

Digital Out-of-Focus

April 2005

The first zoom lenses were optical disasters and most pros wouldn't have touched them. Things have changed and many of today's zoom lenses are of very fine quality. The most obvious advantage of prime lenses is that they are on average about two stops faster. In order to keep size and weight down (and to make them affordable), zoom lenses often have maximum apertures of f4-5.6.

This is not a bad thing, considering that today's digital SLRs have such a good grip on noise that ISO 800 is perfectly useable. Then we have lenses with Image Stabilisation that give us another two stops, before we need a tripod. To get the best out of our optics we stop them down, and so we often land up with f8 when, just two decades ago, we would have used a prime lens at f2.8 with our Kodachrome 64 film.

In many instances the lower f-stop will be an advantage. In other cases, when we want to isolate our subject from surrounding clutter, the increased depth-of-field will be a nuisance.

That's exactly what happened in the shot below. It would have been a nice snapshot of my son Paul playing with one of those huge soap bubbles, if it was not for the cluttered background.



Original Shot (Canon 20D, 17-85 mm lens, f/8)



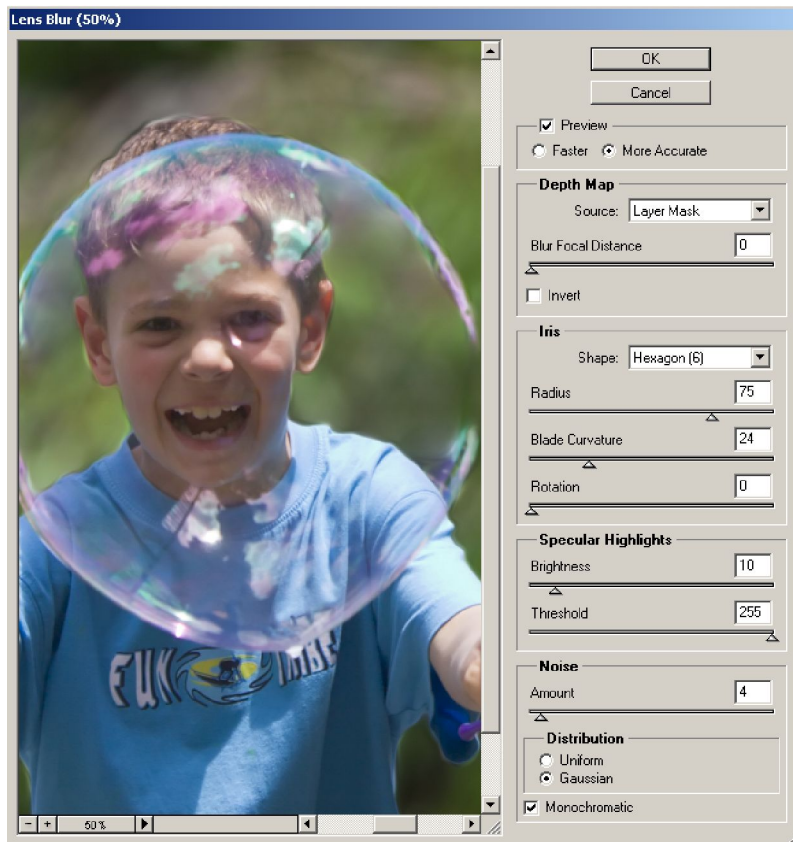
After applying Lens Blur

Here comes our digital darkroom to the rescue. We remember that there is a Blur filter in Photoshop, actually a couple of them, although most people are only familiar with the Gaussian Blur. In the latest CS version we can find something new - Lens Blur. Let's have a look what it can do.

The Lens Blur Filter

All blur filters eliminate detail through blending of neighbouring pixels. Gaussian Blur has been doing a good job for many years, but it doesn't really simulate the appearance of an out-of-focus area very well. This is most apparent when we have highlights and light sources in our image. As we will see later, the new Lens Blur filter does a better job.

This new filter only works in 8-bit mode. It opens up in a separate window and the interface looks quite daunting:



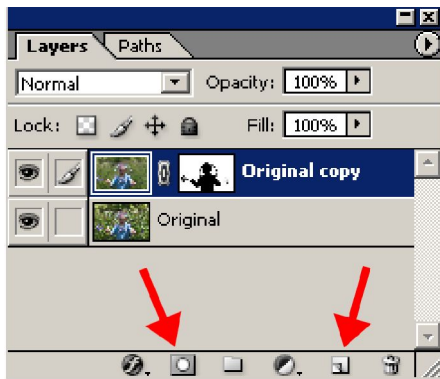
I will go through all the settings, but the first step is to make a selection of the image parts which need to be blurred.

Selecting the Background

For this particular image it was best to start with the Magic Wand and select most of the green background (use the Shift key to add to the selection). Then I switched to Quick Mask mode and cleaned up the selection with Paint Brush and Eraser.

Without feathering, the selection was saved as 'background'. We now have an alpha-channel that can be used with the Lens Blur. However, I prefer to work with a Layer Mask. It allows for better control.

It is fairly simple to turn a selection into a layer mask, while keeping the original image intact: With the selection active, drag the layer to the 'create a new layer' button at the bottom of the layer palette. Then click on the 'add layer mask' button, and there we have our selection as a layer mask.



If you Alt-click (or Option-click) on the layer mask, you can see the mask as a B&W image. The parts to be kept sharp are shown in black, the rest is white. Now is the time to make some corrections. For example, the green background shines through the soap bubble, which needs to be blurred, but we need to keep the outline of the bubble. Alternate painting with black or white, at different opacities, will give us the necessary transition. If it is difficult to do this on the B&W mask, then it is better to work in Quick Mask mode with the underlying image visible.

We now have black and white areas, as well as grey parts where the blur filter is going to work only partially. Next we apply a Gaussian Blur. This will not affect the image, only the mask, to keep a smooth transition between the parts we need to retain sharp and the blurred areas. A radius setting of 4 was best for this particular image. Blurring the mask does the same job as feathering a selection, but with better control.

Once we are ready with our selection we go to Filter > Blur > Lens Blur.

Applying the Lens Blur Filter

This is where the fun begins. The first thing to notice is that the filter is very slow. Even on a fast machine it is advisable to click on the 'faster' preview, unless you work on quite a small file.

Next we select 'layer mask' as the source. If you didn't make a layer mask, you can choose the selection you saved earlier.

Ignoring the 'blur focal distance' for now, we turn to the next section under 'Iris'. Now this is the ultimate for the control-freak photographer. Not only can you define the shape of the lens aperture with the number of blades, but also how curved the inner portion of the blade is and what degree of rotation the final shape will have!

Actually, you only need to change the 'radius' slider to get a more or less strong blur. The other controls only have a modest impact. The amount of blur increases by choosing a more round shape for the lens aperture with more blades, but apart from that these additional controls are only useful for determining size and shape of the out-of-focus highlights.

The next group of controls falls under 'Specular Highlights'. This is really the area where this filter stands out from a normal blur filter. When a lens captures a scene out of focus, any specular highlights will take on the shape of the lens aperture. We can

control this with the Iris settings. The Brightness setting allows us to determine how much the specular highlights will stand out from the surrounding areas. With a setting of 0 they won't be visible at all, at the maximum of 100 they will be very obvious. The next slider, the Threshold, determines which pixels are seen as specular highlights. A true specular highlight should have the maximum value of 255, but we can reduce this with the threshold slider to a lower value and the filter will treat a less bright image area as a specular highlight.

The last set of controls falls under the 'Noise' section. Blurring reduces the amount of detail and this can start to look unnatural. We quickly get the dreaded 'plastic' look, typical for noise reduction programmes with too aggressive settings. Adding some noise will help to overcome this. The Gaussian option will give a more random noise pattern than the more repetitive Uniform option. I also recommend using Monochromatic noise to get only tonal variations, rather than colour variations.

Using the Depth Map

We skipped this point earlier, because it doesn't apply to the image I used as example. But many images will have a gradient in respect to distance from the camera. For example, in a lot of photos the bottom of the picture will have objects close to the camera, and the top will show objects that are furthest away. In those cases we can actually draw a layer mask with a linear gradient going from white (areas to remain sharp) to black (areas to get full blur). This will give us a very smooth and gradual transition between blurred and sharp image areas.

Start by making a duplicate image layer (always apply the filter on a duplicate layer to preserve the original). With the duplicate layer active, add a layer mask by clicking on the 'add layer mask' button. If you Alt-click (Option-click) on the layer mask then you will be working on the mask and you can see what you are doing. With the gradient tool draw a linear gradient in the direction from foreground to background, from white to black, and then apply the Lens Blur filter as shown earlier. With the 'Blur Focal Distance' slider you can control the distance of your focal point. It is like focussing a lens!

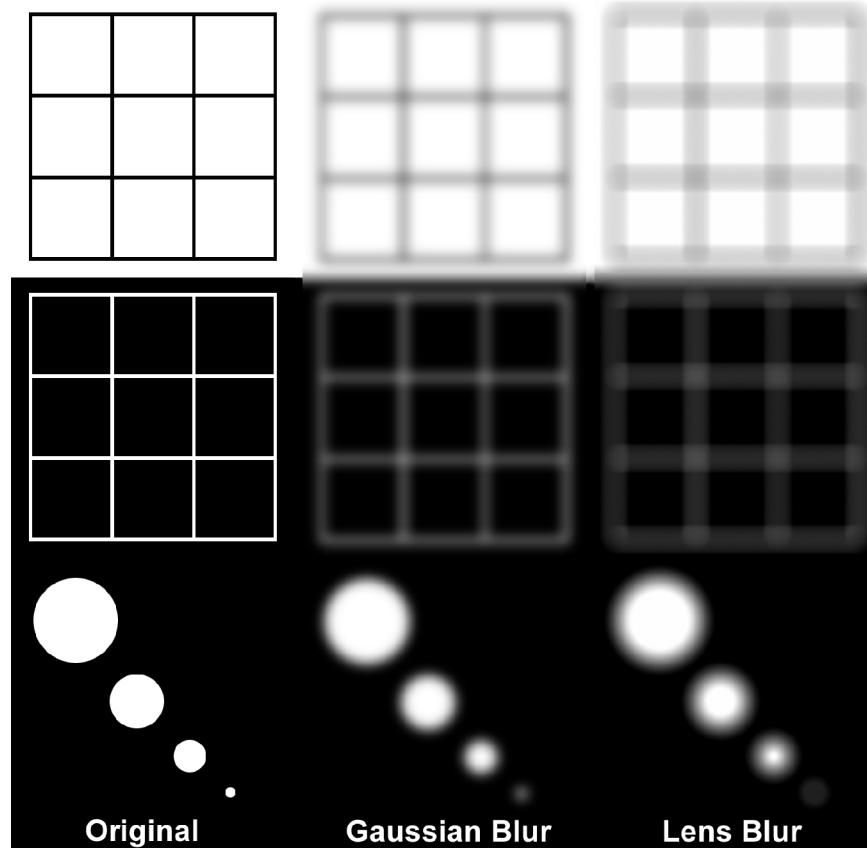
As with most things in the digital darkroom, there are many ways leading to the same result. We could, for instance, simply duplicate the original layer, apply the Lens Blur on the whole image of the duplicate layer and then use the Eraser tool to erase the sharp parts of the image. However, proper selections and layer masks will give you more control and flexibility.

Lens Blur versus Gaussian Blur

We have been doing this blurring now for years with the Gaussian Blur, I can hear you say. What's different? Well, the differences are quite subtle. In the example I used the difference between Gaussian and Lens blur are hardly noticeable.

The new Lens Blur filter better retains the geometric shape of objects, whereas Gaussian Blur merges everything regardless of the luminosity or colours of the picture elements. The difference is evident with highlights: the shape of the blur effect takes on the Iris shape selected by the user. Also the blurred highlights will retain a bright

white core, whereas Gaussian Blur will turn even the centre into a light gray. I have demonstrated the difference with a pattern of grids and simulated highlights:



Another advantage of the Lens Blur is that noise can be added in one go. With Gaussian blur you will need a second step. And then there is the 'Depth Map' feature, which is really cool!

In short, it is worth spending some time with this new filter. Once you get used to it, you will wonder how you ever got by without it.