

Digital Sharpening II

March 2004

Sharpening is one of the most-overlooked, yet most essential elements of digital imaging. Last month we had a close look at the primary sharpening tool, the Unsharp Mask filter (USM). This month we examine ways of getting the best out of this filter. We will also look at two other sharpening techniques without the use of USM and a few commercial programmes.

Where and when do we sharpen?

Devices that translate photons into pixels, digital cameras and scanners, always introduce some softening in the process. This is unavoidable but can be overcome with sharpening. Virtually all cameras and scanners have some sharpening function built into their software. In general they only offer simple controls, like 'low/medium/high' to choose from. I recommend to use the 'low' sharpening setting or to switch it off altogether, if possible. Any photo-editing programme will give us better control over the sharpening process.

Professional film scanner software has USM-type controls with three sliders. Keep in mind that the units of these controls are different to those in Photoshop. Some software even allows you to protect shadow areas. In those cases where you have good control over the sharpening process, it makes sense to apply some sharpening during scanning.

For digital cameras I recommend to shoot in RAW format. Later, during the RAW conversion we have better control over the sharpening, especially if you work with the RAW plug-in of the latest Photoshop CS.

If all the sharpening is done during editing, it is recommended to leave it for the last step before archiving the file. A final round of sharpening will be necessary after re-sizing and in preparation for printing.

Sharpening Individual Channels

The danger with sharpening is that we accentuate details in the image which we don't want to highlight, such as camera noise, dust, film grain, colour artefacts and all the little imperfections on the face of the bride. The third slider (Threshold) of the USM filter gives us some control, but not enough.

CCDs in digital cameras and scanners produce noise. The smaller the CCD and the less light it gets, the more we need to amplify the weak signal, which leads to noise. Even drum scans can be noisy, where it is caused by interferences between the pixels and the film grain.

Have a look at the individual channels of an RGB file. The blue channel is, almost invariably, the noisiest of the three. Similar to our eyes, CCDs are less sensitive to blue light and will add noise, which shows up as random pixels, especially in the dark shadow areas. Fortunately the blue channel is usually the one with the least important details. There is little harm in running the Despeckle filter on the blue channel (or use the Dust and Scratch filter for more control). The red and green channels can then be sharpened more aggressively. Use the same Radius setting, but a higher Amount on green than on the red channel.

Sometimes we find colour artefacts in our images, moiré patterns or colour fringing along edges from chromatic aberration. Sharpening will accentuate these colour problems. We can avoid this by converting the image to LAB mode and only sharpen the Lightness channel.

Changing the colour mode from RGB to LAB and back will degrade the image, but we can get around this by using the following technique: Apply the USM filter to your RGB image, then select Edit > Fade from the menu bar. Change the blending mode from Normal to Luminosity and click OK. This will have the same effect as sharpening the Lightness channel in LAB, but is quicker and will avoid the quantisation errors when changing colour modes.

However, in more severe cases it is best to convert to LAB, sharpen the 'L' channel and apply some blurring to the 'a' and 'b' colour channels. This can be done with the Median filter, the Dust and Scratch or the Gaussian Blur filter. I prefer the Dust & Scratch filter - the Unsharp Mask of blurring - because it gives me better control.

It is recommended to sharpen before CMYK conversion. If you are working with a CMYK file, chances are that it came from a drum scanner. In that case it has already been sharpened during scanning and very little additional sharpening will be required, unless it needs to be down-sampled. You can also consider sharpening individual channels. On portrait shots, for example, it is recommended to sharpen the black channel only, or the black and the cyan channel. This doesn't accentuate any skin textures, which are mainly composed of magenta and yellow.

Suppressing Noise with Masks

If the noise problems are confined to the shadow areas, it makes sense to mask them out before sharpening. The important details are usually in the midtones and highlights anyway.

A quick way to do that is to go to 'Select' in the menu bar, click on 'Colour range' and choose 'Shadows' in the drop-down menu. Tick the 'invert' box and click OK. We now have midtones and highlights selected. You can expand or contract the selection, or do some local touch-up with the paintbrush in Quick Mask mode. To avoid abrupt transitions, the selection needs to be feathered by a few pixels, depending on image size. Then we are ready to apply a full-strength sharpening to the more important areas of the image.

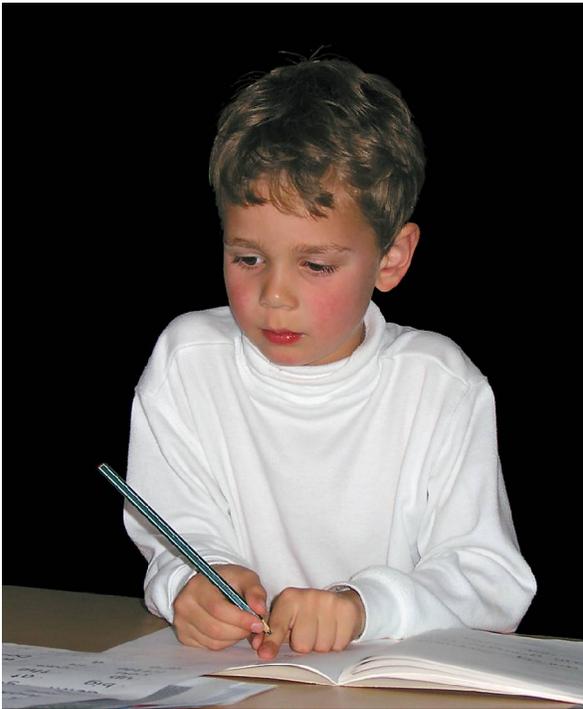
Similarly we can protect large sky areas, which are also quite often noisy.

Smart Sharpening

The ideal way of sharpening would be to only apply USM to the edges in our image and not exaggerate the texture in flat areas. Well, there is a filter called 'Find Edges' in Photoshop. Let's see what we can do with it.

1. Go to the Channels palette and click on each of the three colour channels. We look for the channel with the highest edge contrast.
2. Duplicate that channel by dragging it to the New Channel button.
(Needless to say, we omit step 1 with B&W images).
3. Select Filter > Stylise > Find Edges
This will be our mask through which we apply the USM filter. The darker the area, the more sharpening it will get.
4. Select Filter > Blur > Gaussian Blur
This will smooth out the transition between areas which get sharpened and those that don't. The radius setting will depend on the resolution of the image.
5. Select Image > Adjustments > Levels
Here we can increase the contrast of our mask by moving the black and white sliders towards the middle.
6. Choose Select > Load Selection from the menu
This makes a selection from the modified channel. Check the 'Invert' box to select the black areas for sharpening.
7. Click on the RGB channel to return to the normal view and apply the USM filter. We can use a fairly strong setting, say 250/1/0 or more, because we are sharpening only the important areas. You can get rid of the 'marching ants' by pressing Ctrl+H (or Command+H) and observe the outcome in 100% view.

This is my preferred method of sharpening, which I use in 99% of cases. It can be automated to a large extent by using an action. I also run it on a separate layer on top of the original. This allows me to use the Rubber tool on the top layer to reduce the sharpening effect in areas where I don't want it. In the example on the opposite page we see young Paul doing his homework. The pencil gets a lot of sharpening, too much for my liking, and we can reduce this by applying a soft Rubber brush to the top layer to let the original, unsharpened image come through.



Canon G2 – Paul with Smart Sharpening



Smart Sharpening mask - Only the dark areas get sharpening



Detail: Normal USM filter



Detail: Smart Sharpening

Commercial Sharpening Programmes

There are a number of Photoshop Plug-ins available which promise us the perfect sharpening tool. I have used EdgeSharpenPro from Fred Miranda and nik Sharpener Pro (very expensive!) from nik multimedia. Others are Unsharp Mask Pro, AutoFocus, Intellisharpen, PhotoKit Sharpener, PhotoWiz FocalBlade and Ultra-Sharpen Pro.

None of these plug-ins does anything which cannot be done in Photoshop alone. I prefer a more hands-on approach, which gives me full control. For the beginner, however, and the less confident Photoshop user they are ideal tools.

One programme stands out and deserves special mentioning - Focus Magic from Acclaim Software. This plug-in is not based on the USM filter, but works on a "blur width" parameter and claims to recover out-of-focus and motion-blurred images. The results are not perfect, but certainly better than what the USM filter can produce.

Other Sharpening Techniques

I mentioned that I use the Smart Sharpening technique on 99% of my own and my client's images. What about the other 1%? Last month I said that not every, but most good images have a strong edge definition. An example of a perfectly good image, but without sharp edges, would be a portrait taken with a special soft lens. We wouldn't want to sharpen that.

Another example shown here is one of Andris Apse's superb shots. The USM filter, even in Smart Sharpening mode would only bring out the film grain. These images often benefit by some sharpening which does not rely on USM.

One technique is based on the **High-pass filter**:

1. Duplicate the background layer
2. Select Filter > Other > High-pass
The radius setting can be between 2 and 10. A lower setting gives a stronger effect.
3. Change the blending mode to 'overlay', 'soft light' or 'hard light' depending on the desired effect.
4. Decrease opacity of the layer, if necessary.

Another one worth mentioning works with the **Emboss filter**:

1. Duplicate the background layer
2. Select Filter > Stylise > Emboss
Set the angle to mimic the direction of light and set height to 2-4.
3. Change the blending mode to 'overlay'.



Photo: Andris Apse

No sharpening



Sharpened with High-pass Filter

Conclusion

Sharpening can give your images the extra snap that makes them jump off the page. Too little sharpening will leave them looking dull and, worse, too much sharpening gives them the unpleasant 'crunchy' look. It is essential to have a good grasp of how the USM filter works, to know what the three controls are doing and how they interact. We discussed this last month.

The next step is to apply the USM filter selectively. By sharpening individual channels and selected areas, and possibly blurring other parts, we can transform an ordinary photograph into a work of art.

Digital sharpening is definitely one of those skills that improve with practice and experience. Expect your results to improve over time and, since sharpening cannot be undone, this is one good reason to always keep a copy of your unsharpened files!

Many thanks to Andris Apse for allowing me to use one of his images.