokeh Blur* filter node.

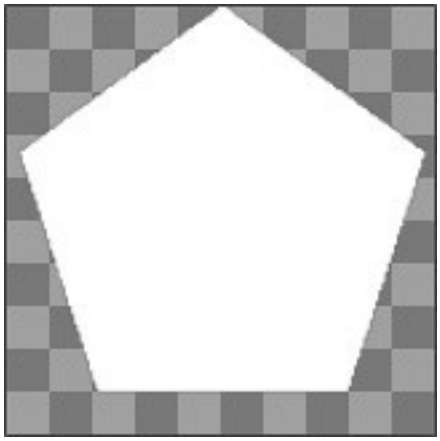
Bokeh Image is designed to create a reference image which simulates optical parameters such as aperture shape and lens distortions which have important impacts on bokeh in real cameras.

The first three settings simulate the aperture of the camera. Flaps sets an integer number of blades for the cameras iris diaphragm. Angle gives these blades an angular offset relative to the image plane and Rounding sets the curvature of the blades with a `0` being straight and `1` bringing them to a perfect circle.

Catadioptric provides a type of distortion found in mirror lenses and some telescopes. This can be useful to

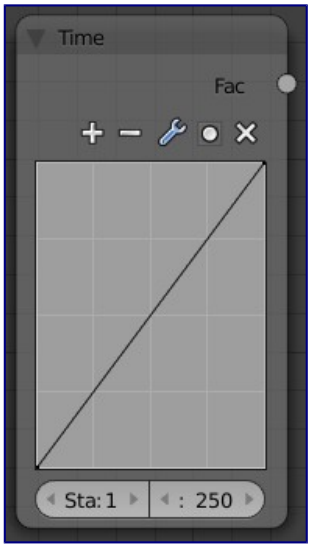
produce a ‘busy’ bokeh.

Lens Shift introduces chromatic aberration into the blur such as would be caused by a tilt-shift lens.



Example of a bokeh image with 5 flaps.

Time Node



Time Node

The Time node generates a *fac* tor value (from 0.00 to 1.00) (that changes according to the curve drawn) as time progresses through your movie (frames).

The *Start* and *End* NumButtons specify the range of time the values should be output along, and this range becomes the X-axis of the graph. The curve defines the Y-value and hence the factor that is output. In the example to the right, since the timespan is 250 frames and the line is straight from corner to corner, 0.50 would be output at frame 125, and 0.75 will be output at frame 187.

Note

Note on output values

The *Map Value* node can be used to map the output to a more appropriate value. With some time curves, it is possible that the Time node may output a number larger than one or less than zero. To be safe, use the

Min/Max clamping function of the Map Value node to limit output.

You can reverse time (unfortunately, only in Blender and not in the real world) by specifying a Start frame greater than the End frame. The net effect of doing so is to flip the curve around. Warning: doing so is easily overlooked in your node map and can be very confusing (like meeting your mother when she was/is your age in “Back to the Future”).

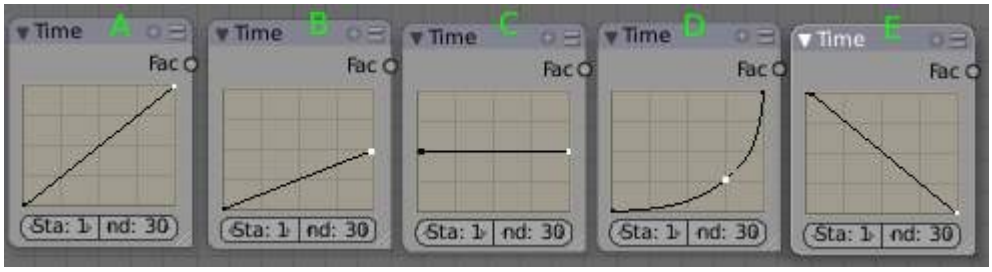
Note

Time is Relative

In Blender, time is measured in frames. The actual duration of a time span depends on how fast those frames whiz by (frame rate). You set the frame rate in your animation settings (Render Dimensions Panel). Common settings range from 5 seconds per frame for slideshows (0.2 fps), to 30 fps for US movies.

Time Node Examples

In the picture below, over the course of a second of time (30 frames), the following time controls are made:



See:

1. No Effect
2. Slow Down
3. Freeze
4. Accelerate
5. Reverse

Common uses for this include a *“fade to black”*, wherein the accelerate time curve (typically exponentially-shaped) feeds a mix value that mixes a constant black color in, so that the blackness accelerates and eventually darkens the image to total black. Other good uses include an increasing soften (blur-out or -in) effect, or *fade-in* a background or foreground, instead of just jumping things into or out of the scene.

You can even imagine hooking up one blur to a background renderlayer, another inverted blur to a foreground renderlayer, and time-feeding both. This node group would simulate someone focusing the camera lens.

Usage

As your imagination runs wild, consider a few ideas that came to me just now on my couch: mixing a clouds texture with a time input to fog up a piece of glass or show spray paint building up on a wall. Consider mixing red and the soften with time (decreasing output) to show what someone sees when waking up from a hard hit on

the head. Mix HSV input with a starfield image with time (decreasing output) to show what we might see someday as we accelerate our starship and experience red-shift.

Track Position

Render Layers Node

TODO - see: https://developer.blender.org/T43469