

## 35mm Camera Macros Version 1.0 by Edouard Poor

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The 35mm Camera macros were created to allow POV users to place cameras in their scenes with the properties of a standard 35mm film (or full frame digital) camera.

The user can specify the lens (e.g. 50mm or 300mm) and the focal ratio (e.g. f/1.4 or f/8), and the macros set the field of view and amount of focal blur to approximate the effect seen in the real world.

The user can specify the focal plane in several ways:

- Setting it to the look\_at point
- Specifying a separate point in space that is in focus
- Specifying a distance to the focal plane
- Allowing the camera to autofocus on an object
- Setting the camera to the maximal hyperfocal point

Multiple options can be set, such as the standard samples, variance and confidence of POVs focal blur, as well as other options like the circle of confusion for the hyperfocal calculations, the autofocus samples and tightness, etc.

There is also a "stochastic" mode that allows the user to render multiple frames (via the animation clock settings). The passes can then be composited together later to produce an image with focal blur. This mode turns POV's built-in focal blur off completely.

There are also two debugging variables that can be set to show the focal plane, and the autofocus samples respectively.

Finally these macros output some detailed information about the cameras being use.

### Camera Macros

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Camera35mm( cam\_pos, look\_pos, focal\_length, fstop )

Creates a camera with the focal plane at the same point as the "look\_pos" point.

Related Options:

Camera35mm\_SetFocalSamples( num\_samples )  
Camera35mm\_SetFocalVariance( variance )  
Camera35mm\_SetFocalConfidence( confidence )

Camera35mm\_Point( cam\_pos, look\_pos, focal\_pos, focal\_length, fstop )

Creates a camera with the focal plane at the same distance as the "focal\_pos" point.

Related Options:

Camera35mm\_SetFocalSamples( num\_samples )  
Camera35mm\_SetFocalVariance( variance )

Camera35mm\_SetFocalConfidence( confidence )

Camera35mm\_Distance( cam\_pos, look\_pos, focal\_distance, focal\_length, fstop )

Creates a camera with the focal plane set at "focal\_distance" from the camera.

Related Options:

Camera35mm\_SetFocalSamples( num\_samples )

Camera35mm\_SetFocalVariance( variance )

Camera35mm\_SetFocalConfidence( confidence )

Camera35mm\_Hyperfocal( cam\_pos, look\_pos, focal\_length, fstop )

Creates a camera with focal plane set to the maximal hyperfocal distance (i.e. such that infinity is the furthest distance to still be considered in focus).

Related Options:

Camera35mm\_SetCircleOfConfusion( coc\_size )

Camera35mm\_SetFocalSamples( num\_samples )

Camera35mm\_SetFocalVariance( variance )

Camera35mm\_SetFocalConfidence( confidence )

Camera35mm\_Autofocus( cam\_pos, look\_pos, focal\_length, fstop, obj )

Creates a camera with the focal plane set by shooting test rays at the object "obj".

The object needs to be declared and passed to the macro, as follows:

```
#declare ball = sphere { 0, 20 pigment { rgb <1,0,0> } };
```

```
object { ball }
```

```
Camera35mm_Autofocus( cam_pos, look_pos, 50, 2.8, ball )
```

Related Options:

Camera35mm\_SetAutofocusTightness( fraction\_of\_screen )

Camera35mm\_SetAutofocusSamples( num\_samples )

Camera35mm\_SetFocalSamples( num\_samples )

Camera35mm\_SetFocalVariance( variance )

Camera35mm\_SetFocalConfidence( confidence )

Camera35mm\_NoBlur( cam\_pos, look\_pos, focal\_length, fstop )

Creates a camera with focal blur turned off. Useful for setting up or testing a scene.

## Camera Modes

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By default, the camera macros all use POV's built-in focal blur, but the mode can be changed to use a stochastic rendering technique that renders multiple images (via the animation clock settings) that

can later be composited together to give a scene with focal blur.

Camera35mm\_SetStochasticMode()

Turns the stochastic rendering mode on (instead of POV's built-in focal blur).

Related Options:

Camera35mm\_SetIrisImage( iris\_image\_png\_filename )

Camera35mm\_SetPovFocalBlurMode()

Turns on POV's built-in focal blur mode.  
This is the default setting.

## Camera Options

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The following options may be set by the user

Camera35mm\_SetFocalSamples( n )

Set the number of focal blur samples as per the standard POV camera feature.

Camera35mm\_SetFocalVariance( n )

Sets the focal blur variance as per the standard POV camera feature.

Camera35mm\_SetFocalConfidence( n )

Sets the focal blur confidence as per the standard POV camera feature.

Camera35mm\_SetFocalParameters( n\_samples, n\_variance, n\_confidence )

Sets the samples, variance and confidence all in one call.

Camera35mm\_SetIrisImage( s )

Sets the iris image used for setting up each pass of the stochastic render rig.

The image file has to be a grayscale PNG file currently.

The system has a built-in iris image that is used if this macro isn't called.

Camera35mm\_SetCircleOfConfusion( n )

Sets the circle of confusion for use in the hyperfocal macro.

Camera35mm\_SetAutofocusSamples( n )

Sets the number of samples shot into the scene to determine the optimal focal distance given an test object.

The default value is 500.

Camera35mm\_SetAutofocusTightness( n )

Sets the tightness of the autofocus area. 1.0 means use a circle the width of the image, 0.5 is half the image, and 0.1 is 10% of the image. The circle is always centered in the image.

The default value is 0.7.

Wider values might be helped by using more samples, and narrower values could use less samples.

## Debugging Variables

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There are two variables that can be set to debug a scene:

Camera35mm\_DebugFocalPlane

Draws a partially transparent plane through the focal plane.

Camera35mm\_DebugAutofocus

Draws spheres at every position where an autofocus sample hit the object being focused on.

The sphere are purple, except for the one choosen to focus on, which is green.

## Example Output

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Autofocus Debug Output:

Number of hits = 77 (out of 500)

Autofocus tightness = 0.70

Autofocus on = <14.769, 256.538, -37.084> (distance 1263.750mm)

35mm Camera Debug Output:

Focal Length is 50mm

Focal Ratio is f/1.4  
Focal Distance is 1259.1mm  
Field of View is 39.6 degrees

Sensor size is 36mm by 18mm  
Sensor size is 700 by 350 (pixels)  
Circle of confusion is 0.051mm

Hyperfocal distance is 34772.2mm  
Near Focus is 1216.7mm  
Far Focus is 1304.5mm  
Total distance in focus is 87.80mm  
In front of focal plane 42.37mm (48.3%)  
Behind focal plane 45.43mm (51.7%)

Focal Blur Debug Output:  
Focal blur samples is 37  
Focal blur variance is (Default)  
Focal blur confidence is (Default)