

Programs and files needed

To follow the steps in this guide you will need to download Blender which is available here <https://www.blender.org/download/>

You will also need to download an example blender file [here](#).

The example files that come with Lit Smoke and Fire 2 work in Blender only.

You can generate art assets using other 3D programs and most of the steps below will still work.

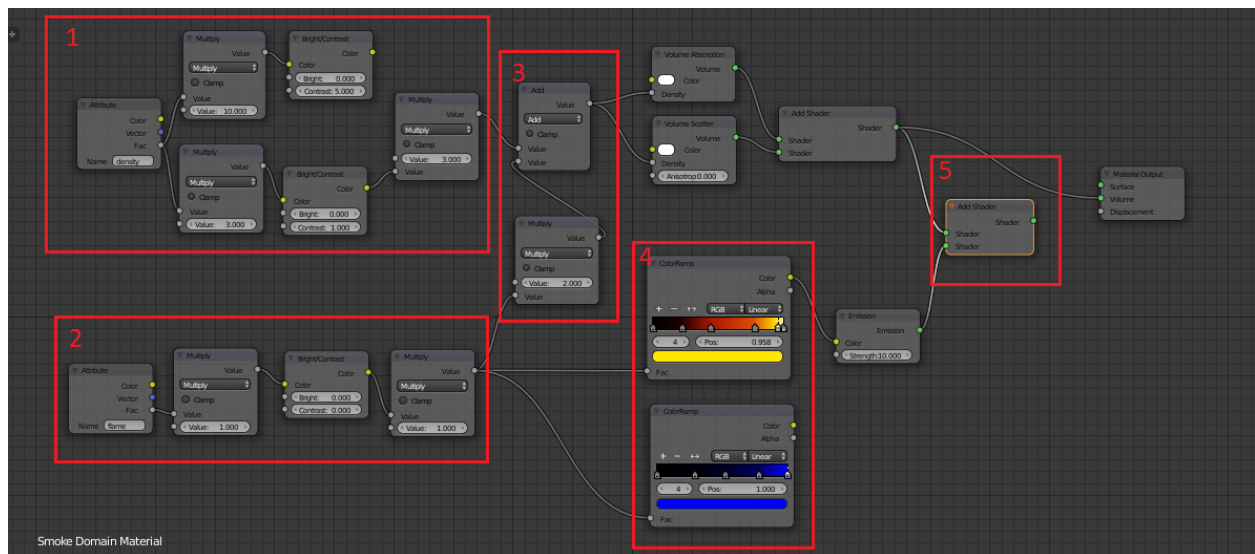
Setting up the smoke sim

The example file has a smoke simulation already set up called “Smoke Domain” this is what simulates the smoke that we will be rendering out to the sprite sheets. This guide will not go into details on how smoke sims work in blender for a tutorial on blender smoke go to <https://www.youtube.com/watch?v=LSVi4ffZPII> or just use google.

Blender Smoke Shader Setup

Once you have a smoke simulation that you like it’s time to tweak the render settings for the smoke to get it looking the way you want.

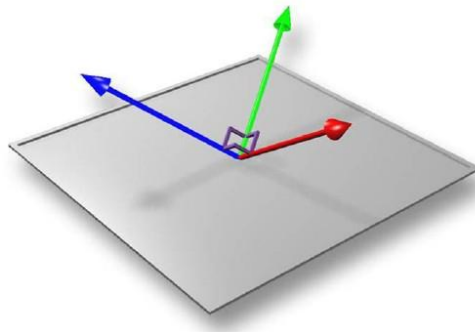
This is the node map for the blender fire material (for more information on nodes and materials in blender try <https://www.youtube.com/watch?v=f5Gb1VK98Wc>)



1. Smoke density and contrast settings. You will often want different settings for rendering emissive lighting vs normal map baking. To make it easier to keep track of the settings there is a duplicate of the node path one for emissive the other for normal mapping.
2. Fire density and contrast settings
3. Fire smoke crossover. Sometimes you want little to no smoke but still want thick flames these nodes allow you to transfer some of the flames intensity over to smoke thickness

4. Emissive lighting ramp. There are 2 ways to do emissive lighting, store the emissive colour calculated by blender or store the intensity of the emissive lighting. Storing the flame colour will give you the best results but limits how much you can edit the texture later and will not let you make packed emissive textures. Storing the intensity will allow you to recolour the texture in the editor later using Unity's vfx tools or make packed emissive textures that are recoloured using a colour lookup texture. Connect the colour ramp that corresponds to the emissive rendering style you want to do up to the emission node before baking the emissive lighting out.
5. When rendering out the normal mapping you don't want the emissive lighting enabled. Disconnect the combine shader node that merges the emissive and smoke lighting and connect the smoke lighting directly to the output when rendering the normal map. When rendering the emissive lighting connect the node that combines both the emissive and smoke lighting.

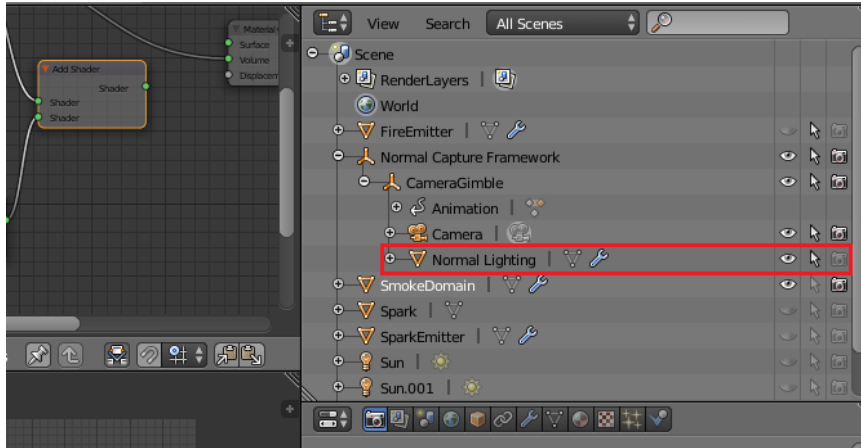
Normal light sphere settings



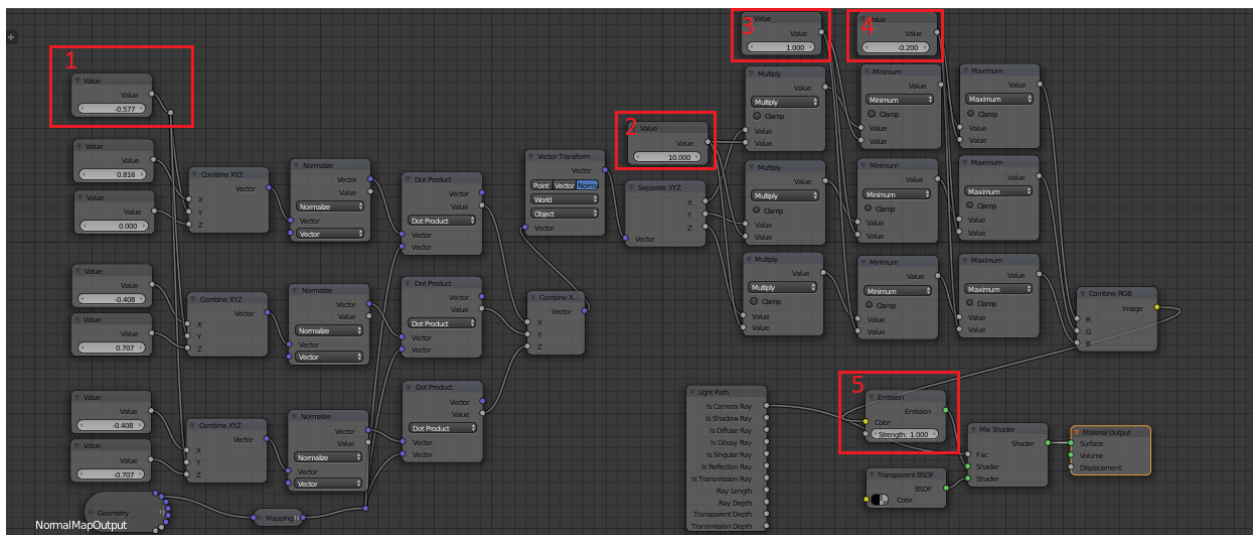
Lit smoke and fire works 2 by collecting the light arriving at the particle from 3 different directions then multiplying that light by how each pixel in the smoke texture responds to light from that angle.

To get the light response for each pixel a red green and blue light is shone onto the smoke effect in blender capturing the lighting response for each of the lighting directions.

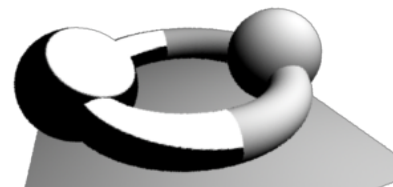
To light the smoke effect in blender and capture the lighting response a large sphere surrounding the smoke effect with a special material is used. The lighting sphere is called normal lighting and can be found in the hierarchy under normal capture framework.



The material attached to the “Normal Lighting” sphere has several properties that can greatly affect the way the normals are captured.



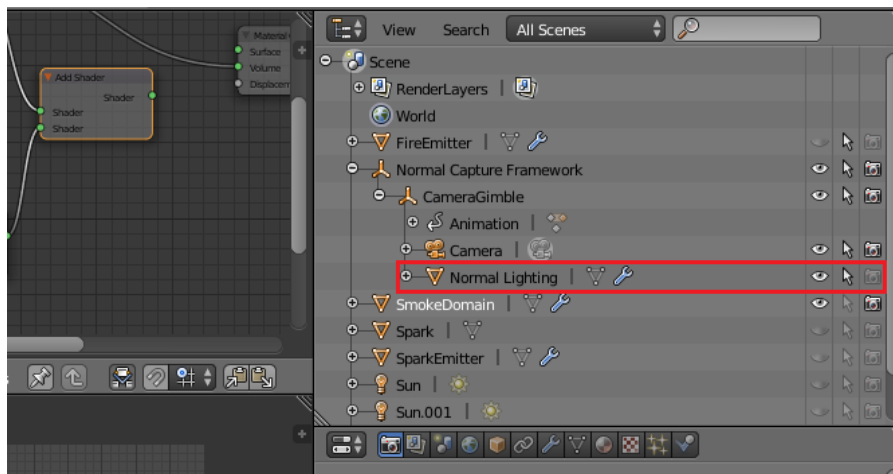
1. This value affects the light angle relative to the camera direction. Higher values move the lights closer to the camera direction/front of the smoke lighting the front more than the sides creating flatter lighting. Lower values will light the edges of the smoke particle more and the front less exaggerating the directional lighting/edge lighting.
2. Light size. This value changes the size and style of the lights with a value of 1 creating a dot product distribution of light similar to the sphere on the right and values greater than 1 creating a saturated light distribution closer to the sphere on the left. A light size value of 1 will more accurately capture the lighting but larger light sizes will allow light to get into crevices and indents in the smoke capturing details not reached by smaller light sizes.
3. Light Max Brightness. If you have very large lights you may want to turn this down otherwise it can be left at 1.



4. Light Min Brightness. Lights in blender can go into negative values removing light from the scene instead of adding it. If you set this value to a negative number you can remove the effect of the light from smoke facing away from the light direction. If you want to make a high contrast smoke effect that appears almost solid then negative lighting works otherwise just leave this value at close to 0.
5. Emissive light multiplier. You want the lighting to be as bright as possible without oversaturating the image, use this value to tweak the lighting levels.

Setting up for capturing normals

1. Make sure the smoke shader is set up for normal capture and not emissive.
2. Make sure the normal lighting rig is enabled



3. Set the background to whatever colour you want. Dark colours make thin smoke appear black, light colours or transparent backgrounds make thin smoke appear lighter.
4. Bake out the normal maps.

Moving the camera and the lighting gimbal

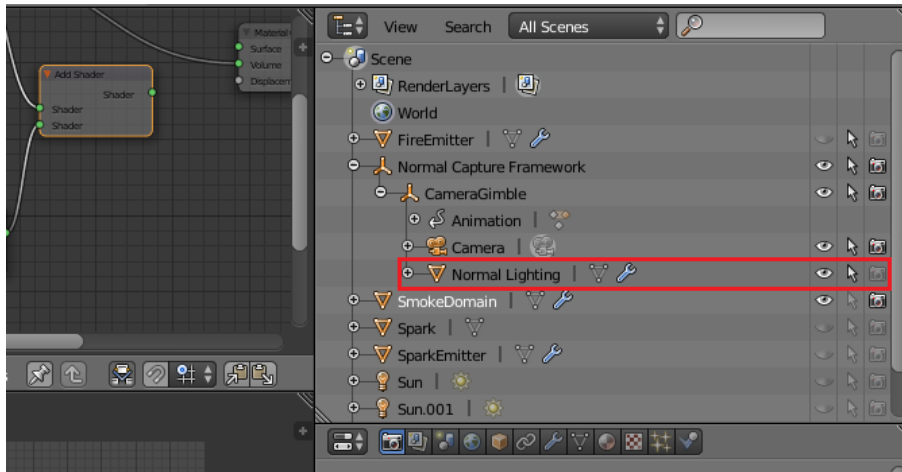
For the normal capture to work correctly the lighting rig must move with the camera. If you need to reposition the camera move it by the “Camera Gimbal” object.

Setting up for capturing emissive

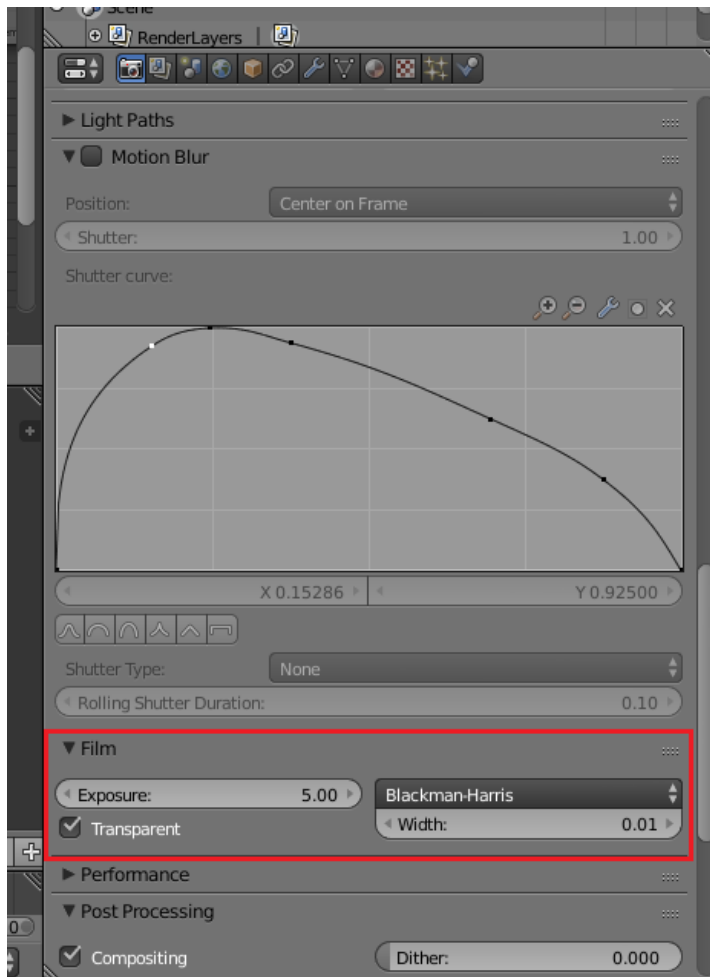
If you want to use Lit smoke and fire 2 for fires and explosions you will need to render out an emissive map. An emissive map holds all the lighting that the effect is emitting independently of the external lighting in the scene. Things like fire, sparks, lighting or magic effects should be captured in the emissive lighting texture.

When capturing the emissive lighting there are a few steps you need to perform/check

1. Make sure the shader is set to render the emissive lighting with the correct smoke settings
2. Disable the normal map lighting rig. To capture the smoke normal map a system of lights illuminate the smoke from different angles. If the normal mapping lights are not disabled they will interfere with the rendering of the emissive lighting. To disable the normal map lighting turn off the “Normal Lighting” component in the hierarchy.



3. Make sure the background is set to transparent.



4. Bake out your emissive lighting

Combining the images in unity

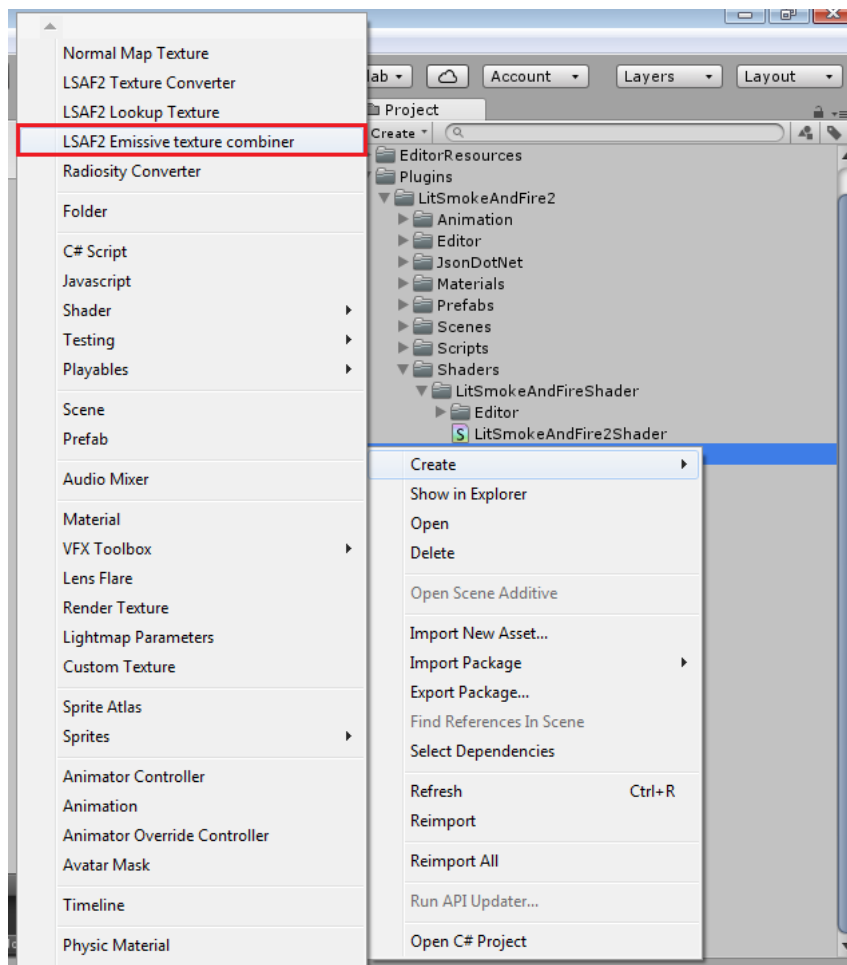
Once you have rendered out an image sequence your next port of call is Unity. Using unity vfx tools combine the images you have rendered out into an image sheet making sure to keep the normal map and emissive map on separate sheets. It is important that you use the same number of frames on each sheet otherwise you may experience errors. If you have chosen to bake out only the lighting intensity and don't plan on making a packed emissive texture now is the time to recolour the texture using unity's VFX tools.

Tools

Lit smoke and fire 2 comes with several helpful tools to make your life easier. The goal of these tools is to do as much of the image editing in the unity editor as possible to streamline the asset creation process and make it easy to tweak the art assets.

Emissive combiner tool.

To create a new emissive combiner tool right click in the project window, select create then “LSAF2 Emissive texture combiner”.



The Emissive Texture Combiner tool helps merge 2 emissive textures together in the unity editor and save out the result. The Emissive Texture Combiner can even convert the emissive texture to a gray scale for use in a packed emissive texture. By separating an emissive texture into separate textures for flames sparks and other emissive elements you can make it easier to tweak the colour and intensity without needing to rerender the entire effect saving many hours of work.

Texture Converter.

If you want to use standard RGB normal maps, create packed emissive textures or edit the contrast, brightness or blur of the particle effect then you will want to use the texture converter tool.

To create a new Texture Converter follow the steps for creating an Emissive Texture Combiner but select “LSAF2 Texture Converter”.

Normal map textures created using the instructions in this document will be in radiosity format and the “Already in radiosity format” option should be selected. The texture converter tool will convert normal rgb normal maps to radiosity normal maps if this option is not set.

The texture converter can combine a separate opacity map with a the normal map. If you used a solid colour background when rendering out the normal map you can use the opacity from the emissive map you baked out or render out an entirely custom one if you want.

If a texture is added to the “Emissive Map” field the texture converter will try to convert the texture to a packed emissive texture. Packed emissive encodes the emissive lighting into the normal map texture.

The texture converter tool can change the contrast and brightness of the opacity map. A narrow source range will force all the normals in the texture to fall within the source min and max length. This will flatten out the image and remove a lot of the dark shadows and bright highlights.

The destination range defines how much the source values will be scaled and translated. The contrast of the final image will increase or decrease based on the relative range difference between the source and the destination with a larger destination range increasing contrast and a smaller destination range decreasing it. The destination range also defines the brightness with a higher min and max range making the output brighter and a lower min and max range making the normal map darker.

As a general rule of thumb try and make the final output image as bright and as high contrast as possible without losing any information to colour clipping or over saturation. The flatter the texture becomes the less lighting difference you will see when light is shon at the particle from different angles.