

Neat Image

To make images look better.

User guide

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1. Introduction

1.1. Overview

Neat Image is a digital filter application designed to reduce visible noise in digital photographic images.

Neat Image detects, analyzes, and reduces image noise. The filtration quality is higher than that of other methods because Neat Image takes into account specific characteristics of particular image acquisition devices, making the filtration more accurate. You can train the program to adapt to almost any input tool (digital camera, scanner, etc.). Access to the rich control set allows you to easily achieve your desired level of noise reduction.

Noise is a serious problem that hinders high-quality digital image processing. In digital photography, the consumer- and prosumer-level cameras produce images with an easily noticeable noise component. This component is especially strong in images taken at high ISO rates. The noise reduces the visual quality of digital images and resulting printouts. Some image processing operations, like sharpening, make quality of noisy images even worse.

In addition, Neat Image can make images look sharper without any degradation of image quality (which is usually inevitable with noisy images). The combination of the sharpening and noise filter makes such an effect possible.

See [examples](#) of Neat Image noise reduction.

Neat Image is currently produced in four editions: Demo, Home, Pro and Pro+.

Demo is a free edition of the software with slightly-limited functionality. Home is the edition of Neat Image for home users. Pro is the edition of Neat Image for professional users. Pro+ additionally includes the Photoshop-compatible plug-in version of the filter.

1.2. Features

Noise Reduction and Image Sharpening

- **Advanced noise filter** to reduce the level of noise in digital images
- **Complete control** over the filter settings to achieve the desired level of noise reduction
- **Smart sharpening filter** to make images look sharper without amplification of noise
- **16-bit image support** to fully utilize capabilities of modern image acquisition devices
- **Photoshop-compatible plug-in version** of the filter

Device Noise Profiles

- Rich set of free ready-made **device noise profiles** in the profile library
- **Easy building custom device noise profiles** for your camera or scanner
- **Profile Matcher** for automatic matching of device noise profiles to images

Queued Processing

- **Queued processing / batch processing** of image series
- **Background processing** (images are processed as you prepare a new one)

Preview

- **Embedded preview** of filtration results for a selected area of the input image
- Preview of filtration results for each image **channel** and **frequency range**
- **Variant Selector** for easier filter adjustment
- **Full-size comparison** of original vs. filtered images

Some features are only available in certain editions of Neat Image. Detailed feature map, page 47, explains the differences between Neat Image editions in details.

1.3. Requirements

Recommended system configuration to process 2-3-megapixel images is:

- Windows 9x, ME, NT, 2000, XP
- Pentium-III class machine or higher
- 128 MB RAM or higher
- True color display, resolution 1024x768 or more

Minimum system requirements are:

- Windows 95
- Pentium-I class machine
- 32 MB RAM
- Hi-color display, resolution 800x600

System requirements for practical applications of Neat Image depend on size of input images. The more system RAM is available the larger the images that can be handled. The processing speed is determined primarily by CPU number-crunching power and memory speed.

For the standalone version of Neat Image, input images should be in one of the following formats (the same formats are supported to save output images¹):

- TIFF (uncompressed, single image, no layers, no alpha channel, no mask)
 - 24-bit RGB
 - 48-bit RGB
 - 8-bit grayscale
 - 16-bit grayscale
- JPEG
 - 24-bit RGB
 - 8-bit grayscale
- BMP (uncompressed, Win3x)
 - 24-bit RGB
 - 32-bit RGB

Minimum size of the input images is 20x20 pixels; maximal size is usually limited by the amount of system RAM available.

The plug-in version of the filter is compatible with the following plug-in hosts:

- Adobe Photoshop 5, 6, 7, CS
- Adobe Photoshop Elements 2
- Jasc Paint Shop Pro 7, 8
- Ulead PhotoImpact 8
- Corel Photopaint
- PhotoLine32 9, 10

The plug-in may be compatible with other hosts as well.

¹ Saving output images to TIFF and BMP formats as well as copying to the clipboard is only available in the Home, Pro and Pro+ edition of Neat Image.

2. Key concepts

2.1. What it can do – functionality of Neat Image

Neat Image is a digital image filter. Its main function is to reduce noise in digital images.

Neat Image can work with many imaging devices – digital cameras, scanners, etc. The program can be adjusted to a particular device by means of a *device noise profile*, which contains data describing the noise characteristics of the device working in some mode.

A device noise profile is built through analysis of featureless image areas. The key idea behind analysis is to let the human user specify image areas that contain no visible (or important) details. The program alone cannot distinguish noise (or some other unwanted details, like periodic interference) from important image details while a human user can easily select an area that contains no important details. By analyzing specified area, the program can build a device noise profile which describes this particular noise. With the profile, Neat Image can efficiently reduce noise in the image. Also, the software can automatically select the device noise profile best matching a particular image.

The Neat Image *noise filter* processes images in *three frequency ranges*. This makes possible reducing noise in one frequency range even if details are present in other ranges.

Neat Image can use several working color spaces (RGB, YCrCb JPEG or YCrCb Symmetric) to process images. Choosing suitable working color space increases the filter efficiency as well. For example, color spaces of the YCrCb family separate the brightness and color (luminance and chrominance) image components so it is easier to deal only with the brightness component, which often contains the major part of visible noise.

The characteristics of noise often strongly depend on the local brightness of an image area. Neat Image can measure these dependencies and take them into account within the filtration procedure resulting in increased accuracy of the noise reduction.

In addition to noise reduction, Neat Image has the *sharpening filter*, which only sharpens important image details without increasing the level of noise. This filter uses the same device noise profile as the noise filter, so applying two filters together saves time and produces better overall results.

2.2. When it works – types of input images

Neat Image is designed to reduce noise in images produced by digital cameras and scanners, and can also be used to process images from other sources. The input image should satisfy the following requirements:

- **Noise must be uniformly distributed throughout the image**, i.e., there should be no strong surges of noise intensity in some areas of the image or significant changes of noise characteristics across the image.

Neat Image works fine, for example, on images with high ISO noise. However, ‘hot’ or ‘dead’ pixels (produced by single ‘broken’ image sensor elements) do not satisfy the uniformity condition and, therefore, are not efficiently removed by Neat Image¹.

Another frequent source of noise is JPEG compression. The JPEG noise is approximately uniform when high quality compression (low compression rate) is used. However, low quality compression makes noise non-uniform. Therefore, we recommend using the highest quality of compression whenever possible. Try to avoid visible artifacts (‘squares’ or ‘blocks’ introduced by JPEG compression) in input images beginning from the early stages of image processing!

- **Noise should be concentrated in high and medium frequencies**. This condition is usually met by images produced by modern digital cameras. This condition may not be completely satisfied if you use the strong (e.g., x2-x3 and more) digital zoom features of digital cameras.
- If you are going to use the noise profile equalizer then **the primary sensors of an image acquisition device should be RGB** (as compared with image sensors with subtractive primary colors). This requirement is not strict and may be dropped completely in the future.


¹ Hot pixel removal is in our development plans.

3. Filtration process overview

3.1. Overview of filtration process

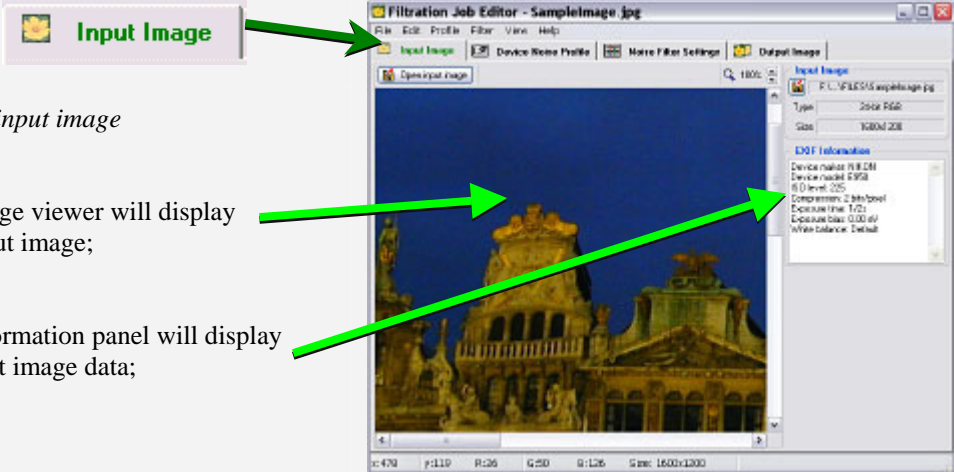
You can filter an image using the **Filtration Job Editor**. The **Filtration Job Editor** opens when a new filtration job is created by you or automatically. When you start Neat Image for the very first time, the **Filtration Job Editor** opens automatically.


Using the **Filtration Job Editor** you can:

1.  **Input Image**

Open an *input image*

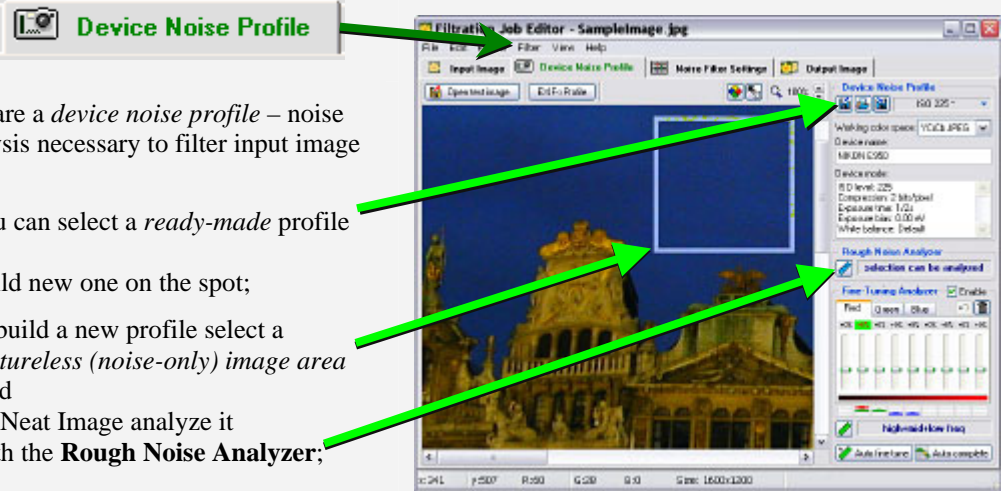
- the image viewer will display the input image;
- the information panel will display relevant image data;



2.  **Device Noise Profile**

Prepare a *device noise profile* – noise analysis necessary to filter input image

- you can select a *ready-made* profile or build new one on the spot;
- to build a new profile select a *featureless (noise-only) image area* and let Neat Image analyze it with the **Rough Noise Analyzer**;



continued on the next page...

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3. **Noise Filter Settings**

Adjust the *noise filter* and *sharpening settings* to achieve desired level of noise reduction and sharpening

- select any image area and Neat Image will prepare a *preview*;
- vary the filter settings (start with the noise reduction amount in the **Y** channel) and immediately see the preview result;
- as soon as you are happy with the preview proceed to the next step;

4. **Output Image**

Process the input image

- *apply filter* to the whole image;
- when processing is finished, evaluate the resulting output image by *comparing* it with the input image;
- save the output image to a file on the disk.



3.2. Running Neat Image on a sample image

To help you start using Neat Image, we have prepared a test-kit. You can download it from the Neat Image web page: [test-kit](#) for Neat Image (250KB). Having downloaded, please unzip it to a new folder/directory.

The test-kit contains a sample image: the file **SampleImage.jpg**. This image is a part of typical photo taken with digital camera (Nikon CoolPix 950 in this case). Detailed information about the test image is available in the file **SampleImageInfo.txt**.

Please start Neat Image and follow the steps below to see how it can improve the image:

Step 1. Open the sample image

1. Click  **Open input image** on the toolbar of the **Input Image** tab:  **Input Image**
2. In the **Open input image file** dialog, navigate to the folder/directory where the sample image has been unzipped and double click on the file **SampleImage.jpg**;

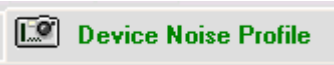
Neat Image will open the sample image.


You will see that there is strong noise in the image, especially in the sky area (use zoom and scroll to see

it). This is the typical noise produced by the Nikon CoolPix 950 digital camera. The task of Neat Image is to eliminate this noise. To do that the program generally needs some information about the noise. We have prepared this information in advance and saved it in a sample device noise profile. This profile is supplied with the test-kit in the file *SampleProfile.dnp*. Using the noise profile, Neat Image can efficiently eliminate noise in the image.

Step 2. Open the sample device noise profile

1. Switch to the **Device Noise Profile** tab:




2. Click  (blue disk) in the **Device Noise Profile** box on the right panel;
3. In the **Open device noise profile** dialog, navigate to the folder/directory where the sample device noise profile has been unzipped and double click on the file *SampleProfile.dnp*;

Now the sample device noise profile is opened and Neat Image is almost ready to filter the sample image. Usually, you would adjust the filter settings at this stage. To make things easier for the first run of Neat Image, we have prepared a sample preset file that stores 'good' filter settings suitable for the sample image.

Step 3. Open the sample filter preset

1. Switch to the **Noise Filter Settings** tab:




2. Click  (pink disk) in the **Filter Preset** box on the right panel;
3. In the **Open filter preset** dialog, navigate to the folder/directory where the sample filter preset has been unzipped and double click on the file *SamplePreset.nfp*;

Now the sample filter preset is opened and the filter settings are adjusted to process the sample image.

Step 4. Apply the filter

1. Switch to the **Output Image** tab:



2. Click  on the toolbar and wait until the progress indicator disappears.

Processing may take some time (this depends on the speed of your computer's CPU). Then the filtered output image is displayed. You can click the image to compare it with the input image. Notice that the noise – especially in sky area – has been significantly reduced while the image details have been preserved.

Please note that the sample device noise profile and sample filter preset supplied with the test-kit are suitable only for images taken with that particular digital camera working in certain mode. Neat Image can perform similar noise reduction on images captured or acquired by any image acquisition devices working in any mode. To be able to do that Neat Image needs specific device noise profiles that describe the noise characteristics of those devices. The good news is that you can build these profiles yourself. With Neat Image, you can easily do this because the program can automatically build the profiles by analyzing noise samples selected by you. Also, you can find ready-made device noise profiles for many digital cameras and scanners in the [Profiles](#) section of Neat Image web page.

The next sections – Filtration process details, page 9, and Building device noise profiles, page 16, – contain detailed descriptions of the filtration process and building custom device noise profiles. There are also several examples of profiling and filtration in the [Examples](#) section of Neat Image web page.

4. Filtration process details

Neat Image can be used to filter a single image or multiple images at the same time. This section contains a detailed description of the filtration process involving a single image. Queued processing of multiple images is explained in the section 7, page 29.

The filtration process is described as a set of steps that have to be taken to process an image. Please follow the description step-by-step or read a specific part to find out particular details.

4.1. Step I. Open an input image

Use the **Input Image** tab in the **Filtration Job Editor**:



To open an input image

⇒ Click (the **Open input image...** button) on the toolbar, or in the **Input Image** box, or select the **File | Open Input Image...** menu item. Supported file formats are BMP, TIFF and JPEG (please see Requirements, page 4, for details).

or

Use the Windows clipboard to bring an image into the program from another application: use the **Edit | Paste** menu item. The clipboard image should be in 24/32-bit RGB format.

or

Drag an image file from the Windows Explorer and drop it to the input image viewer.

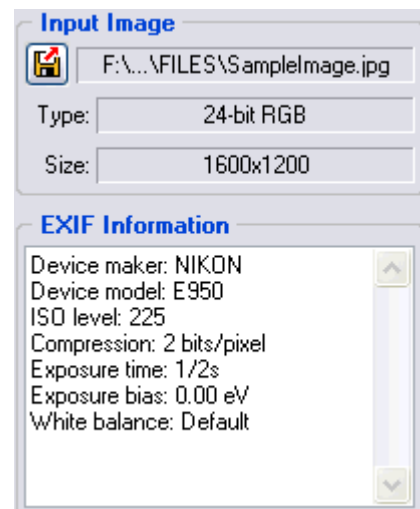
When the input image is ready, the **Input Image** box (on the right panel) displays related image information such as image bit depth, size, channel names, and EXIF data fields¹ (when available). You may need to refer to these data later on.

To scroll and pan the image in the image viewer:

- drag the image using the middle mouse button;
- press the spacebar and drag the image with the left mouse button.

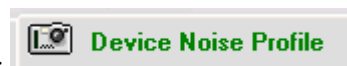
To change the image zoom level:

- use the mouse wheel;
- use the zoom control on the toolbar;
- use the **Ctrl-Plus**, **Ctrl-Minus** keyboard shortcuts.



4.2. Step II. Prepare a device noise profile

Use the **Device Noise Profile** tab in the **Filtration Job Editor**:



To filter an image, Neat Image needs to know the characteristics of noise produced by the image acquisition device (digital camera, scanner, etc.) that the input image comes from. The noise characteristics of a device working in certain mode are stored by Neat Image in a *device noise profile*.

There are several ways to get a device noise profile that suits the input image:

- To automatically select the most suitable device noise profile from a ready-made set of profiles using Neat Image automatic profile matcher;
- To manually select a suitable profile from a ready-made set of profiles using their descriptions;

¹ Only those EXIF fields are shown that could be extracted from the input image and are important for noise reduction.

- To build a new profile using the input image or a specially prepared test image.


The first two options are available once you have a ready-made set of profiles. You may find free sets of profiles for your imaging device(s) in:

- [Profiles](#) section of Neat Image web page;
- [Device noise profiles](#) section of Neat Image community forum;
- Other digital imaging forums and web pages from users of Neat Image.

Once you have a set of profiles for different modes of your imaging device, you can (automatically or manually) select a profile that matches the input image.

If you cannot find a ready-made set of profiles, then you can easily build profiles yourself. See the Building device noise profiles section, page 16, for more information.


To automatically select and open the best matching noise profile

- ⇒ Click  (the **Profile matcher** button) or select the **Profile | Open Best Matching Profile** menu item.

Neat Image automatic profile matcher uses the EXIF data fields of the input image to select the device noise profile that best matches the device mode of the image. The device noise profile is selected among a set of profiles stored in a special folder (and its subfolders). You can specify this folder in the application options.

See Profile matching options, page 37, for more details about the following profile matching options: *Matching device noise profile folder/directory*, *Matching parameters priorities* and *Auto match on image open*.

To manually select and open a device noise profile

- ⇒ Click  (the **Open device noise profile...** button, blue disk) in the **Device Noise Profile** box or select the **Profile | Open...** menu item. In the **Open device noise profile** dialog box, you can specify the name of the device noise to be opened.

or

Select a profile using the popup menu: click on the button on the right side of the profile name shown in the top part of the **Device Noise Profile** box, and select a profile from the popup menu.¹

When selecting a profile that matches the device mode of the input image, use the profile file names and folder structure to guide your search. See Preparing a set of profiles for different device modes, page 25, for more information on structuring the profile sets.

To build a new profile using the input or test image

If the input image has enough featureless areas or you have prepared a special test image (see Using the calibration target, page 23) then you can build a new device noise profile on the spot. Please see Building a device noise profile for specific device mode, page 16, for detailed instructions.

4.3. Step III. Adjust filter settings

Use the **Noise Filter Settings** tab in the **Filtration Job Editor**:



The noise and sharpening filters have many settings that you can adjust. You can vary the settings to find values that produce the best results from your point of view. The easiest way to do this is to use the preview.


¹ If there is no popup menu, check the Folder options of Neat Image, see page 38.

4.3.1. Use preview to adjust filter settings

To use preview

⇒ Select any image area: press the left button, drag the mouse and then release the button.

When an area is selected, Neat Image will¹ automatically apply filtration to the selected image area.

You can also manually invoke preview recalculation with  (the **Preview** button), the **Filter | Preview** menu item, or the **F5** hotkey.

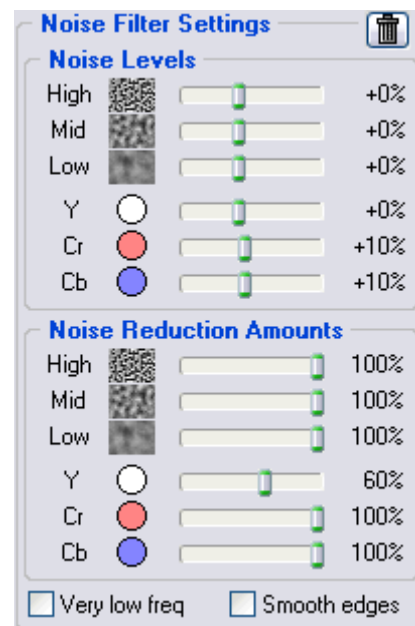
As soon as the preview is ready, you can left-click on the selected area to temporarily switch back to the original for comparison.

4.3.2. Adjust noise filter settings

The noise filter has separate settings for all frequency and channel components. There are the *noise level* and *noise reduction amount* controls for all image components.

The noise level controls determine which image elements are considered noise. Because the noise level controls are relative to the device noise profile, their defaults usually produce satisfactory results. The noise level defaults are 0%², which means the noise levels are completely determined by the noise profile. When the level controls are set differently, the noise level estimations are raised or lowered accordingly. A noise level can be in the range from -100% (which means no image elements are considered noise, and therefore, noise reduction will not be applied at all to the corresponding image component) to +150% (which means noise reduction will be applied to the image elements that are 'weaker' than 2.5 times the noise level determined by the noise profile).

Noise reduction amount controls determine how much reduction is applied to the image elements identified as noise. Noise reduction amounts can be in the range from 0% (none of the detected noise is removed) to 100% (all the detected noise is removed). By default, the noise filter removes 100% of detected noise³. Decreasing the amounts can have a positive effect if the input image contains some natural noise. For example, when you are filtering images of asphalt, sand, or anything else that contains fine natural noise-like features, it may be helpful to reduce amounts down to 40-70%.⁴ Our experience shows that these values generally provide a good balance between preserving image details and noise removal.



To adjust noise filter settings⁵

- **Adjust noise levels (optional)**

⇒ Use the **High**, **Mid**, and **Low**; **Y**, **Cr**, **Cb** (**R**, **G**, **B**) **noise level** sliders.

The noise filter has access to three frequency components and three channel components of the input image. Corresponding sliders adjust the estimated noise levels for each of these components.

The higher a specific noise level, the more image elements in the corresponding image component are considered noise. Be careful, setting a noise level too high can lead to removal of important image details. Setting a noise level too low can lead to incomplete filtration: residual noise and

¹ If **auto recalculate preview** is checked; see Filtration options, page 38.

² Some of the noise level defaults may be different from 0%.

³ Some of the noise reduction amount defaults may be different from 100%.

⁴ See also Partial filtration, page 46, for additional tips.

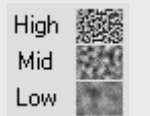
⁵ It is advised to switch off the sharpening in all channels when adjusting noise filter.

compression artifacts can stay in the output image.

As a rule, if the device noise profile has been built properly, it is not necessary to increase the noise levels by more than 50%. If the input image contains strong surges of noise in the high frequency range, it is recommended to increase the high frequency noise level up to +20 to 40%.

If the input image contains strong low frequency noise then you may need (in addition to low frequency component filtration settings) to switch on the very low frequency filter (check the **Very low freq** checkbox in the **Noise Filter Settings** box).

Noise samples of different frequency/size are shown in the **Noise filter settings** box. These are examples of grainy structures typically regarded as noise.



If the input image contains strong color noise, it is recommended to increase the **Cr** and **Cb** noise levels to +30%. In some cases, it may be useful to increase these noise levels up to +100%.

As human vision is not very sensitive to variations of colors, strong filtration in the **Cr** and **Cb** channels does not noticeably distort an image, but efficiently removes color noise.

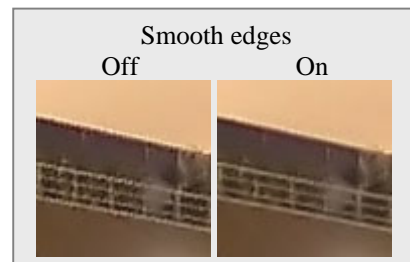
- **Adjust noise reduction amounts (optional)**

⇒ Use the **High**, **Mid**, and **Low**; **Y**, **Cr**, **Cb** (**R**, **G**, **B**) noise reduction amount sliders.

You can vary the noise reduction amount for each frequency and channel component of the input image. The higher a specific noise reduction amount, the more of the detected noise is removed in the corresponding image component. Be careful, setting the noise reduction amounts too high can lead to loss of fine details and unnaturally looking (over-smooth, plastic-like, see page 44) results. Too low amounts may be not enough to sufficiently remove the objectionable part of the noise. You need to balance the noise reduction amounts (most importantly, the amount of noise reduction in the **Y** channel) to get the result that looks best to your eyes.

If the input image has only fine (high frequency) noise elements you can utilize only the high frequency filter and switch off the filters for other frequencies by setting their amounts to 0%.

Turn on the **Smooth edges** checkbox to make edges and lines in the image look smoother (see an example on the right).



- **Use preview**

⇒ Use the preview when adjusting the noise filter settings.

After you have made changes to the noise filter parameters, do not forget to check the preview.¹ Use the preview on different parts of the image to get a better feeling for the results of noise reduction.

If the noise filtration looks too strong (weak) try to decrease (increase) the noise levels and/or noise reduction amounts for the appropriate channels and/or frequency ranges. If this does not help, probably the device noise profile is not accurate enough. Return to Step II, page 9, and additionally fine-tune the device noise profile (analyze a featureless image area with the manual fine-tuning noise analyzer).

- **Use Component Viewer (optional)**

The **Component Viewer** is intended for detailed examination of both frequency and channel components of the image. Find more details about using this tool in the Component Viewer subsection, page 28.

- **Use Variant Selector (optional)**

The **Variant Selector** is designed to compare several variants of filtration side-by-side to find the

¹ Using *auto recalculation of preview* is recommended (see Filtration options, page 38).

optimum filter settings easier and faster. More information about this tool is available in the Variant Selector subsection, page 28.

4.3.3. Adjust sharpening settings (optional¹)

The sharpening filter is designed to increase image sharpness without increasing the noise strength.

The values of the sharpening settings are relative to the device noise profile and the noise filter settings. The default values of the sharpening settings should produce satisfactory results (when sharpening is enabled for any of the channel components) but you are encouraged to vary the settings to find values that produce the desired level of sharpness. Zero sharpening amounts will not sharpen the image at all. The non-zero sharpening amounts will apply sharpening of the specified strength. Use sharpening controls for different frequency components to sharpen fine, medium or large image details. Like with any sharpening method, you need to balance the amounts to avoid oversharpening.

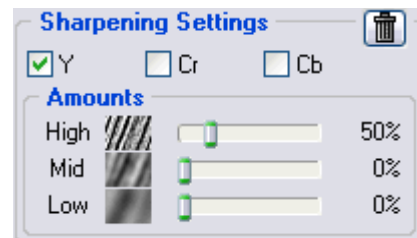
Use the preview when adjusting the sharpening settings.

To adjust sharpening settings

- **Select color channels where sharpening should be applied**

⇒ Use checkboxes in the **Sharpening Settings** box.

If the working color space is **RGB**, then all color channels should typically be processed. If it is the **YCrCb** color space (JPEG or Symmetric), then, usually, you do not need to sharpen the **Cr** and **Cb** channels.



- **Adjust sharpening amounts**

⇒ Use the **High**, **Mid** and **Low** amount sliders in the **Sharpening Settings** box.

Specify how much sharpening should be applied to each frequency component of the image.

The standard sharpening settings used by many graphic editors are 100% for high frequency and 0% for medium and low frequencies (used by default).


- **Use preview**

⇒ Use the preview when adjusting the sharpening settings.

After you have made changes to the sharpening settings, do not forget to check the preview. Use the preview on different parts of the image to get a better feeling for the results of sharpening.

4.3.4. Save the filter settings into a preset (optional)

To save filter settings for future use


⇒ Click  (the **Save filter settings as preset...** button, pink disk) in the **Filter Preset** box or select the **Profile | Save Filter Settings as Preset...** menu item.

In the **Save filter preset as** dialog box, specify the name of the file to save the preset. The filter presets are stored in ***.nfp** files.

Saved filter preset includes the noise filter and sharpening settings. By saving-opening a preset, you can reproduce exactly the same filter settings later on. Also, you can exchange filter presets with other users of Neat Image. Together, a device noise profile and a filter preset can be used to accurately reproduce the filtration results.

¹ You can skip this subsection when reading for the first time.

To open a previously saved filter preset

- ⇒ Click  (the **Open filter preset...** button, pink disk) in the **Filter Preset** box or select the **Filter | Load Filter Settings from Preset...** menu item. In the **Open filter preset** dialog box, specify the name of the filter preset to be opened.

or

Select a preset using the popup menu: click on the button on the side of the preset name shown in the top part of the **Filter Preset** box, and select a preset from the popup menu.¹

There are several pre-written filter presets in the **PRESETS** subfolder of installed Neat Image application. Please explore these presets to see what combinations and values of the noise and sharpening filter's settings can be used to solve typical tasks (names of the presets explain these tasks).


4.4. Step IV. Apply filter to the input image

Use the **Output Image** tab in the **Filtration Job Editor**:

**To apply the filtration to the input image****1) Select output image type**


- ⇒ Select the output image type from the list in the **Filter Output** box (24-bit RGB/48-bit RGB; 8-bit/16-bit Grayscale). The output image type can be made different from the input image type. In this case, the input image will be internally converted during processing.

2) Apply the filtration

- ⇒ Click  (the **Apply** button) on the toolbar or select the **Filter | Apply** menu item.

Processing may take a few minutes (depending on the speed of your computer's CPU and size of the image). During this time, you can minimize the **Filtration Job Editor** window.

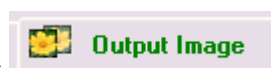
Neat Image is a CPU-intensive application, and in the current implementation, the processor's speed is the most critical. On Pentium IV 1.4GHz, processing a 2-megapixel image takes about 20 seconds (Neat Image v3.0). On a computer of typical configuration, the processing time is linear with respect to image size (in megapixels).

When the filtration is completed, you can compare the output and input images. Click  (the **Compare** button) on the toolbar or just click the output image. If the filtration result is not satisfactory, please return to Step III, page 10, to change some of the filter settings, or to Step II, page 9, to build a new or improve the current noise profile to better match the noise of the input image.

See Filtration options, page 38, for more details about the following filtration-related options of Neat Image: *audible indication* and *filter process priority*.

4.5. Step V. Save the output image

Use the **Output Image** tab in the **Filtration Job Editor**:

**To save the output image**

- ⇒ Click  (the **Save output image as...** button) on the toolbar or select the **File | Save Output**

¹ If there is no popup menu, check the Folder options of Neat Image, see page 38.

Image As... menu item.

The available output file formats are: BMP, TIFF, and JPEG (see the Requirements subsection, page 4, for more details). When you save the output image in JPEG format, you can select the compression quality. The last used compression quality value is always used as default unless you change it when saving the output image in JPEG format.

or

Use the Windows clipboard to export the filtration results to another application. Use the **Edit | Copy** menu item for that purpose. An image put on the clipboard will be in 24bit RGB format.

5. Building device noise profiles

Each device noise profile describes the properties of noise produced by a device working in some mode. Several device noise profiles corresponding to different device modes constitute a set that can be used to process images produced in any of these device modes.

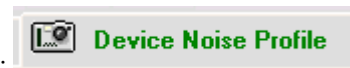
In this section, you will find out how to build a single device noise profile, how to document this profile for future use, and how to prepare and document a structured set of profiles for your imaging device.

5.1. Building a device noise profile for specific device mode

Building a single device noise profile for specific device mode includes use of rough and fine-tuning noise analyzers. **Rough Analyzer** is used to do initial analysis of image noise; it produces a *rough device noise profile*. **Fine-Tuning Analyzer** improves the initial analysis to produce a *fine-tuned device noise profile*.

Both rough and fine-tuning noise analyzers need uniform image areas to measure noise properties. If the image has uniform areas that contain noise but no visible/important details, Neat Image can analyze the noise properties using these areas. Neat Image itself cannot find the uniform areas (or areas that contain no details **important for you**), so you have to specify areas that it should analyze.

Use the **Device Noise Profile** tab in the **Filtration Job Editor**:



5.1.1. Preparing a rough device noise profile

To build a rough device noise profile

1) **Select working color space**

- ⇒ Use the **Working color space** list in the **Device Noise Profile** box.

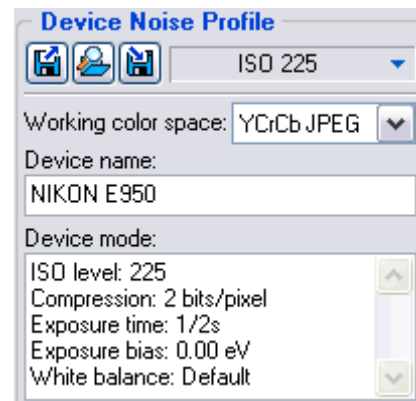
The working color space is an internal parameter of the filtration algorithm. An image is only temporarily converted to the working color space for processing (the input and output images are always in the RGB color space).

We recommend using the YCrCb JPEG or YCrCb Symmetric space to analyze and process color images.

The RGB color space is not the best for discerning image details that are masked by noise. Using this color space most likely will not produce the best results.

Normally, you use the YCrCb JPEG (default) working color space for color photographic images or the YCrCb Symmetric color space for grayscale (halftone) images. The RGB color space may also be useful for specific applications. For example, if your intention is to filter only one specific color channel (R, G or B) of the image then you use this space.

To use a specific working color space you need a noise profile built in that space. Neat Image will re-build a noise profile if you change the working color space.




2) **Find a uniform image area**

- ⇒ Scroll, pan, zoom the input image to find a uniform area.

A uniform area (with minor variation in all channels) may be overcast sky, clear sky (without clouds and birds), or any other part of an image, where there are no visually perceptible details (except those caused by noise).

The uniform area should preferable (but not necessary) be gray (neutral). The area should be at least 60x60 pixels large. That is the minimum size; the recommended size is 100x100 pixels or more.

See examples of uniform image areas (the subsection 10.1, page 40)

- ⇒ Use  (the **Show negative** button) on the toolbar to temporarily turn the image into its negative. This can make finding the noise and noise-only areas easier in some cases.

If you cannot find a uniform area in the input image, you can use an alternative test image. The test image is supposed to be produced by the same device working in the same or similar mode. The test image can be just another image from the same series that contains uniform featureless area suitable for analysis. Or you can prepare a special test image using the calibration target, which is specifically designed to provide several featureless areas of different brightness. See Using the calibration target, page 23, for more details.

- ⇒ To open the test image, click  **Open test image** (the **Open test image...** button) on the toolbar (or select the **File | Open Test Image...** menu item). The test image will only replace the input image in the **Device Noise Profile** tab for the purpose of building a device noise profile.

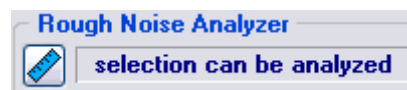
or

Paste the test image from the Windows clipboard or drag and drop it from another application to the image viewer in the **Device Noise Profile** tab.

3) Select found uniform image area

- ⇒ Use the mouse to select a uniform image area: press the left button, drag the mouse and then release the button.


The selection should be at least 60x60 pixels large; the recommended size is 100x100 pixels or more. The selection frame will change its thickness according to the selection size. When you are selecting an area, the selection status in the **Rough Noise Analyzer** box is dynamically indicating whether the chosen area is large enough for analysis.



Warning

The selection status displays "**signal clipping!**" when the image in some of the channels (R,G,B) is close to the dynamic range limit in the selected area. A device noise profile built using the selected area could be inaccurate. Please try to avoid this for best results.

4) Analyze selected image area with Rough Noise Analyzer

- ⇒ Click  (the **Rough Noise Analyzer** button) in the **Rough Noise Analyzer** box or select the **Profile | Build Using Selected Area** menu item.

The program will measure the noise characteristics of the image acquisition device by analyzing uniform areas of the image. You only need to make this analysis once to build a rough noise profile.

5) Describe device name and device mode

- ⇒ Use the **Device name** and **Device mode** fields on the **Device Noise Profile** panel.

Here, you can specify the model of image acquisition device used. For example, "*Olympus C5050Z*".

Also, you can describe the device mode. Specify parameters used to take the image(s). For example, this can be something like the data in the text box on the right.

ISO level: 200
Compression: 5 bits/pixel
Exposure time: 1/80s
Exposure bias: 0.00 eV
White balance: Default

- ⇒ Neat Image can automatically fill out the **Device name** and **Device mode** fields in the **Device Noise Profile** box. The program can extract these data when EXIF data fields are available in the image.

Use the **EXIF->Profile** button on the toolbar or the **Profile | Copy EXIF Data to Profile** menu item to do that.

About device name and device mode

It is recommended to specify these details to keep record of devices, device modes, and corresponding device noise profiles that you use. This is important because the noise characteristics of any two devices can be extremely different. Even a single device in different modes can produce significantly different noise. Therefore, it is always better to use separate noise profiles for different devices and device modes to avoid inaccurate filtration and artifacts. Commenting on the device name and device mode parameters helps you to keep track of them afterwards when you manually match the profiles and input images.

Automatic profile matching is using the EXIF data of the image files, not the **Device name** and **Device mode** fields, so filling out these fields may not be necessary for auto-matching. However, filling these out is highly advisable both for the clarity purposes and for the cases of EXIF-less input images (in case of EXIF-less images, you will have to manually select a matching profile based on the **Device name** and **Device mode** fields).

About cross-use of noise profiles

Naturally, it is always better to build a new device noise profile for each image, because such profile better matches the noise of particular image. Nevertheless, a device noise profile can be used to process many images received from the same device working in the same (or similar) mode. Several device parameters should be taken into account when such a cross-use of profiles is to be used.

It is most likely that any two images would be shot in different or slightly different conditions (device mode, shooting conditions); therefore, the noise characteristics would be different. In the table below, device mode data (for digital cameras) are described that affect the noise characteristics the most (from the most to the less important ones):

ISO rate	50, 100, 200, 400 , etc.; depends on a camera	Higher ISO rate produces more noise.
Sharpness adjustment	Low, Normal, High , etc.; depends on a camera	Internal sharpness adjustment of a camera makes noise more intensive. Using no internal sharpness adjustment produces least noise.
Compression	1:1 (or Uncompressed), 1:5 (or Fine), 1:10 (or Normal), 1:20 (or Basic), etc. or 2 bits/pixel, 4 bits/pixel , etc. depends on a camera	Strong JPEG compression typically produces more JPEG artifacts and destroys image elements including noise; weaker compression preserves more image elements including noise created by the image sensor. It is preferable to use the lowest amount of compression possible for the best results.
Resolution	1:1 (original resolution, like 1600x1200), 1:2 (downsized in camera, e.g., 800x600), 2:1 (digital zoom, 2x), etc.	Camera's internal interpolation (both downsizing and upsizing, e.g., that of digital zoom) changes many characteristics of noise.
White balance	Sun, Cloudy, Incandescent, Fluorescent , etc.; depends on a camera	White balancing changes characteristics of noise (mainly of color noise) slightly.

If two images were shot in the same or similar conditions (most the above device mode data are the same) then the noise of these two images should be very similar. If you have built a device noise profile using one of these images, you can use this profile to filter both with good results.

If however, the shooting conditions were different then the noise components of two images could be significantly different. In this case, cross-use of the device noise profile is not recommended. Instead, build a new profile for another device mode.

5.1.2. Fine-tuning the rough device noise profile

For more accurate noise reduction, it is helpful to measure the dependence between the level of noise and the local brightness in different image areas. This dependence should be taken into account if noise appreciably depends on brightness (for example, if noise is strong in dark areas and weak in light areas).

The **Fine-Tuning Analyzer** measures this dependence. The measurements results are displayed by the noise profile equalizer. Noise profile equalizer has nine sliders that represent the range of image brightness from darkest to lightest for each sensor (R, G, B) of the image acquisition device.

The values of the equalizer sliders correspond to the estimated noise levels in different brightness ranges relative to the rough noise profile. Positive values of sliders reflect higher estimated noise levels and make Neat Image consider more image elements to be noise; negative values reflect lower estimated noise levels and fewer image elements are considered noise in the corresponding brightness ranges.

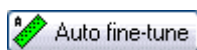
The **Fine-Tuning Analyzer** can be used in manual and automatic way. Below, the automatic method is described first. Then the manual method is explained in details to provide understanding of the whole process and result.

To automatically fine-tune the rough device noise profile

1) Enable Fine-Tuning Analyzer

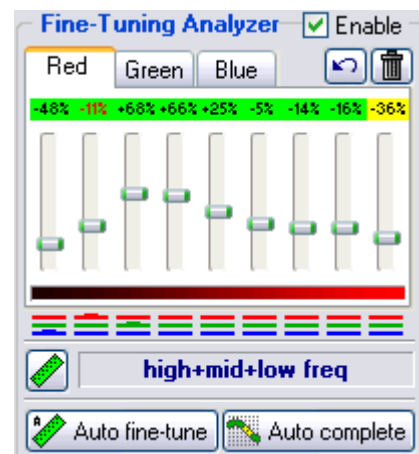
⇒ Enable the **Fine-Tuning Analyzer** by checking the **Fine-Tuning Analyzer** ☒ **Enable** checkbox in the **Fine-Tuning Analyzer** box.

2) Apply Auto Fine-Tuning Analyzer

⇒ Click  (the **Auto Fine-Tuning Analyzer** button) or select the **Profile | Auto Fine-Tune** menu item.

The whole image will be automatically analyzed by Neat Image and some of the equalizer sliders will receive the 'measured' status (see page 21). The values of other sliders will be then automatically interpolated by the **Auto Complete** function and will receive the 'manual' status.

You may want to inspect the equalizer values after applying auto fine-tuning. In most cases, there is no need to do manual slider adjustments afterwards. If you feel this is necessary, please follow the guidelines given in the manual fine-tuning subsection below.



To manually fine-tune the rough device noise profile

1) Find and select a uniform image area

⇒ Use the mouse to select a uniform image area: press the left button, drag the mouse and then release the button.

See examples of uniform image areas, page 31.

The size of an image area can be from 30x30 to 300x300 pixels. The selection frame will change its thickness according to the selection size. When you are selecting an image area, the selection status on the bottom of the **Fine-Tuning Analyzer** box is dynamically indicating which frequency¹ components are contained in the selected area and would be analyzed: 'high', 'high+mid', 'high+mid+low', 'high+mid+low+very low freqs'.



¹ See "what is frequency", page 45.

Size of an area (pixels)	Which frequency components would be analyzed	Rating
200x200 - 300x300	High, medium, low and very low	Best
100x100 - 200x200	High, medium and low	Good
60x60 – 100x100	High and medium	Ok
30x30 – 60x60	High	Poor


The selected area would be analyzed according to its frequency composition (of high, medium, low and very low frequency image components). When a frequency component is not analyzed, all the data related to this component are estimated (extrapolated). That is always not accurate; therefore, it is best to choose large areas so that all the frequency components could be analyzed.

Warning

The selection status displays "signal clipping!" when the image in some of the channels (R,G,B) is close to the dynamic range limit in the selected area. Fine-tuning a device noise profile using the selected area could be inaccurate. Please try to avoid this for best results.

When you select an image area, its position in the brightness range is shown with red font color of the value(s) of the corresponding slider(s) in the noise profile equalizer. Also, it is displayed by the color indicators at the bottom of the equalizer.

2) Analyze selected image area with Fine-Tuning Analyzer

⇒ Click  (the **Manual Fine-Tuning Analyzer** button) or select the **Profile | Fine-Tune Using Selected Area** menu item.

The analysis results are shown in noise profile equalizer. For uniform areas with noise only, the corresponding slider(s) receives the 'measured' status – a green shading on the slider's value, like **-27%**. If an area with signal clipping has been used to analyze noise characteristics then the corresponding slider(s) receives the 'inaccurate' status – a red shading, like **86%**. When an area with unexpectedly strong level of noise is encountered, an orange shading is applied, like **+215%**.

Warning

An orange shading is applied when the analyzed noise in the corresponding brightness range is unexpectedly strong. There are several potential reasons for that:

- Fine-tuning is being done using a bad (e.g., containing visible details) image area;
- Wrong device noise profile is used (the profile's device and device mode do not match those of the analyzed image OR the (rough) profile has been built inaccurately);
- Noise in this image is unusual and contains strong variations.

An orange shading is a warning sign. It does not necessarily signify wrong measurement. Please make your own judgment in this situation and if necessary rebuild the device noise profile or select a more uniform area for fine-tuning.

A red shading is a sure sign of wrong measurement. You need to reset the corresponding slider or undo the last analysis (see below).

3) If necessary, reset status of a slider (optional)

⇒ Click on the color shading of a slider to reset its status and value.

If a slider has red (or any other color) shading, you can safely reset it and analyze another part of the input image to re-measure its value. There is no need to reset the entire equalizer because of one wrong value.


4) If necessary, undo the last analysis (optional)

⇒ Click  (the **Undo** button) or select the **Profile | Undo Last Fine-Tuning Analysis** menu item.

Undoing the last fine-tuning analysis may be useful when a bad choice of image area has resulted in

bad analysis results.

5) If necessary, reset the whole equalizer (optional)

⇒ Click  (the **Reset fine-tuning results** button) or select the **Profile | Reset Fine-Tuning Results** menu item.

6) Repeat steps 1-5 with other uniform image areas of different brightness

To make a device noise profile more accurate you have to fine-tune it using several uniform areas¹ of the image (naturally, analyzing the same area many times makes little sense). Try to choose uniform areas to cover all brightness ranges in all channels of the equalizer (i.e., to get shadings on all sliders' values). Use color shadings as well as red markings (which are used to reflect the range of the current selection; like **-40%**) to guide the process of fine-tuning. Also use the color indicators on the bottom of the **Fine-Tuning Analyzer** box as guidance when doing that. If the majority of sliders' values have green shadings, you can stop the process.

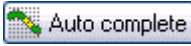
7) Set remaining sliders at your option (optional)

If not set by the **Fine-Tuning Analyzer**, the sliders of the equalizer have default values. You can leave them with default values or can adjust these sliders to bring them into better agreement with the neighbor measured ones.

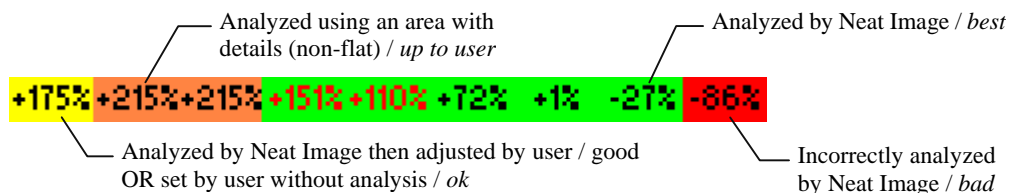
⇒ Set the remaining sliders as you consider necessary.

Manually adjusted sliders receive the 'manual' status (a yellow shading, like **+175%**).

or

Use **Auto Complete** to automatically adjust the unmeasured sliders by interpolation based on the measured data. Click  (the **Auto Complete** button) or select the **Profile | Auto Complete** menu item to automatically complete the fine-tuning.

Using **Auto Complete** is highly advisable as the last step of the manual fine-tuning process.

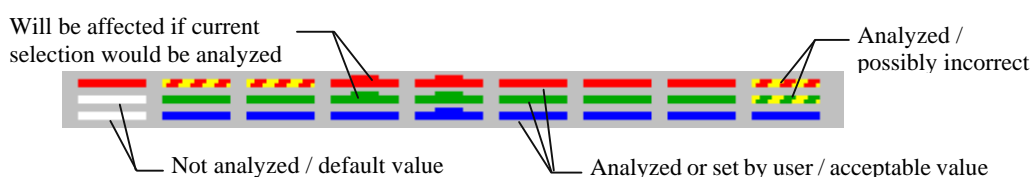


The figure below summarizes the status marking of sliders:

When using the noise profile equalizer, use the color indicator to simplify the fine-tuning process. Colored lines of the indicator show:

- which sliders of the equalizer correspond to the colors of the selected image area/pixel (press the **Shift** key for pixel-wise indication);
- which slider values are different from their default values;
- which sliders have (possibly) incorrect values.

The figure below explains each state of the indicator elements:




How to check if a device noise profile has been fine-tuned properly

The equalizer sliders should be mostly shaded in green and, occasionally, yellow. The color indicators should be filled with solid colored lines at all positions.

5.1.3. Saving the fine-tuned device noise profile

To save a device noise profile for future use

- ⇒ Use  (the **Save device noise profile as...** button, blue disk) in the **Device Noise Profile** box or select the **Profile | Save As...** menu item.

In the **Save device noise profile as** dialog box, specify the name of the file to save the device noise profile. The device noise profiles are stored in ***.dnp** files.

Saved noise profile includes complete information about rough and fine-tuning analyses. Therefore, by saving the noise profile, you can reproduce exactly the same conditions for image processing later on. Also, you can exchange noise profiles with other Neat Image users.

In addition, the noise profile can contain an image sample that has been used to build rough noise profile. You can control whether it is included into profile using the **Save analyzed image area in profile** option, see Profiling options, page 36.

File naming considerations

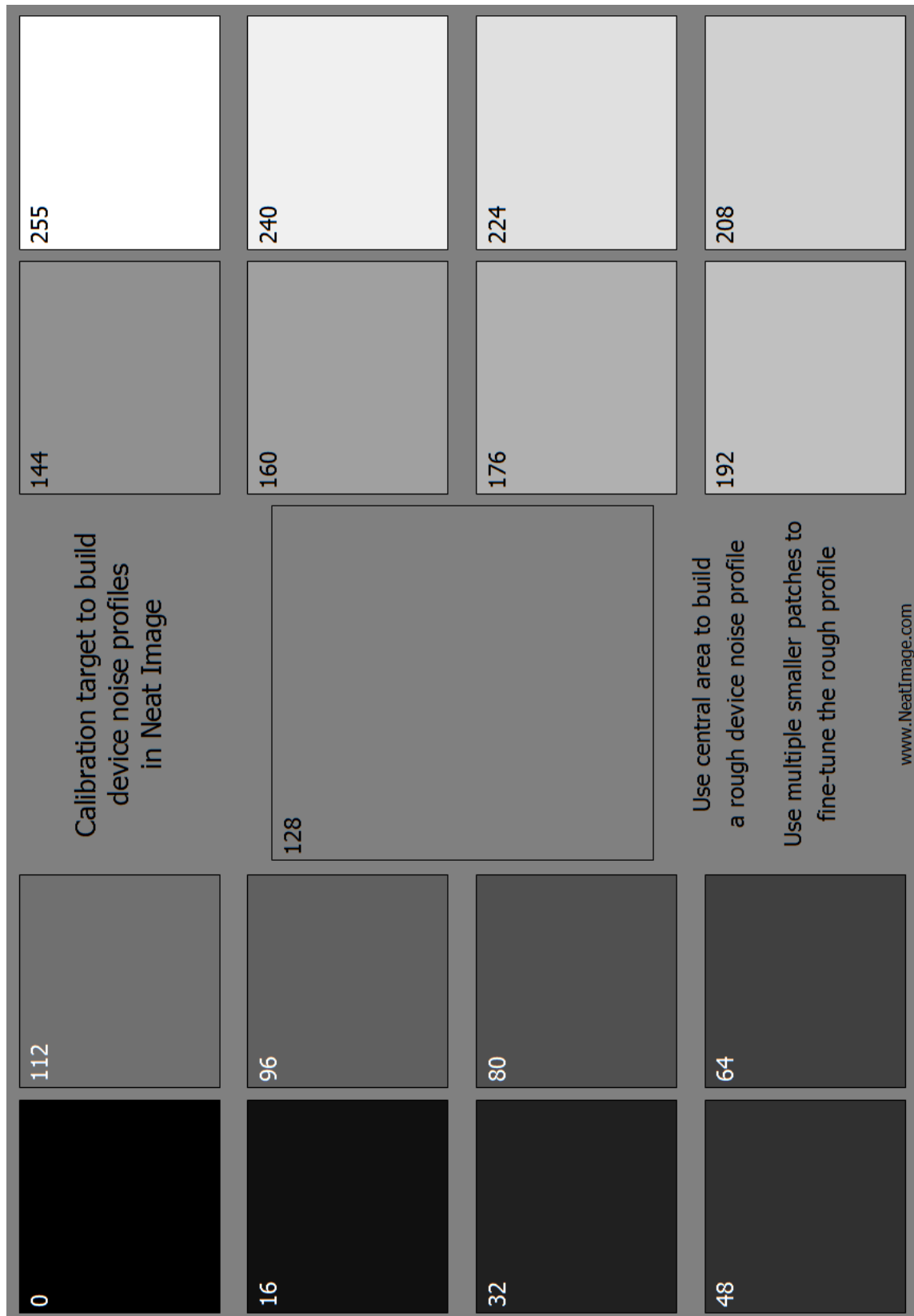
If you are going to re-use a device noise profile, select a good file name explaining the device name and mode so that you could easily recognize this profile by its file name later on. Alternatively, you can use special folder structuring to keep many device noise profiles arranged according to their device modes.

See the subsection 5.4.1, Structuring profile set, page 25, for additional information.

¹ See Profiling options, page 36, for more details on *combination of last fine-tuning analyses* option of Neat Image.

5.2. Using the calibration target

This page is intended to be a test shot target for device noise profiling.



Alternatively, you can use a standard color or grayscale target available from your local photo store. The patches should be uniform, grayscale or color, without any visible details or texture.

Calibration target guidelines follow on the next page.

5.2.1. Digital camera profiling

Use the calibration target page to prepare a test image for building a device noise profile for your camera using the following steps:

1. Set the camera to a specific shooting mode (ISO level, exposure, etc.) that you want to build a profile for.
2. **Important:** set the focusing system on infinity (you need to get an out of focus image).
3. Make sure the calibration target fills the whole frame and make a shot.
4. Bring the resulting image to Neat Image and build a device noise profile using this test image:
 - a. Use the central area to do rough analysis;
 - b. Use the **Auto Fine-Tuning Analyzer**.

5.2.2. Flatbed scanner profiling

Use the calibration target page to prepare a test image for building a device noise profile for your flatbed scanner using the following steps:

1. Set the scanner to a specific scanning mode (resolution, light level, etc.) that you want to build a profile for.
2. If possible set the scanner out of focus (an out of focus scan is preferred for profiling).
3. Scan the calibration target
4. Bring the scanned image to Neat Image and build a device noise profile using this test image:
 - a. Use the central area to do rough analysis;
 - b. Use multiple smaller patches to fine-tune the rough profile or just use the **Auto Fine-Tuning Analyzer**.

5.2.3. Film scanner profiling

Use the calibration target page to prepare a test image for building a device noise profile for your film scanner using the following steps:

1. Set the camera to a specific shooting mode (ISO level, exposure, film type, etc.) that you want to build a profile for.
2. **Important:** set the focusing system on infinity (you need to get an out of focus image).
3. Make sure the calibration target fills the whole frame and make a shot.
4. Develop the slide and put it into the scanner
5. Set the scanner to a specific scanning mode (resolution, light level, etc.) that you want to build a profile for and scan the slide.
6. Bring the scanned image to Neat Image and build a device noise profile using this test image:
 - a. Use the central area to do rough analysis;
 - b. Use multiple smaller patches to fine-tune the rough profile or just use the **Auto Fine-Tuning Analyzer**.

5.3. Profiling methods

In the subsection Building a device noise profile for specific device mode, page 16, building profiles using the input image is explained. In some cases, the input image does not contain enough featureless areas for building a profile. In such cases, other images can be used. Generally, there are several such profiling options that can be arranged from the most desirable to the least desirable (from the standpoint of profiling accuracy):

1. Use a 100x100+ uniform featureless area in the *input image* for rough analysis; then fine-tune the profile using several other featureless areas in the same image;
2. Do (1) with *another image* (for example an image of the calibration target) from the same camera/scanner shot/scanned in similar conditions; then additionally fine-tune the profile using

the *input image*¹;

3. Do (1) with *another image* from another camera/scanner of the same model shot/scanned in similar conditions; then additionally fine-tune the profile using the *input image*;
4. Get a ready-made profile built with a similar image from another camera/scanner of the same model; then additionally fine-tune the profile using the *input image*;
5. Do (1) starting with a smaller (60x60+) uniform featureless area in the *input image*;
6. Cut out a 59x59- uniform featureless area from the *input image* and (preferably) seamlessly clone it in an image editor to produce a 60x60+ area; do (1) with the resulting larger area;
7. Up-size your image (using your favorite method) in an image editor; do (1) with it; process the upsized image in Neat Image (do not process original image with such a profile); down-size the result in the image editor.

5.4. Preparing a set of profiles for different device modes

Since every imaging device can work in different modes, there should be several device noise profiles, corresponding to a set of modes to make possible processing of arbitrary images produced by specific device. If the set of profiles covers all modes of the device then any image from this device can be processed by using one of the profiles from the set.

A set of profiles for specific device should be prepared first. This can be done by any owner of specific imaging device because he/she has direct access to its hardware. You can do this too. To help you, we give some guidelines about structuring and documenting sets of profiles so that you could prepare a set of profiles for your camera, scanner, etc., in such a way as to make use of this set easy for you².

5.4.1. Structuring profile set

When you prepare a set of profiles, for example, for a digital camera, you build profiles for camera modes with different ISO rates, quality (camera JPEG compression level), image size, etc. It is advised to put the description of the device mode into the profile comments fields (**Device name**, **Device mode**) but it is also smart to name the profile file using the key parameters of the device mode. For example, the profiles for Olympus C5050Z can be named like the following³:

<div> <div>  Olympus C5050Z </div> <div> Olympus C5050Z JPEG ISO 100 HQ 2560x1696.dnp Olympus C5050Z JPEG ISO 100 HQ 2560x1920.dnp Olympus C5050Z JPEG ISO 100 SHQ 2560x1696.dnp Olympus C5050Z JPEG ISO 100 SHQ 2560x1920.dnp Olympus C5050Z JPEG ISO 200 HQ 2560x1696.dnp Olympus C5050Z JPEG ISO 200 HQ 2560x1920.dnp Olympus C5050Z JPEG ISO 200 SHQ 2560x1696.dnp Olympus C5050Z JPEG ISO 200 SHQ 2560x1920.dnp Olympus C5050Z JPEG ISO 400 HQ 2560x1696.dnp Olympus C5050Z JPEG ISO 400 HQ 2560x1920.dnp Olympus C5050Z JPEG ISO 400 SHQ 2560x1696.dnp Olympus C5050Z JPEG ISO 400 SHQ 2560x1920.dnp Olympus C5050Z TIF ISO 100 2048x1536.dnp Olympus C5050Z TIF ISO 100 2288x1712.dnp Olympus C5050Z TIF ISO 100 2560x1696.dnp Olympus C5050Z TIF ISO 100 2560x1920.dnp Olympus C5050Z TIF ISO 200 2048x1536.dnp Olympus C5050Z TIF ISO 200 2288x1712.dnp Olympus C5050Z TIF ISO 200 2560x1696.dnp Olympus C5050Z TIF ISO 200 2560x1920.dnp Olympus C5050Z TIF ISO 400 2048x1536.dnp Olympus C5050Z TIF ISO 400 2288x1712.dnp Olympus C5050Z TIF ISO 400 2560x1696.dnp Olympus C5050Z TIF ISO 400 2560x1920.dnp </div> </div>	<div> <p>Here:</p> <div>  – disk folder </div> <p>Olympus C5050Z – camera name</p> <p>JPEG / TIF – image file format</p> <p>HQ / SHQ – JPEG compression quality</p> <p>ISO nnn – ISO rate of the camera</p> <p>####x#### – image size</p> </div>
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¹ Here and below, when additional fine-tuning is applied using the input image, the equalizer values should not change much if the two images were indeed shot/scanned in similar device modes. If the equalizer values do change a lot, consider doing (1) with another image that is closer to the input image.

² ..and other people if you decide to share your results. Please do share because in this way you will help people with the same camera or scanner brand. You can submit a set of profiles to Neat Image team to publish the set on www.neatimage.com (see Contacts, page 48) or just share them with other people directly.

³ This example is based on a real profile set prepared by Terry Nelms, available at www.neatimage.com

When the profiles are named like this, finding and selecting an appropriate profile is not difficult. You simply check the device mode of the input image (using the **Input Image** box on the right panel in the **Input Image** tab of the **Filtration Job Editor**) and then select a profile for this device mode from the list of profiles in a folder.

There is another way to do the same, based on structuring the profile set using the disk folders. For example, the above Olympus C5050Z profile set could be structured like this:

Here:

– disk folder

Olympus C5050Z,
TIFF/JPEG,
HQ/SHQ,
####x####
 – the names of disk subfolders containing device noise profiles for corresponding device modes.

ISO nnn.dnp
 – specific device noise profiles.

In this case, the folder tree enables storing device noise profiles in a structured way, which helps to select one profile from the set given the device mode of the image to process. This can be especially useful when you use the popup menu¹ to select profiles.

Note that the automatic profile matching provided by Neat Image does work well in both cases: you can keep the whole set of profiles as a flat list of files in one folder, or you can structure the files into subfolders. This choice only affects the convenience of manual profile selection, while automatic profile matching can handle both cases.

If the automatic profile matching is not available (for example, if the images contain no EXIF information) then you have to use manual profile matching. Therefore, we advise to structure profiles according to one of the methods above to make your manual work easier.

5.4.2. Documenting profile set

Along with the text comments inside the device noise profiles and their file names, we advise to document a profile set with a plain text file explaining the following points:

- Author of the profile set, profiling date
- Device name, firmware version
- Device modes that have been profiled in this set

¹ See paragraph about manual selection of a profile in Step II. Prepare a device noise profile, page 9.

- Device mode parameters that change over the profile set
- Device mode parameters that are constant for all profiles in the set
- Post-processing used (after imaging device and before Neat Image)

An example of such a description is below:

Olympus C5050Z noise profiles

by John Smith, November 20, 2003

A set of profiles for Olympus C5050Z TIFF and JPEG files. The profiles were built using shots of the calibration target (from <http://www.neatimage.com/testtarget.html>) for the following file formats and image sizes:

TIFF

2048x1536

2288x1712

2560x1696

2560x1920

JPEG

HQ

2560x1696

2560x1920

SHQ

2560x1696

2560x1920

For each file format and image size above, shots with different ISO rates (100, 200 and 400) were made and used to build profiles.

Default camera settings were used for Sharpness, Contrast, and Saturation. In-camera noise reduction was switched off. The white balance was set to daylight.


No post processing was applied; the calibration target shots directly from the camera were opened in Neat Image to build profiles.

Such kind of summary will help you to figure out any set of profiles you prepared as well as let other people understand your results if you decide to share profiles.


6. Using Component viewer and Variant selector

6.1. Component Viewer

The **Component Viewer** is intended for detailed examination of both frequency and channel components of images. Examining the components and the filtration masks may be useful to find the optimum filter settings easier and faster.

- ⇒ Working with the filter, turn on the **Component Viewer** window by clicking on  (the **Component Viewer on/off** button) on the toolbar or by selecting the **View | Component Viewer** menu item. The window will pop up to show the image components of the selected image area (see the selection in the **Filtration Job Editor** window).

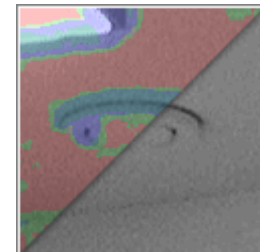


Examine individual image components as well as filter masks for each channel and frequency component (use selectors on top of the **Component Viewer**). To switch on the filter masks, click  (the **Show filtration masks** button). To switch between original and filtered image (or image component) simply click on one of the images in the **Component Viewer**.

Red masks indicate the areas where the standard (aggressive) noise filtration is applied (see the upper left part of the picture on the right). Adjust noise filter settings (noise levels) to have red masks covering all featureless areas. Do not let any noise remain uncovered by these masks.


Green masks indicate the areas where important image details have been detected and a special type of noise filtration is applied. This type of filtration is more delicate than the standard one; it is used to preserve the visible details.

Blue masks indicate the areas where sharpening is applied.




6.2. Variant Selector

The **Variant Selector** is intended for side-by-side comparison of several variants of filtration applied to a selected image area. When you consecutively adjust filter settings you get several possible variants of filtration. To select the best of these variants use the **Variant Selector**.





- ⇒ Turn on the **Variant Selector** by clicking on  (the **Variant Selector on/off** button) on the toolbar or by selecting the **View | Variant Selector** menu item. The window will pop up to enable adding, sorting, deleting and selecting the variants.



- ⇒ To add a filtration variant to the **Variant Selector**, select an area in the input image and let Neat Image prepare a preview of filtration for this area. This is usually done by Neat Image automatically. As soon as the preview is ready, this new variant of filtration is added to the **Variant Selector**. This happens automatically if **Auto add variants** is checked in the **Variant Selector** window. To manually add a new variant, click  (the **Add new variant** button).

If you change any filter setting then another filtration variant is prepared and added to the **Variant Selector** by Neat Image.

- ⇒ When several variants are listed in the **Variant Selector**, you can click any of them to see the filtration result in the image viewer area of the **Variant Selector**. Click on this result to temporarily switch to the unfiltered image. Move to other variants (using the mouse or arrow keys) to compare filtration variants.

- ⇒ Click  and  (the **Move variant up / down** buttons) or drag and drop variants in the list to sort them according to the quality (for example, move the best variants to the top of the list to group them for easier comparison).
- ⇒ Click  (the **Delete variant** button) or the **Del** key to remove the selected variant(s) from the list.
- ⇒ Click  (the **Select variant** button) or double-click a variant to select it as the best one and return it to the filter (the filter settings will be automatically adjusted to produce this variant).

7. Queued processing

Neat Image can automatically process multiple images. To use this capability, create several *image filtration jobs*, put them into the **Filtration Queue** and let Neat Image process the jobs one after another.

You can also create new jobs while existing jobs are being processed in the background. It is possible to create many jobs at once (*batch*) to filter many images with the same filtration parameters. You can also change filtration parameters of any job at any time.

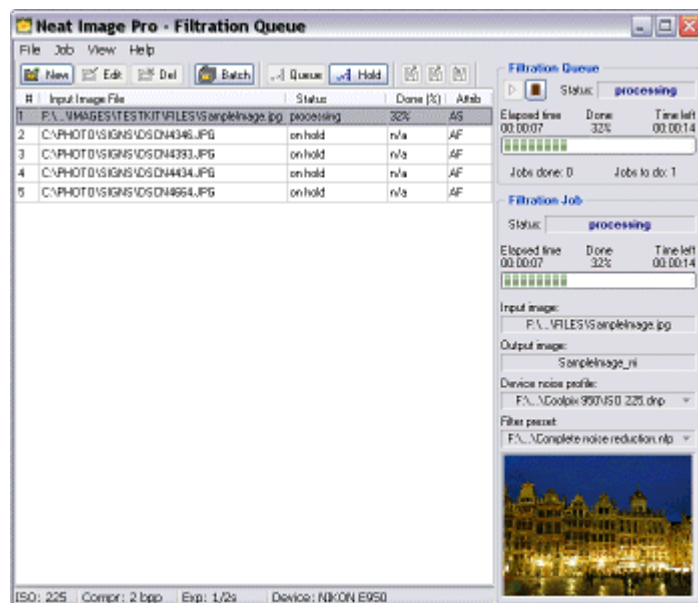
In this section, we explain in detail how you can use all these capabilities of Neat Image.

When you read this section, please make sure that the *Auto create new job at startup* setting in the application options (use **View | Options...** menu item) is unchecked. If it is checked, the **Filtration Job Editor** appears at startup instead of the **Filtration Queue** window. This option is checked by default to make initial work with the program easier.

7.1. Filtration Queue window

When you start Neat Image, the **Filtration Queue** window is opened (see the above comment if it is not).

This window contains the filtration queue itself (in the left box), a set of tools to create, edit, delete, start and stop jobs (on the toolbar), and the panel on the right with detailed information about the queue as a whole and about any single selected image filtration job.



7.2. Creating new image filtration jobs

Neat Image processes filtration jobs by taking them one-by-one and applying filtration with specific settings to each image. A single filtration job includes one image and one customized set of filtration settings. You can create and configure one or more filtration jobs and let Neat Image process them.

To create one new image filtration job

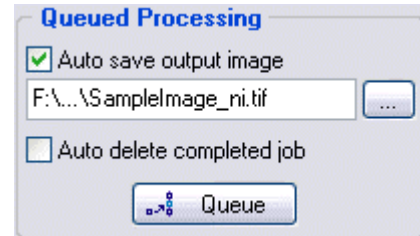
- ⇒ Click  (the **Create new image filtration job** button) on the toolbar or select the **Job | New...** menu item.

A new filtration job will be created. Initially, you will be offered to select an input image and then the **Filtration Job Editor** window will be opened with this input image. You will then be able to select a device noise profile and adjust filter settings in the same way as explained above in the Filtration process details section, page 9.

When the image is ready to be processed, do not apply filtration in the **Filtration Job Editor** if you want to process the image in the queue.

When the input image, noise profile and filter settings are ready you can put this new job into the filtration queue for processing using the controls in the **Queued Processing** box.

Clicking  **Queue** will send the job to the bottom of the queue and let Neat Image process it when its turn comes in the queue.



You can also select to **Auto save output image** and specify **Output image file name for auto save** using the [...] button. If you do then Neat Image will automatically save the output image into the specified file as soon as this job is completed in the filtration queue.

Neat Image may ask about the place where it should save the output image. It may also ask about particular image saving properties, e.g., the JPEG compression level. The last used JPEG compression level is offered as the default value.


When **Auto save** is chosen, you can additionally select to **Auto delete completed job** from the queue when the job is completed and its output image is successfully saved.

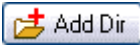
If you do not want to let the job to be processed in the queue then press the **Esc** button or select **File | Put Job to Queue** menu item. The job will be put on hold in the queue until you manually allow Neat Image to process it.


To create multiple image filtration jobs at once

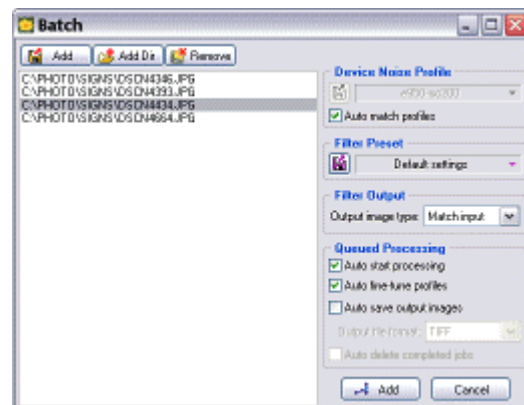
- ⇒ Click  **Batch** (the **Create many filtration jobs at once** button) on the toolbar or select the **File | Batch...** menu item.

The **Batch** window will appear to give you a way of selecting image files to be processed. Also, you can select a device noise profile and a filter preset that should be used to filter the selected images.


- ⇒ Click  **Add** to add new image files to the list.
- or

- ⇒ Click  **Add Dir** to select a folder with image files. All image files contained in selected folder and its subfolders will be added to the list.

- ⇒ Click  (blue disk) or the popup menu to select a device noise profile to filter all the images in the list.




Or instead, check **Auto match profiles** to make Neat Image try to automatically find the best matching profile for every image in the list.

- ⇒ Click  (pink disk) or the popup menu to select a filter preset to filter all the listed images.
- ⇒ Specify output image type in the drop-down list: **8/24bits**, **16/48 bits**, or **Match input**.

- ⇒ Check desired 'auto'-actions that should be applied to all the jobs added to the queue:
- **Auto start processing** - to automatically start processing these jobs in the queue
 - **Auto fine-tune profiles** - to automatically apply auto fine-tuning to every job's profile
 - **Auto save output images** - to automatically save the output images of completed jobs
 - **Auto delete completed jobs** - to automatically remove completed jobs from the queue

⇒ Select output file format: **TIFF**, **JPEG** or **BMP** (if **Auto save output images** is selected).

⇒ Click  **Add** to add new image filtration jobs to the queue.

At this point, Neat Image may ask about the location on the disk where it should auto save the output images. It may also ask about particular saving properties, e.g., the JPEG compression level.

Then, several new image filtration jobs will be created in the queue. These jobs will be immediately processed by Neat Image if **Auto start processing** has been checked.

To create one or more new image filtration jobs via drag and drop


- ⇒ Drag several image files from another application and drop them in the **Filtration Queue** window. Neat Image will automatically create new image filtration jobs for each dropped file using the **Job Defaults** specified in the **Options**.

7.3. Editing image filtration jobs

An image filtration job in the queue can be edited at any time if you need to change some of its filtration parameters. This applies to all jobs in the queue except the one which is currently being processed. You

need to put it on hold (using , see details below) to be able to edit it.

To edit existing image filtration job

- ⇒ Select a job in the queue and click  **Edit** (the **Edit selected filtration job** button) or select the **Job | Edit...** menu item.

The **Filtration Job Editor** will open the selected job to enable modify its details: input image, device noise profile and filter settings. Change these according to the guidelines of the Filtration process details, page 9.

When the job is ready to be processed, put it back into the queue using the controls in the **Queued Processing** box.

To change device noise profile for selected job(s) in the queue


- ⇒ Select job(s) in the queue and use the **Device noise profile** popup menu in the **Filtration Job** box (or select the **Job | Set Profile** menu item) to select a profile you want.

To change filter preset for selected job(s) in the queue

- ⇒ Select job(s) in the queue and use the **Filter preset** popup menu in the **Filtration Job** box (or select the **Job | Set Preset** menu item) to select a preset you want.

7.4. Removing image filtration jobs


To remove existing image filtration job(s)

- ⇒ Select one or more filtration jobs in the queue that you want to remove and click  **Del** (the **Delete selected filtration job** button) or select the **Job | Delete** menu item.

7.5. Queuing and holding image filtration jobs

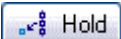
An image filtration job in the queue is processed when it is ready (i.e., input image and device noise profile are present) unless you specifically put it on hold. A job put on hold will not be processed until you explicitly queue it.

To queue image filtration job(s)

- ⇒ Select one or more filtration jobs in the list that you want to process and click  **Queue** (the **Queue selected job** button) or select the **Job | Queue** menu item.

The selected job(s) will receive status 'queued' and will be processed when their turn comes.

To put image filtration job(s) on hold


- ⇒ Select one or more filtration jobs in the queue that you want to put on hold and click  **Hold** (the **Put selected job on hold** button) or select the **Job | Hold** menu item.

The selected job(s) will receive status 'on hold' and will not be processed.


7.6. Starting and stopping the filtration queue

You may need to completely stop (and then start again) the filtration queue. This can be done using the controls in the **Filtration Queue** box.

To stop the filtration queue

- ⇒ Click  to stop processing jobs in the filtration queue.

To start the filtration queue

- ⇒ Click  to start processing jobs in the filtration queue.

7.7. Saving output images

When a job is done in the filtration queue, you most likely will want to save the result. This can be done within the **Filtration Job Editor** (you can use the **Edit** button to open it) or directly from the **Filtration Queue** window.

To save output image of a filtration job

- ⇒ Click  (the **Save output image as** button).

You can save output images of more than one job using this button. Select several completed jobs and click this button to save several output images at once.

8. Using plug-in

8.1. Installing the plug-in into an image editor¹

To install Neat Image plug-in to...

... Adobe Photoshop / Photoshop Elements / ImageReady

⇒ Method 1 (traditional one):

Copy the *NeatImage.8bf* file from the Neat Image installation folder (typically, *C:\Program Files\Neat Image 3.0 Pro Plus*) into the *Plugins* or *Plug-ins* subfolder inside the Photoshop / Photoshop Elements / ImageReady folder.

Then re-start the image editor, and you will find the Neat Image plug-in in the **Filter** menu under the **ABSoft** submenu.

⇒ Method 2 (an easier one, available in Photoshop 7.0, CS):

In Photoshop, go to **Edit** menu, **Preferences | Plug-ins and Scratch Disks** and set **Additional Plug-ins Directory** to the Neat Image installation folder (typically, *C:\Program Files\Neat Image 3.0 Pro Plus*).

Then re-start the editor, and you will find the Neat Image plug-in in the **Filter** menu under the **ABSoft** submenu.

... Jasc Paint Shop Pro

⇒ Open the **File** menu, select **Preferences | File locations | Plug-ins (PSP8)**, **Preferences | File locations (PSP7)** or **Preferences | Plug-in Filters (PSP4-6)** and select the Neat Image installation folder. Press OK and the Neat Image plug-in will appear in the **Plug-in Filters** submenu of the **Effects** menu.

8.2. Using the plug-in to process images

The Neat Image plug-in can be invoked from an image editor to process the selected part of one layer or one channel of the current image. This subsection explains key steps of using the Neat Image plug-in. Since these steps are very similar to the filtration process of the Neat Image standalone version, the sequence of steps is described based on the above Filtration process details section, page 9.

8.2.1. Step I. Invoke the plug-in from the image editor

In the image editor, select a layer (or a channel) in the image that should be processed. In this layer (channel), select an area to be filtered. The whole layer (channel) will be filtered if no area is selected.

Invoke the Neat Image plug-in using the standard way of invoking filter plug-ins from your image editor:

In Adobe Photoshop / Photoshop Elements / ImageReady

⇒ Select the menu item **Filter | ABSoft | Neat Image...**

In Jasc Paint Shop Pro

⇒ Select the menu item **Effects | Plug-in Filters | ABSoft | Neat Image...**

¹ The plug-in is only available in the Pro+ edition of Neat Image. Please see Detailed feature map, page 47.

8.2.2. Step II. Prepare a device noise profile


Preparing a device noise profile is done in the same way as with the standalone version of Neat Image. Please see the section 4.2, Step II. Prepare a device noise profile, page 9.

8.2.3. Step III. Adjust filter settings

This is done in the same way as with the standalone version of Neat Image. Please see the section 4.3, Step III. Adjust filter settings, page 10.

8.2.4. Step IV. Apply filter

To apply filter to the image

⇒ Click  (the **Apply** button on the toolbar of the **Noise Filter Settings** tab) or select the **Filter | Apply** menu item.

The plug-in window will be closed and filtration will start. Processing may take a few minutes (depending on the speed of your computer's CPU and size of (the selected part of) the image).

During this time, the image editor will display the filtration progress.¹

The Neat Image plug-in will automatically save the device noise profile and filter preset used during processing as **RecentProfile** and **RecentPreset**. This allows re-applying the plug-in (using the **Ctrl+F** shortcut in Photoshop, for example) with the same device noise profile without repeating the steps II-III. Also, you can open the plug-in manually and continue to work with the last used parameters.

8.3. Using the plug-in in Photoshop actions

The Neat Image plug-in can be used in Photoshop actions along with standard Photoshop filters. The plug-in has two parameters when used within a recorded action: **Profile** and **Preset**. The Profile parameter tells Neat Image which device noise profile should be used within this action. The Preset parameter specifies which noise filter preset should be used within this action.

When you record an action that includes the Neat Image plug-in, when working with Neat Image you can select any device noise profile and filter preset saved on the disk and the Photoshop action will automatically pick up these parameters. Any time the action is run afterwards, it will make Neat Image open those device noise profile and filter preset from the disk. Therefore, you have to keep available the device noise profile and filter preset to be used by the action. If you want to distribute the action you have to include the profile and preset files.

¹ In Photoshop, updating Photoshop user interface during processing may be slow. This is a feature of Photoshop. Do not consider it to be 'hanging' or 'freezing', just let it work.

9. Application options¹

Use the **View | Options...** menu item to open the **Options** dialog box.

Neat Image has several options that you can change to adjust the behavior of the application. Refer to the descriptions below for details about each of these options.

9.1. General options

Show splash screen at startup

This option controls whether the splash screen (the yellow flower picture) is displayed at the application startup.

Auto create new job at startup

When this option is checked, the **Filtration Job Editor** appears at startup (instead of the **Filtration Queue** window), which can be useful if you want to only process a single image without going to the queue window.

This option is checked by default to make initial work with the program easier.

We advise you to switch the option off if you need to work a lot with the **Filtration Queue** window.

Show hints over interface controls

This option allows switching on/off the hints. The hints are displayed when the mouse pointer is placed over the application controls.

Double buffer image viewers

This option controls the image viewers buffering mechanism. Double-buffered image viewers provide smoother display rendering at expense of rendering speed. Disable this option on slow machines for better performance.

Allow overwriting existing image files

Select this option to allow Neat Image to overwrite existing image files when output images are auto saved by the application (in queued processing).

Preserve EXIF data in output images

Check this option to make Neat Image preserving the EXIF data fields by copying these from the input to output images. Note that copying the EXIF data fields to the output image is not always possible. This depends on both input and output file types used. The EXIF is copied with the following combinations of input and output file types: JPEG->JPEG, JPEG->TIFF, and TIFF->TIFF.

Enable multiprocessor support

Check this option to let Neat Image use all processors on a multiprocessor computer (or on a computer with HyperThreading). When enabled, Neat Image will process two or more jobs in the filtration queue simultaneously.

¹ Some of the options are also available in the plug-in version of the filter. The options that are related only to the standalone application are disabled in the plug-in.

9.2. Job defaults

Default color space

This is the working color space selected by default when a new image filtration job is created (if there is no default profile selected; see **Default device noise profile** below). You can always change working color space later on, if necessary; this option just provides a default choice.

The working color space is a color space used by Neat Image to analyze and process images. Currently, there are three working color spaces available: RGB, YCrCb JPEG, and YCrCb Symmetric. For most images, we recommend the use of YCrCb JPEG for color images and YCrCb Symmetric for grayscale (halftone) images.

Note: The working color space does not affect or change any color profiles (ICC profiles) embedded in the image file.

Default output bitdepth

This option controls default image bitdepth of the images processed by the filter. For example, if the input image is 8/24 bits and the output bitdepth is selected to be 16/48 bits, then the input image will be converted to 16/48 bits, processed with the filter, and the output image will be 16/48 bits. If 'match input' is selected then the output bitdepth will match the input bitdepth.

Default device noise profile

The default noise profile file is automatically opened by Neat Image when a new image filtration job is created. Specify the name and location of the file containing this noise profile in the available space below using the file browser ([...] button).

You may want to use this option if you frequently use the same profile. Any valid noise profile can be made default.

Default filter preset

The filter settings are automatically loaded from the default filter preset when a new image filtration job is created. Specify the name and location of the file containing this preset in the available space below using the file browser ([...] button).

You may want to use this option if you frequently use the same preset. Any valid filter preset can be made default.

Auto save output image

Check this box to have the **auto save output image** option selected by default in the **Filtration Job Editor** and **Batch** window.

Auto delete completed job

Check this box to have the **auto delete completed job** option selected by default in the **Filtration Job Editor** and **Batch** window.

Output file name suffix

Select the suffix added to the output image file name by default.

9.3. Profiling options

Combination of last fine-tuning analyses

This is a way of combining multiple fine-tuning analyses (related to the same brightness range) in the noise profile equalizer.

In order to measure the dependence between the noise and brightness of an image (that is usually done during fine-tuning a device noise profile, see Fine-tuning the rough device noise profile, page 19) it is necessary to analyze many uniform areas in an image. Each individual analysis determines the dependence in some narrow range of brightness values. The noise profile equalizer reflects this dependence with a number of sliders that correspond to specific ranges of brightness individually for each RGB color channel.

Initially, all the sliders are at their default positions. Analyses change their positions according to characteristics of noise encountered.

It is possible that different analyses taken in the same brightness range will affect the same slider. In this case, the slider's behavior is determined by the **Combination of last fine-tuning analyses** option:

- **Take the maximum value (recommended)**
Equalizer sets the slider's RGB values to the maximum of the last two analyses (aggressive filtration, maximum noise removal);
- **Take the minimum value**
Equalizer sets the slider's RGB values to the minimum of the last two analyses (conservative filtration, minimum image changes);
- **Take the average value**
Equalizer sets the slider's RGB values to the average of the last two analyses;
- **Take the last value**
Equalizer sets the slider's RGB values to the current analysis.

Save analyzed image area in profile (.dnp file)*

Turn this option on to make Neat Image saving analyzed image area into the device noise profile (*.dnp file). This will increase the size of the *.dnp file but will also improve the compatibility with the future versions of the software (Neat Image will be able to re-build the profile using the saved image area).

9.4. Profile matching options

Matching device noise profile folder/directory

Select the folder where Neat Image should look for device noise profiles to find one that best matches the input image. This should be the topmost folder of all the subfolders with device noise profiles to be checked during automatic matching.

By default, the **PROFILES** subfolder of Neat Image installation folder is used.

Matching parameters priorities

To automatically match profiles for the input image, Neat Image compares the device parameters of the image and profiles in the **Matching device noise profile folder/directory**. Different parameters usually have to be matched with different priority. Using these controls, you can select the priorities of such parameters as **Input device**, **ISO rate**, **Compression**, **Exposure**:

- **Match** – the parameter should match exactly;
- **High** – it is highly important that the parameter is very close or matches exactly;
- **Low** – it is preferable that the parameter is close or matches exactly;
- **Ignore** – the parameter is not important at all.

Auto match on image open

Select this option to automatically find the best matching profile when the input image is opened.

9.5. Filtration options

Audible indication

Neat Image has a simple audible signal system.

The **when filtration jobs are processed** checkbox is used to enable/disable periodic sounds during filtration process. This may help you monitor the application while it is processing jobs.

Use when all filtration jobs are done checkbox is to enable/disable a single sound to indicate the end of filtration process.

Filtration Job Editor

Auto minimize is to minimize the **Filtration Job Editor** window during filtration. This has two purposes; one it can speed up the process and conserve memory, and two, it gets the editor out of your way while it works.

Auto restore is to restore the **Filtration Job Editor** window at the end of filtration.

Filtration Queue window

Auto restore is to restore the **Filtration Queue** window when all filtration jobs are done.

Filter process priority

Use this option to adjust the priority of the filtration process running in a multitasking environment:

- **Idle** – lowest priority; filtration gives way to other applications when necessary.
- **Below** – priority below normal; provides the smoothest performance for all applications. This may slow down Neat Image a bit, but will allow you to work normally with other applications, especially if the computer is slow.
- **Normal** – normal priority; filtration may slightly slow down other applications.

Auto recalculate preview

This option enables/disables automatic recalculation of preview in the **Filtration Job Editor**. When enabled, automatic recalculation is invoked every time you select a new image area or change filter parameters. Auto-preview is invoked only when the **Noise Filter Settings** tab is used.

...every N second(s)

This is the delay in seconds between a change of filter parameters and automatic preview recalculation.

9.6. Folder options

Use independent open/save folders/directories

This option enables using two independent folders (directories) for opening and saving files. If this option is selected then Neat Image will remember two folders, otherwise, only one folder for both opening and saving files.

Use independent folders/directories for images/profiles/presets

This option enables using three independent folders (directories) for working with images, device noise profiles and filter presets. If this option is selected then Neat Image will remember three folders, otherwise, only one folder for images, profiles and presets.

Temporary folder/directory

Select the folder that Neat Image will use to store its temporary files. In other applications, this is sometimes called 'scratch disk'.

Profile folder/directory

Select the folder where Neat Image will look for device noise profiles. This should be the topmost folder of all the (sub)folders with device noise profiles. In this way, Neat Image will be able to display all the profiles (stored in all the subfolders of the specified folder) in the popup menus in the **Device noise profile** panel of the **Filtration Job Editor** and of the **Filtration Queue**.

By default, the **PROFILES** subfolder of Neat Image installation folder is used.

Preset folder/directory

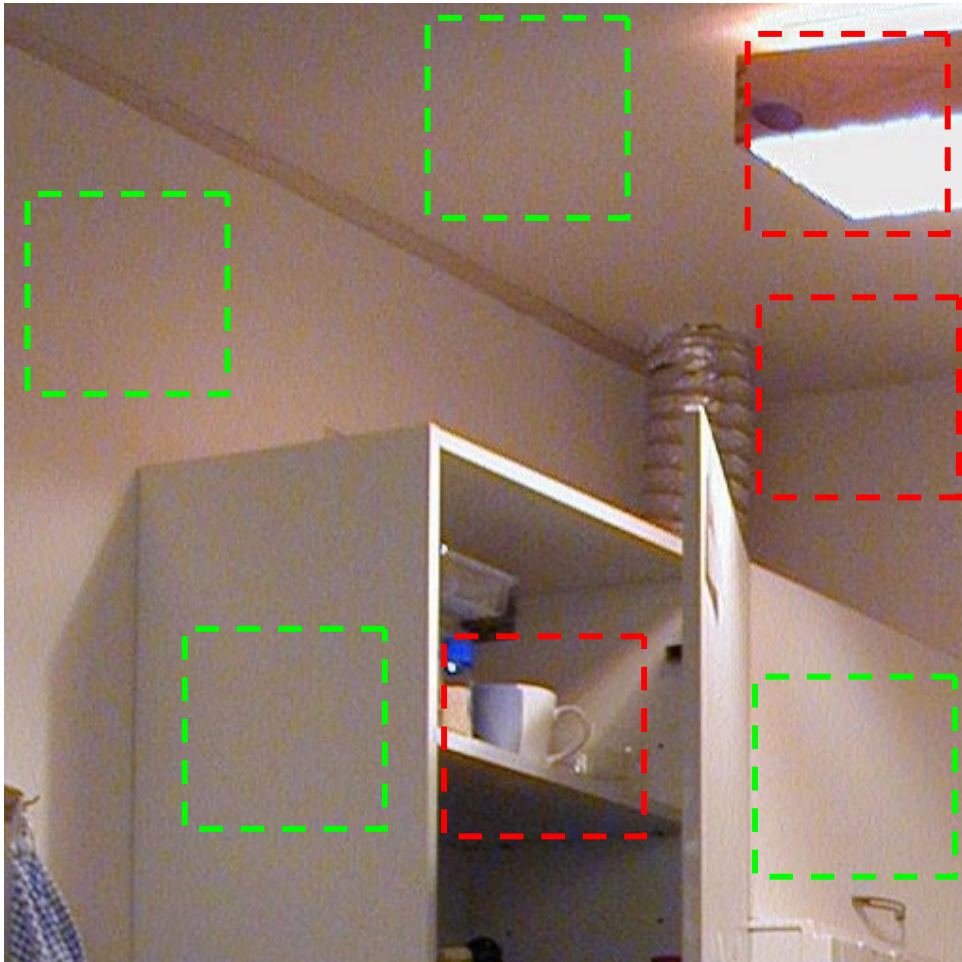
Select the folder where Neat Image will look for filter presets. This should be the topmost folder of all the (sub)folders with filter presets. In this way, Neat Image will display all the presets (stored in all the subfolders of the specified folder) in the popup menu in the **Noise Filter Settings** panel of the **Filtration Job Editor** and of the **Filtration Queue**.

By default, the **PRESETS** subfolder of Neat Image installation folder is used.

10. Examples

10.1. Images to build a device noise profile

See the image below for examples of good and bad image areas to select for building device noise profiles. Here, image areas suitable for building noise profiles are highlighted in green; those that should not be used are highlighted in red. Note that an image area suitable for building a device noise profile should be at least 60x60 pixel large (preferably more than 100x100 pixels).

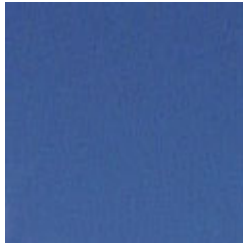


Additional comments regarding selection of image areas are shown on the next page.

These image areas **can be used** to build device noise profiles, as they contain no visible details in all frequency ranges:



– GOOD, because this area contains no important details



– GOOD, no important details
(this area is from another image)

The following image areas **should not be used** to build device noise profiles, because they contain visible details:



– BAD, because this area contains a detail: corner – junction of wall and ceiling



– UNACCEPTABLE, because this area contains many details



– BAD, because this area contains some details: clouds (this area is from another image)

See more [examples](#) of building device noise profiles on the Neat Image web page.

10.2. Images to fine-tune a device noise profile

In this subsection, you can find examples of image areas to be used for fine-tuning analysis in the noise profile equalizer:

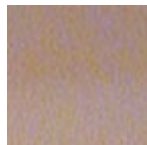
10.2.1. Large size areas

In image areas larger than 100x100 pixels, high, medium and low frequencies are taken into account.

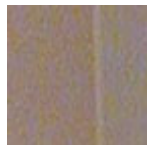
The examples are essentially the same as in the case of building a device noise profile. See examples in subsection 10.1, page 40.

10.2.2. Medium size areas

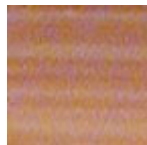
In image areas larger than 60x60 pixels but less than 100x100 pixels, high and medium frequencies are taken into account:



– GOOD, because this area contains no important details



– BAD, because there are medium frequency details (a vertical stroke)



– UNACCEPTABLE, because there are many medium frequency details (horizontal strokes)

10.2.3. Small size areas

In image areas larger than 30x30 pixels but less than 60x60 pixels, only high frequencies are taken into account:



– GOOD, although this area contains low frequency details, they are not taken into account because the area is small



– BAD, because this area contains high frequency details (a vertical stroke)



– UNACCEPTABLE, because this area contains various details

See more [examples](#) of fine-tuning device noise profiles on the Neat Image web page.

10.3. Filtration results

Here are some examples of Neat Image performance.



This is a small portion of a digital photo taken with a Nikon CoolPix 950 digital camera. The original image contains easily visible noise. In this case, the source of noise is the camera's image sensor (CCD) put in high ISO mode.



This image was taken with a Kodak DC 210 digital camera. Along with the strong CCD high ISO noise, there is an image degradation caused by the JPEG compression. Even though Neat Image tries to do its best to clean up such images, please avoid using strong JPEG compression!

See more [filtration examples](#) on the Neat Image web page.

11. Questions and Answers

11.1. General questions

Q What is the difference between Demo, Home, Pro and Pro+ editions of Neat Image?

A The Demo edition of Neat Image has some of the advanced functionality disabled. In particular, it does not save images in TIFF and BMP formats and does not copy to the clipboard (the Demo edition only saves images in JPEG). Pro+ includes a plug-in version of the filter. Please see the [Detailed feature map](#) for more information.

Q Should I uninstall Demo prior to installing Home / Pro / Pro+ edition?

A This is not necessary. However, you will not need Demo anymore because you are installing the Home / Pro / Pro+ edition, which has all the functionality of Demo plus added features. To uninstall Demo, use the **Uninstall** shortcut in the Windows **Start** menu: **Start menu->Programs->Neat Image Demo->Uninstall**. That will remove Demo. You may need to manually (re)move images and/or profiles that you put in Neat Image Demo subfolders.

Q Should I uninstall the older version of Neat Image prior to installing a newer one?

A Yes, this is usually necessary. Please uninstall old version of Neat Image and only after that proceed to install a new version. This will ensure that important files are not mixed up.

Q Are you going to release a Mac OS9 or OSX version?

A A Mac version of Neat Image currently is under development.

Q I think I have found a bug. How can I submit bug report?

A Please use the online [bug report form](#) on the Neat Image web page; please fill it out to let us know all the details necessary to reproduce the problem.

See more information about bugs in the Known issues subsection, page 47, and about bug fixes in the file *WhatsNew.txt* supplied with the software (also see the [History](#) section on the Neat Image web page for the most up to date information).

Q What about batch processing?

A Neat Image supports batch processing starting in version 2.0. Please refer to the [Queued processing](#) section, page 16.

Earlier versions of Neat Image (v1.x) can use Neat Batch - Batch Processing Assistant (<http://www.tawbaware.com/neatbatch.htm>), which adds a simple batch processing functionality to Neat Image. This free software is written by Max Lyons.

Batch processing is also possible with Neat Image plug-in used via Photoshop batching mechanism.

11.2. Filtration-related questions

Q Why do I receive some crystal-like artifacts in the filtered image?

A The crystal-like artifacts (usually these are the residual JPEG compression artifacts) look like thin lines in the filtered image. They can be easily eliminated by increasing the high frequency noise level in the filter settings.

Note: presence of many residual artifacts is usually a consequence of using a poorly built device noise profile or a profile built for another device and/or device mode.

Q Filtered image looks 'plastic'. Why?

A The reason is that too much filtration was applied. Let Neat Image keep some noise to have natural-looking results. Adjust the noise reduction amounts; for example, reduce Y channel amount to 50-70%. Also, make sure the device noise profile does match the image processed. Using an

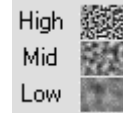
incorrectly chosen or poorly built profile can both produce plastic-looking results and leave residual artifacts (see the previous question).

Q What is frequency?

A The term *frequency* is used in Neat Image to denote image elements (both important details and noise) of specific size.

High frequency corresponds to image elements of smallest size. *Medium (mid) frequency* corresponds to elements of medium size. *Low frequency* corresponds to image elements of (relatively) large size.

For reference, see the noise samples of different frequencies in the **Noise Filter Settings** tab of the **Filtration Job Editor**.



Q The filtration process is slow, is this normal?

A This is normal, because the filtration algorithm is quite complex. We are working on further optimization to provide better performance.

Q Is the input image automatically changed according to the profile that is being opened?

A The input image is NEVER changed. Neat Image always creates a new output image, which contains the filtration results. The output image can then be saved to any file.

Q How to filter only the color noise (not the brightness noise)?

A When a YCrCb space is used, set the value of the Y channel noise reduction amount (in the **Noise Filter Settings** box) to 0%. This will switch off filtration in the brightness (luminance) channel Y.

Q What is YCrCb?

A YCrCb is the name of a family of color spaces widely used in digital imaging, television, image compression (e.g., the JPEG compression transform RGB images into this space), etc.

In 'YCrCb', 'Y' corresponds to the luminance channel, 'Cr' - to the Cr chrominance channel covering the red to blue-green range, 'Cb' - to the Cb chrominance channel covering the blue to yellow range.

Because this space enables easy separation of the luminance and chrominance information, it suits the needs of noise filtration.

Q Is processing via Neat Image best done before or after any other processing (i.e. tonal/color correction)?

A Such operations as tonal/color correction are quite conservative from the standpoint of noise, i.e., they do not significantly change the noise characteristics of the image. Therefore, filtering before or after makes little difference – as long as the device noise profile is built and applied at the same stage of image processing. For example, don't use a device noise profile built with an unprocessed image to filter a processed image.

Some digital cameras apply some color correction internally. Other cameras allow access to unprocessed RAW data. Neat Image is a generic filter, which can be applied in both cases. The only requirement is to use matching profiles.

On the other hand, image sharpening applied to a noisy image makes it much more noisy. It is best to apply Neat Image filtration before sharpening (including internal camera sharpening). However, the sharpening and noise filters of Neat Image can be used together because the sharpening is applied AFTER noise filtration.

12. Tips and Tricks

12.1. Preventing banding

In some cases, the banding effect may appear when applying the noise filter to images with faint brightness gradients. This effect is quite rare for normal images, especially when viewed on a true color display (it can be more visible on hi-color displays¹).

To avoid banding, try to reduce the noise reduction amount for the high frequency component to 50%.

12.2. Filtration of shadow areas

In some situations, it is preferable to filter only the shadow areas of images leaving bright areas intact. You can do this with Neat Image by using the noise profile equalizer to limit or stop filtration of bright image areas.

The noise profile equalizer sliders correspond to particular ranges of brightness (individually for each color channel) of the RGB color space. The position of each slider changes (fine-tunes) parameters of the noise profile for the corresponding range of brightness. The lower a slider, the less filtration will eventually be applied to image elements that belong to the corresponding range of brightness.

Therefore, to filter only shadows you can manually move all the 'bright' sliders down (refer to the gradients on the bottom of noise profile equalizer). For example, move down all but the three 'darkest' sliders in each RGB channel.

Using this method, you can effectively prevent filtration of the bright image areas.

If you use the plug-in version of Neat Image, you can filter shadows/lights only using the selection capabilities of your image editor. Select an area to be processed (for example, select shadows based on low brightness values) and invoke Neat Image plug-in to filter this area.

12.3. Partial filtration

Some images contain both noisy and clean areas and it may be preferable to filter only noisy areas. This can be manually done by combining two images – original and filtered one – in an image editor. For example, the following steps can be followed if you use the standalone version of Neat Image:

1. Filter the input image in Neat Image (so that noisy areas are cleaned) and save the output image to a new file;
2. Open this new file in an image editor;
3. Place the filtered image in a new layer on top of the original image;
4. Adjust the transparency of the new layer so that noisy areas look fine;
5. Select and delete the areas of the new layer where filtration is not necessary or excessive (you may want to use the eraser tool with adjustable transparency and shape).

12.4. Faster processing

You can get better filtration speed if one (or more) of the image components is not processed. To disable processing of a frequency component set the noise reduction amount and sharpening amount to 0% for this component. To disable processing of a color channel component set the noise reduction amount to 0% and disable sharpening of this channel.

The filtration speed is 15-25% higher per image component left out of the filtration process.

¹ This is a common problem of hi-color displays. If the display does not have enough colors then the image can have some bands of the same colors. Dithering is usually used to mask this problem on such displays. An original image usually contains some noise, which acts like dithering. When Neat Image removes this noise, the underlying problem of banding may come up again. A solution is to use a true color display or a better image viewer (in hi-color), which applies some dithering automatically.

13. Information

13.1. Known issues

We are trying to keep bugs away from Neat Image as much as possible. Please report any bugs or problems (even those already described below) you encounter while working with Neat Image. For convenience, use the [online bug report form](#) on the Neat Image web page. Your feedback will greatly help us to improve the software and provide you with an even better imaging tool. Thank you very much in advance!

List of known issues

- Nothing so far

13.2. Plans

The current version of Neat Image is the result of our ongoing research on noise filtration. We are continuing to work on the filtration algorithm to improve the quality and speed of noise reduction. In addition, we are planning to introduce new functionality in the future, such as:

- Mac version
- Hot pixel removal

Please let us know if you have ideas that can make the program better. Participate in the discussion on the Neat Image message board, express your opinion, make suggestions, and ask questions. Remember, the more people that ask for a feature the more likely it is that it will be implemented.

13.3. Detailed feature map

Features			Edition			
			Demo	Home	Pro	Pro+
Image processing	Processing speed		100%	100%	100%	100%
	8 bits/channel (24-bit RGB, 8-bit Grayscale)		+	+	+	+
	16 bits/channel (48-bit RGB, 16-bit Grayscale)		-	-	+	+
	Alternative working color spaces (YCrCb standard (ITU 601), YCrCb symmetric, RGB)		+	+	+	+
Noise reduction	Channel-wise (R, G, B; Y, Cr, Cb)		+	+	+	+
	Frequency-wise (High, Mid, Low, Very low)		+	+	+	+
Smart sharpening	Channel-wise (R, G, B; Y, Cr, Cb)		+	+	+	+
	Frequency-wise (High, Mid, Low)		+	+	+	+
Filter presets (reusable sharpening and noise filter settings)			+	+	+	+
Image input/output (in/out)	TIFF (uncompressed, single image/no layers)	24-bit RGB	+/-	+/+	+/+	+/+
		48-bit RGB	-/-	+/-	+/+	+/+
		8-bit grayscale	+/-	+/+	+/+	+/+
		16-bit grayscale	-/-	+/-	+/+	+/+
	JPEG	24-bit RGB	+/+	+/+	+/+	+/+
		8-bit grayscale	+/+	+/+	+/+	+/+
	BMP (uncompressed)	24/32-bit RGB	+/-	+/+	+/+	+/+
		8-bit grayscale	+/-	+/-	+/-	+/-
	Windows clipboard	24/32-bit RGB	+/-	+/+	+/+	+/+
	Drag and drop (from Windows Explorer)		-	+	+	+
Device noise profiles	Building profiles for custom image acquisition devices		+	+	+	+
	Matching profiles to input images		+	+	+	+
	Reusing (saving/reopening) noise profiles		+	+	+	+
Workflow	Queued processing / batch		limited ¹	limited ²	full	full
	Command line support		-	+	+	+
	Photoshop plug-in version of the filter		-	-	-	+

¹ Queue depth is limited to 2 jobs.

² Queue depth is limited to 10 jobs.

13.4. Contacts

We really appreciate your opinion of Neat Image. Please let us know what you think about the program. Feel free to ask questions regarding Neat Image. To share your opinion or to receive support regarding Neat Image, use any of the following means:

13.4.1. E-mails

- info@neatimage.com — for general inquiries
- support@neatimage.com — for any inquiries regarding use of Neat Image
- sales@neatimage.com — for any inquiries regarding purchase of Neat Image software

13.4.2. Message board

Register in Neat Image community forum (<http://www.neatimage.net/forum/>), and participate in discussions on the use and development of Neat Image. Such topics are covered in the forum as:

- announcements of new and updated version of the software;
- questions about use of Neat Image;
- examples of using Neat Image with comments and suggestions;
- feedback from the users: suggestions of new features and improvements;
- polls: what OS, CPU, camera types are used with Neat Image;
- contacts and general comments.

13.4.3. Web page

<http://www.neatimage.com>

13.5. Legal information

13.5.1. Copyright

Neat Image Copyright © 1999-2003 by ABSOft. All rights reserved.

13.5.2. License agreement

Your use of Neat Image software indicates that you accept this license agreement:

You may

Use Demo edition of Neat Image free of charge for non-commercial purposes.

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Purchase a license for Neat Image Home, Pro, or Pro+ edition and become a registered user of the software.

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The authors make no warranty or representation, either express or implied, with respect to this software, its quality, accuracy, merchantability, or fitness for a particular purpose. This software is provided "as is", and you, its user, assume the entire risk as to its quality and accuracy.

Distribution

Demo edition of Neat Image may be distributed unmodified provided any charge is to cover distribution costs only.

Demo edition of Neat Image may be placed on magazine CDs, etc. as long as ASoft is informed.

13.6. Registration

To become a registered user and to get a fully functional edition of Neat Image (Home, Pro or Pro+ edition) you have to purchase a Neat Image license (a single- or multi-user license). This can be done through an online software shop. Please find the detailed information in the [Purchase](#) section of the Neat Image web page.

After you have purchased a Neat Image license, you receive an e-mail from the Neat Image team with detailed download and registration instructions. These instructions will help you download Neat Image Home, Pro or Pro+ and become a registered user of the software.

By becoming a registered user of Neat Image Home, Pro or Pro+ edition you will:

- Encourage the authors to further develop and improve Neat Image;
- Get access to the functions of Neat Image that are disabled in the Demo edition (see Detailed feature map, page 47);
- Be able to use Neat Image for commercial and other purposes;
- Get free access to updates (minor modifications) of the software;
- Enjoy the reduced upgrade prices for major modifications of Neat Image;
- Receive the most attention of Neat Image support group;
- Receive the most attention of Neat Image development group (tell us what you want to see in the new version).

Message from Neat Image team

By becoming a registered user, you are helping us to continually improve the software. It is only possible with your support!

Become a registered user and we will make Neat Image better for YOU!

13.7. Acknowledgments

Neat Image utilizes the Intel JPEG Library.

Neat Image utilizes the openTIFF library.

Neat Image utilizes the Windows XP Theme Manager by Mike Lischke.

Thank you to all the users who have contributed to Neat Image by proposing improvements and new features.

Thanks to all the people who help us to find bugs in Neat Image.

Thank you to all the users who stimulate the development of Neat Image by their word and deed.

Image wouldn't be Neat without all of you!

Neat Image team, ASoft

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