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KODAK PROFESSIONAL Anti-Aliasing Filter

Anti-Aliasing Advantages

What is anti-aliasing?

In digital imaging, "aliasing" is a term used when information (colors or patterns) is created in an image that was not in the original scene. Normally, after the pixels on the digital camera's charged coupled device (CCD) sample all of the data in the exposure, the data is transferred to the camera's PC card. From the PC card, the data is converted to digital output, and the color is interpolated as it reaches ADOBE PHOTOSHOP through Kodak's DCS TWAIN/Acquire module. Aliasing is revealed at this point, after color interpolation.

To understand the effects and results of color interpolation, look at Figure 1. This is an example of an image that was photographed with and without the anti-aliasing filter installed. Note that color aliasing commonly occurs in details like fabric and on the edges of type. Strands of hair and metal objects present a similar challenge.

How does it happen?

When the CCD pixels sample the information, they see a very sharp distinction from black to white (dark to light) and are unable to sample all the high-frequency data.

When the information is color interpolated, under-sampled data is created and results in unwanted color, such as color aliasing, spectral highlights, and moiré patterns. To remove color-aliasing artifacts, an anti-aliasing filter can be installed in the camera. The filter is an optical assembly that fits in front of the CCD and behind the camera lens. It eliminates aliasing by lowering the high-frequency/high-contrast areas in an image that would normally exceed the sampling capability of the CCD.

In turn, the CCD pixels sample the image data at lower frequencies before the data is color interpolated. But because the anti-aliasing filter moderates the high frequency, it also affects the surrounding low-frequency data—and this can decrease the sharpness of the image. You can compensate for this reduction in sharpness using the TWAIN/Acquire module, or in PHOTOSHOP using Unsharp Mask or the Quantum Mechanic plug-in.

Color aliasing

As illustrated in Figures 2a and 2b, when the image was photographed with the anti-aliasing filter removed, the hair and sewing needle showed a rainbow effect. This type of aliasing is referred to as color or chromatic aliasing. When this same image was photographed with the anti-aliasing filter installed, the aliasing was removed—but the overall image was less sharp.

Figure 1



Anti-aliasing filter removed



Anti-aliasing filter installed

Sharp transition

The lines and type in Figure 3 illustrate the sharp transition (high frequency) of information from black to white. The CCD pixels can't sample the high-frequency data, so when the information is interpolated, the software guesses which pixel colors to insert. In this image, the result is a colored halo effect around the type and the lines.

The same image photographed with the anti-aliasing filter shows the colored halo removed. And again, the image can be sharpened in the TWAIN/Acquire module, or in PHOTOSHOP using Unsharp Mask or the Quantum Mechanic plug-in.

Moiré aliasing

Shiny polyester material and patterns such as herringbone and stripes create a type of aliasing called "moiré." The changing reflection of the pattern creates an inaccurate sampling by the CCD pixels. After interpolation, the result is a pattern in the image that does not exist. (See Figure 4.)

When photographed with the anti-aliasing filter installed, the resulting image still reflects the unwanted color pattern, but to a lesser degree. Processing in the TWAIN/Acquire module or in PHOTOSHOP using the Quantum Mechanic plug-in may help achieve the desired results.

Kodak Professional

Anti-Aliasing Filter

Figure 2a



Anti-aliasing filter removed

Figure 2b



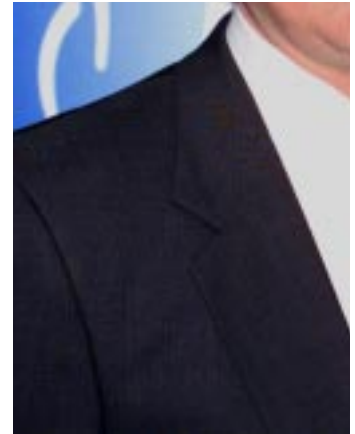
Anti-aliasing filter removed

Figure 3



Anti-aliasing filter removed

Figure 4



Anti-aliasing filter removed



Anti-aliasing filter installed



Anti-aliasing filter installed



Anti-aliasing filter installed



Anti-aliasing filter installed

Don't forget the IR filter

It's important to understand that when the anti-aliasing filter is removed, an infrared (IR) cut-off filter must be installed in its place. While Kodak's CCDs do have a built-in IR, some IR wavelengths are still able to pass. Kodak's anti-aliasing filter has a secondary IR coating, which blocks the remaining IR wavelengths from the CCD. The combination of the two filters blocks all IR wavelengths from the CCD. Allowing infrared light to reach the CCD would result in color contamination of the final image. The anti-aliasing filter can be replaced with an IR cut-off filter that has no anti-aliasing capabilities.

Is anti-aliasing for you?

The eye sees patterns and detail differently from what the CCD can record. When an image is photographed with a one-shot digital camera (KODAK PROFESSIONAL DCS Digital Cameras are one-shot cameras—the pixels on the CCDs

sample all the data in one exposure), colors and patterns are represented by spatial frequencies that are sampled by the CCD. If the frequencies are higher than the CCD can sample, the data is under-sampled—and the result can often be seen as color aliasing.

The KODAK PROFESSIONAL Anti-Aliasing Filter optically prevents aliasing from occurring by reducing the high-frequency data. The resulting image may look less sharp than one photographed without the filter. Portrait, fashion, and product photography may benefit from anti-aliasing.

Realizing that this effect may not be necessary for all subject matter, Kodak Professional has made the anti-aliasing filter removable. Medical and law enforcement photographers and photojournalists can produce images that will benefit from additional sharpness.

For more information

Visit us on the Web at:

www.kodak.com/go/professional

For assistance in the U.S., call 1-800-23KODAK (1-800-235-6325), ext. 19.

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