Neat Image

plug-in for Aperture (Mac)

To make images look better.

User guide

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1. Introduction

1.1. Overview

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

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 shot 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.

Neat Image incorporates the most advanced noise reduction algorithms in the industry. Neat Image detects, analyzes, and reduces image noise. The quality of Neat Image noise reduction is higher than that of other methods because Neat Image takes into account specific characteristics of particular image acquisition devices, thus making the filtration more accurate. Using device noise profiles, Neat Image adapts its noise filter to almost any input device – digital camera, scanner, etc.

Online examples of Neat Image noise reduction: www.neatimage.com

Neat Image's noise filter offers a rich control set to let user adjust all settings and achieve the desired level of noise reduction. In addition, Neat Image includes a smart sharpening filter to make images look sharper without any degradation of image quality (which is usually inevitable with noisy images). The combination of the sharpening and noise filters makes such an effect possible.

Neat Image plug-in for Aperture is currently produced in three editions: Demo, Home and Pro. All editions provide top-quality noise reduction and sharpening. The difference is the following:

- Demo plug-in is a free edition of the software with limited functionality
- Home plug-in processes only 8-bit images and can process up to 100 images in one batch
- Pro plug-in supports both 8-bit and 16-bit images and processes batches without size limits

1.2. Features

Aperture plug-in

- To **streamline** use of Neat Image noise reduction in your Aperture-based workflow
- To process many images using Aperture-style **batching**
- **32-bit** and **64-bit** versions of Aperture supported

Noise Reduction and Image Sharpening

- **Advanced noise filter** to reduce noise and grain in digital images
- **Smart sharpening filter** to make images look sharper without amplification of noise
- **8- and 16-bit image support** to fully utilize capabilities of modern image acquisition devices
- **CUDA-accelerated filter** to speed up processing using computation-capable GPU

Device Noise Profiles

- **Auto Profile** to build noise profiles for your camera or scanner on the fly
- Rich set of free **pre-built noise profiles** in the online profile library
- **Auto Match** for selecting the most suitable pre-built noise profiles for input images

Some features are only available in the Home or Pro plug-in. Detailed feature map (page 39) explains the differences between editions of Neat Image plug-in for Aperture.

1.3. Requirements

System requirements for practical use 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 the processor number-crunching power and memory speed.

Minimum size of an input image is 40x40 pixels; maximum size is usually limited by the amount of system RAM available.

Recommended system configuration to process typical 8-16-megapixel images is:

- Intel Core 2 / Core or PowerPC G4 / G5 processor, single or multi-processor
- Mac OSX 10.4.11+ / 10.5.2+ / 10.6+
- 1 GB RAM or higher
- True color display with 1024x768 resolution or higher

Optional but recommended:

- CUDA-capable GPU[1]

The plug-in is compatible with the following plug-in hosts:

- Apple Aperture 2.1 or newer (32-bit mode only)
- Apple Aperture 3.0 or newer (both 32-bit and 64-bit modes are supported)

The plug-in may be compatible with newer versions of Aperture as well.

The following image types are supported:

- 24-bit RGB
- 48-bit RGB
- 8-bit grayscale
- 16-bit grayscale

Color input images are supposed to be in a flavor of RGB color space, like AdobeRGB, sRGB, etc. If an input image is in some flavor of RGB color space then Neat Image produces the output image in exactly the same flavor of RGB color space.

The plug-in can work with images stored using any file format that can be opened by Aperture: PSD, TIFF, RAW, JPEG, etc.

[1] A CUDA-capable GPU with a recent CUDA driver (v4.0 or newer) is required. You can download the latest versions of the CUDA drivers from http://www.nvidia.com/

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 images produced by any imaging devices – digital cameras, scanners, etc. Neat Image can be adjusted to a particular device by means of a *device noise profile*, which describes the noise characteristics of the device working in a certain mode.

A device noise profile is built by analyzing featureless image areas that contain no visible (or important) details. Usually the software can find such areas completely automatically. In a difficult case, you can assist it and select featureless areas manually. Finding such areas is very easy for human eyes but may sometimes be a bit difficult for software.

By analyzing found or specified featureless areas, the Auto Profile function in Neat Image builds a profile which describes the noise in these areas. Using this profile, Neat Image's noise filter can efficiently reduce noise in the whole image.

When several such profiles for different device modes are available, the Auto Match function can automatically select the profile that matches given input image. In this way, you can skip noise analysis and simply re-use one of profiles built earlier.

Smart Profile combines the power of Auto Profile and Auto Match by preparing two candidate profiles and then selecting the better one for actual image processing. This improves automated image processing and helps to achieve great results in more cases.

The noise filter processes images in three spatial frequency ranges. This makes possible reducing noise in one frequency range even if details are present in other ranges. The filter can also selectively process any of the color channels components of the input images.

In addition to the noise filter, there is the smart sharpening filter, which only sharpens important image details without increasing the level of noise. This filter also uses the noise profile to tell noise from details, so applying the noise and sharpening 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. An 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 because such noise usually uniformly covers the whole image area. However, 'hot' or 'dead' pixels (produced by single 'broken' elements of image sensor) do not satisfy the uniformity condition and, therefore, are not efficiently removed by Neat Image.

  Another frequent source of noise is JPEG compression. The JPEG noise is approximately uniform when high quality setting (low compression rate, larger file size) is used. However, low compression quality makes noise non-uniform. Therefore, we recommend using the highest quality levels 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. If you can, use lossless file formats such as TIFF or RAW (any file format supported by Aperture can be used with the Neat Image plug-in in Aperture environment).

- **Noise should be concentrated in high and medium spatial 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.

3. Installing plug-in

In most cases, the Neat Image plug-in can be automatically installed to Aperture if you download and use one of the ***pkg.dmg*** installation packages from the product website. There are separate packages for Intel and PowerPC Macs. Also, different editions of Neat Image (Demo, Home or Pro) come in separate packages. Please make sure you download the correct installation package.

To automatically install Neat Image plug-in to Aperture

On an Intel-based Mac:

- Intel Core i7, i5, Core 2 Solo, Duo or Quad; Core 1 Solo or Duo

- Intel Xeon

➡ Use the following installation procedure:

Download the ***NeatImageAP.Intel.pkg.dmg*** installation package from Neat Image website (make sure you **download the correct edition**: Demo, Home or Pro);

Double-click the downloaded dmg file to mount the volume;

In the mounted volume, double-click ***NeatImageAP.Intel.pkg*** to start the installer;

Follow the steps of the installer wizard to complete the installation process;
(you may be prompted to enter the Name / Password of the OSX administrator account)

On a PowerPC-based Mac:

- PowerPC G4

- PowerPC G5

➡ Use the following installation procedure:

Download the ***NeatImageAP.PowerPC.pkg.dmg*** installation package from the website (make sure you **download the correct edition**: Demo, Home or Pro);

Double-click the downloaded dmg file to mount the volume;

In the mounted volume, double-click ***NeatImageAP.PowerPC.pkg*** to start the installer;

Follow the steps of the installer wizard to complete the installation process;
(you may be prompted to enter the Name / Password of the OSX administrator account)

To check whether the installation has been successful

(Re-)start Aperture;

In Aperture, find the Images > Edit With > Neat Image... menu item;

Select an image in Aperture and use the above menu item to invoke Neat Image;

If there is no Neat Image in Aperture's Images > Edit With menu then please contact support by e-mail (see Contacts, page 40) and request assistance. We will try to help as soon as possible.

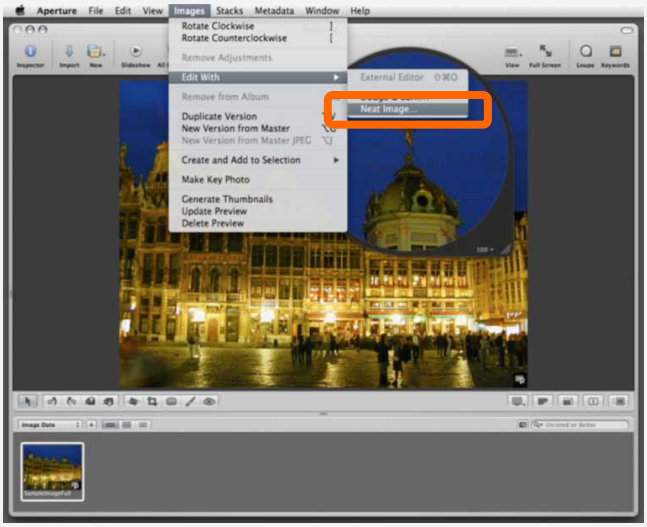
4. Filtration process overview

4.1. Overview of Neat Image filtration process

1. Prepare image

- in Aperture, select the image to be processed;

- use the Images > Edit With > Neat Image... menu item in Aperture to open Neat Image.



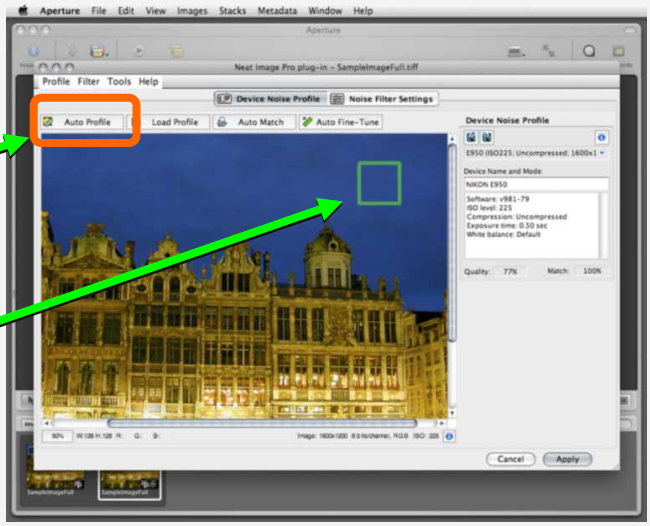
2. Prepare a *noise profile*

You can build a new profile on the spot or load a pre-built one.

To build a new profile:

- click the Auto Profile button; this will automatically find, select and analyze a *featureless (noise-only)* image area

  (if you see that automatic selection includes any important image details then move the selection to a featureless area and click the Auto Profile button again)



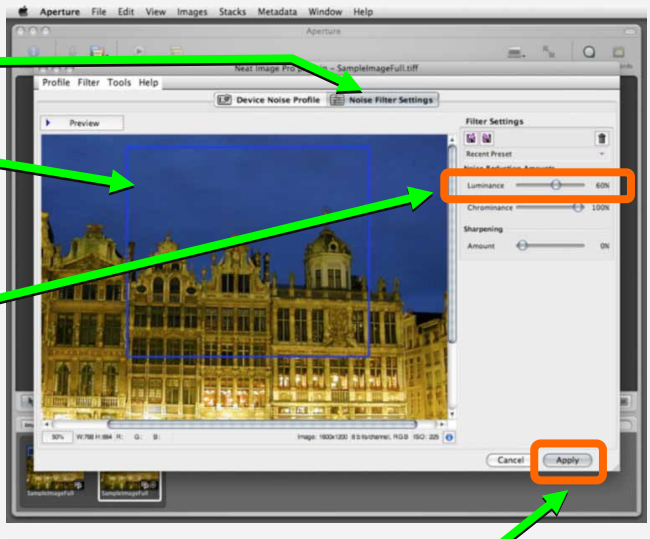
3. Adjust the filter settings

- switch to the Noise Filter Settings tab;

- check preview in the viewer

- adjust the filter settings to achieve desired level of noise reduction:

  - try to vary Noise Reduction Amounts: Luminance and observe how the preview changes;



4. When you are happy with preview results, apply the filter to the image: click the Apply button.

4.2. Running Neat Image on a sample image

You can download a test-kit prepared to help you start using Neat Image plug-in for Aperture: http://www.neatimage.net/files/TestKitMac.zip (250KB). Download and unzip it to a new folder on the hard disk. The test-kit contains a sample image: ***SampleImage.jpg***. This image is a part of typical photo taken with a digital camera. The detailed information about the test image is available in the ***SampleImageInfo.txt*** file.

Please go through the four stages below to see how the image can be improved by Neat Image:

Stage 1. Import the sample image in Aperture and open it in Neat Image

1. Import the sample image (***SampleImage.jpg***) to the Aperture library;

2. Select the imported sample image in Aperture;
   you will see that there is strong noise in the image, especially in the sky area. This is typical noise produced by a digital camera. The task of Neat Image is to reduce this noise;

3. Select the Images > Edit With > Neat Image... menu item in Aperture to open the Neat Image plug-in.

Stage 2. Load the sample noise profile in Neat Image plug-in

To reduce noise in the image Neat Image generally needs a noise profile describing the noise properties of the image. For this sample image, we have prepared such a noise profile in the test-kit in advance: ***SampleProfile.dnp***. Using this profile, Neat Image can efficiently reduce the noise in the image.

1. In the Device Noise Profile tab: 

   click 

   (the Load Profile button);

2. Then in the Open Device Noise Profile dialog, navigate to the folder where the noise profile has been unzipped and select the ***SampleProfile.dnp*** file.

Now the sample noise profile is loaded and Neat Image is almost ready to filter the 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 with “good” settings to process the sample image.

Stage 3. Load the sample filter preset in Neat Image plug-in

1. Switch to the Noise Filter Settings tab: 

   and click  (the Load Filter Preset button) in the Filter Settings box;

2. Then in the Load Filter Preset dialog, navigate to the folder where the sample filter preset has been unzipped and select the ***SamplePreset.nfp*** file.

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

Stage 4. Apply the filter to the image

1. Click 

   in the bottom of the plug-in window and wait until the image processing is completed.

   Processing may take a few seconds. After that the filtered output image is displayed in Aperture along with the original and you can compare them. Notice that the noise – especially in the sky – has been significantly reduced while the real image details have been preserved.

Please be aware that the sample noise profile and sample filter preset supplied with the test-kit are suitable only for images taken with that particular digital camera working in that particular mode. Neat Image can perform similar noise reduction on images captured or acquired by any other camera (or scanner) working in any mode. To be able to do that Neat Image needs device noise profiles that describe the noise characteristics of those devices. The software can build these profiles on the fly using the Auto Profile function. Also, you can find ready-made noise profiles for many cameras and scanners in the Profiles section of the Neat Image web page: http://www.neatimage.com/mac/aperture/profiles.html

The next sections – Filtration process details, page 9, and Device noise profiles, page 20,– contain detailed descriptions of the filtration and profiling processes. There are also examples of profiling and filtration in the Neat Image web page: http://www.neatimage.com/mac/aperture/examples.html

5. Filtration process details

The Neat Image plug-in can be invoked from Aperture to process any image available in Aperture. This section describes the key stages of using the Neat Image plug-in to process one image.[1]

5.1. Stage I. Invoke the plug-in from Aperture

In Aperture, select an image that should be processed (it will be called 'input image' hereafter). Invoke the Neat Image plug-in using the standard method:

➡ Select the Images > Images > Edit With > Neat Image... menu item.

➡ The Neat Image plug-in window will open and will show the selected input image.

To scroll and pan the image

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

To change the image zoom level

- use the mouse wheel when mouse is over the viewer;
- use the zoom control under the image viewer;
- use the Cmd+Plus, Cmd+Minus, Cmd+0 (zero), Cmd+Alt+0 (zero) keyboard shortcuts;

5.2. Stage II. Prepare a device noise profile

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

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

1. Auto Profile: to build a new profile by analyzing the input image (or a specially prepared test image);
2. Auto Match: to automatically select the most suitable device noise profile from a pre-built set of profiles (when it is available);
3. Smart Profile: to use both Auto Profile and Auto Match (with Auto Fine-Tune) to prepare two candidate profiles and then automatically select the better of two profiles;
4. Load Profile: to manually select a suitable profile from a pre-built set of profiles.

The first option is often the easiest one provided the input image includes uniform featureless areas that contain noise but no visible or important details.[2] Auto Profile will try to automatically find such image areas and analyze them to build a noise profile. When the image does contain featureless areas, this automatic way of preparing a noise profile is the most accurate and therefore recommended. If the input image includes no such areas, another image with featureless areas can be used to build a profile.

The other options are available once you have a pre-built reusable set of profiles. You can find some pre-built profile sets for different cameras and scanners in:

- Profiles section of the Neat Image web page:
  http://www.neatimage.com/mac/aperture/profiles.html
- Device noise profiles section of the Neat Image community forum:
  http://www.neatimage.net/forum/viewforum.php?f=5
- Other digital imaging forums and web pages from users of Neat Image.

If you cannot find a pre-built set of profiles for your camera or scanner, you can easily build such profiles yourself. Moreover, please be aware that using profiles built by other people may produce less than optimal results with your images because of possible slight differences in noise properties of cameras (scanners) as well as due to different image processing workflows used. Therefore, we advise

[1] There is also a way to automatically process more than one image: please see the Batch processing section, page 18.

[2] You can see some examples of featureless image areas in the Examples section, page 31.

to use profiles built by others only as a starting point to learn how to use Neat Image. To achieve better results consider building your own reusable profiles.

You can build a set of profiles for different device modes or just one profile to process one image. You can find more details about profiling in the Device noise profiles section, page 20.

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. Or if you have just built a singe profile specifically for the input image, then you can directly use the profile to process the image in the Stages III-IV below.

Auto Profile: build a new profile using the input image

- Make sure you use the Device Noise Profile tab:


- Click 

(the Auto Profile button).

Neat Image will find and highlight the image area selected by Auto Profile for main analysis. Neat Image will then automatically analyze the noise in that area as well as in the whole image and will build a new noise profile.

To build a profile, Neat Image is looking for a flat uniform featureless area in the input image. In difficult cases, Neat Image may have trouble finding a uniform featureless area in the input image and then the auto-selected area will contain some important image details. In such a case, move the selection to an area that does not contain any image details (you can make a new selection or resize the old one) and then click the same Auto Profile button again.

After the profile is built, check the Quality indicator in the Device Noise Profile box. A profile built using a uniform and featureless image area will show a high value in this indicator. If the profile quality is high (for example, higher than 75%) then you can be sure that the noise profile is accurate. In this case, consider the noise profile ready and proceed to Stage III. Adjust filter settings, page 11.

If the quality is not high, try to select another uniform image area and use Auto Profile once again. That may not help still, especially if the input image contains only a few featureless areas. In this case, consider building a noise profile using an alternative image or special test image prepared with the Calibration Target. Please see the Device noise profiles section, page 20, to learn how to use the Calibration Target to build device noise profiles. You can also try to load some pre-built profile using one of the methods described below.

Auto Match: select matching noise profile from a pre-built profile set

- Click 

(the Auto Match button).

The Auto Match function uses the EXIF data fields of the input image to automatically select and load the device noise profile that matches the device mode of the image. The most matching profile is selected from profiles stored in a special folder. By default, this folder is in your home folder[1]:
/Users/<username>/Documents/Neat Image for Aperture/Profiles/

Auto Match will look for matching profiles in that folder as well as all its subfolders (where you can place profiles built by you or downloaded from the Internet).

After a profile is loaded by Auto Match, the degree of match between the current input image and loaded noise profile is displayed in the Device Noise Profile box. Higher values mean better match, leading to more accurate filtration.

Smart Profile: prepare two profiles and select the better one

- Use the Profile > Smart Profile menu item (or press the F5 key).

Smart Profile uses both Auto Profile and Auto Match (with Auto Fine-Tune) to prepare two candidate

[1] You can check and adjust the location of that folder using the menu Tools > Preferences > Matching.

profiles and then selects the better of two profiles. For Smart Profile to be fully efficient, the input image must contain flat featureless areas with noise for Auto Profile to analyze, and also there must be several pre-built profiles to help Auto Match find the most matching noise profile, as described above. You can adjust settings of Smart Profile function in Preferences.

To manually select a noise profile from a pre-built profile set

- Click 

(the Load Profile button). Then select a profile in the Open Device Noise Profile dialog.
or

- Click  (the drop-down button) in the Device Noise Profile box to open the popup menu with all available profiles and then select one of the available profiles.

Please note that you have either to build your own profiles or download some pre-built profiles and place them to the Neat Image's Profile folder to make this drop-down button and popup menu truly work. By default, the Profile folder is located in your home folder[1]:
/Users/<username>/Documents/Neat Image for Aperture/Profiles/

If you build or download some pre-built profiles, place (unzip the profile set if necessary) them to the above folder. Neat Image will recognize and display those profiles in the popup menu to help you quickly open any of them when needed.

When manually selecting a profile for input image, use the profile file names and sub-folder structure to guide your search. See Preparing profile set for different device modes: Stage III. Structuring profile set, page 28, for more information on profile set structuring.

To additionally fine-tune the loaded or matched profile

You may want to additionally fine-tune the profile after it has been loaded either automatically (using Auto Match) or manually (using Load Profile). Fine-tuning the profile to the current image usually makes the profile more accurate and better reflecting the image's noise properties. Please note that you do not need to fine-tune a profile if you have built it using Auto Profile. Auto Profile automatically applies fine-tuning so you do not need to repeat it.

- Click 

(the Auto Fine-Tune button) to fine-tune the profile to the current input image.

There is no need to select any area in the input image because Auto Fine-Tune automatically analyzes the whole image.

Once you have loaded the profile that matches the input image or you have just built a new profile specifically for the input image, you can proceed to process the image in the Stages III-IV below.

5.3. Stage III. Adjust filter settings

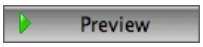
As soon as the noise profile is ready you can use the noise and sharpening filters. These filters have several adjustable settings. The default settings usually produce good filtration results. You may want to additionally vary the filter settings to achieve the filtration results that look best to your eyes.

- Switch to the Noise Filter Settings tab: 

5.3.1. Use preview when adjusting filter settings

The viewer in the Noise Filter Settings tab shows a part of the image processed by the noise and sharpening filters. If you change any filter settings then the preview is automatically updated (provided

[1] You can check and adjust the location of that folder in menu: Tools > Preferences > Folders > Profile folder.



(the Preview button) in the toolbar is depressed). You can zoom in and out, drag, scroll, pan the image to see how the filtration affects different parts of the image. If you manually select an area in the image then only the selected area will be processed for preview.

When the preview is ready (the preview area shows "Filtered"), you can click inside the preview image area to temporarily switch back to the original for comparison.

5.3.2. Standard and Advanced modes

Neat Image has two sets of filter controls, they are available in the Standard mode and Advanced mode (you can select the mode using the Tools > Standard mode and Advanced Mode menu items). The Standard mode provides a simple control set, recommended for beginners who just start using Neat Image. The Advanced mode provides the most complete control set with maximum manual control over noise profiling and filtration processes. The Advanced mode is recommended for power users. Adjusting filter settings is described below separately for the Standard and Advanced mode. We recommend to start with the part about the Standard mode and then proceed to the part about the Advanced mode if you are going to use the complete control set.

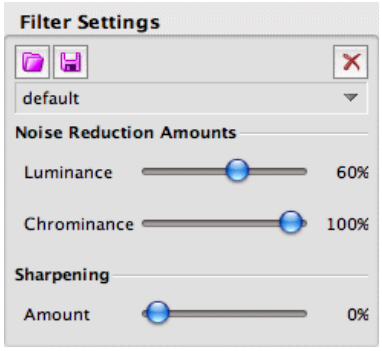
5.3.3. Adjust filter settings in Standard mode

There are two main filters in Neat Image: noise reduction filter and sharpening filter. These two filters can be used together and each of them can be used independently. You can enable, disable and adjust these filters using the guidelines in the subsections below.

Adjusting noise filter settings in Standard mode

If you work with a color image then two major image components can be distinguished: the luminance and chrominance component. This distinction is very useful from the standpoint of noise reduction because it allows processing luminance and chrominance information separately.

Some color images are represented in color spaces that enable direct separation of the luminance and chrominance components (for example, Lab, YCrCb, etc.). Other images (including RGB images that Neat Image takes as input) have to be converted to another representation to enable separation of the luminance and chrominance components. Neat Image applies an internal color space conversion to achieve that. Once luminance and chrominance components of the input image are separated, Neat Image can treat them individually. Neat Image provides separate luminance and chrominance settings in the noise filter (see the figure on the right).



In the Standard mode, the noise reduction applied to one image component (either luminance or chrominance component) is controlled by the corresponding *noise reduction amount* setting.

A noise reduction amount tells the filter how much of the detected noise should be reduced. For example, if the noise reduction amount is set to 50% then all image elements that are considered (by the filter) to be noise are reduced (made weaker) in half. The noise reduction amount value of 100% tells the filter to remove the detected noise completely.

The default noise reduction amounts usually produce good filtration results provided the noise profile is accurate[1]. By default, the noise filter removes 60% of detected noise in the luminance component of the input image and 100% of noise in the chrominance component. Our experience shows that the default noise reduction amounts usually provide a good balance between noise removal and preserving natural (not over-processed) appearance of filtered images.

Decreasing the noise reduction amounts may have a positive effect if the input image contains some natural noise. For example, when you filter images of asphalt, sand, or anything else that contains fine natural noise-like features, it may be helpful to reduce amounts down to 30-50%.

[1] Use the Quality and Match indicators in the Device Noise Profile box to estimate the accuracy of the profile. The Quality indicator shows how accurate and complete is the noise analysis itself. The Match indicator shows how closely this profile corresponds to the current input image. Both indicators have to show high values for the noise reduction to be accurate.

Adjust noise reduction amounts[1]

➡ Use the Noise Reduction Amounts: Luminance and Chrominance sliders.

You can vary the noise reduction amount for both luminance and chrominance component of the input image. The higher a certain 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, especially in the luminance component, may lead to loss of fine details and unnaturally looking (over-smooth, plastic-like) results. Too low amounts may be not enough to sufficiently reduce the objectionable part of the noise. You have to balance the noise reduction amounts (most importantly, the amount of noise reduction in the luminance component) to get the result that looks best to your eyes.

As human vision is not very sensitive to variations of colors, strong filtration in the chrominance component does not noticeably distort image, but efficiently removes color noise.

Use preview

As you make changes in the noise filter parameters, check preview on different parts of the image to get a better feeling for the prospective results of noise reduction.

If the noise filtration looks too strong try to decrease the noise reduction amounts. If the noise filtration is not sufficient then increase the amounts.

Adjusting sharpening settings in Standard mode (optional)

The sharpening filter in Neat Image increases image sharpness without increasing the noise strength.

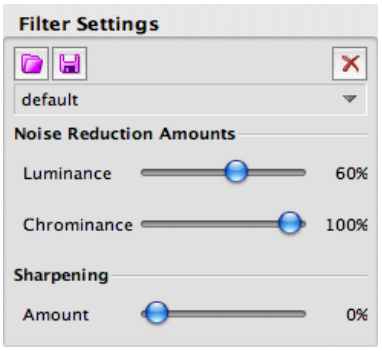
The sharpening filter is disabled (sharpening amount is set to 0%) by default. Increase the sharpening amount to sharpen the image. Like with any sharpening method, you have to balance the sharpening amount to avoid over-sharpening.

Use the preview when adjusting the sharpening settings.

Adjust sharpening amount

➡ Use the Sharpening: Amount slider.

Specify how much sharpening should be applied to the input image.



Use preview

As you make changes to the sharpening setting, check preview on different parts of the image to get a better feeling for the results of sharpening.

As soon as you are happy with the preview results regarding both noise reduction and sharpening, proceed to save the filter settings into a preset (see page 16), or directly to the Stage IV. Apply filter, page 17.

5.3.4. Adjust filter settings in Advanced mode

As said above, Neat Image has two sets of filter controls, that are available in the Standard mode and Advanced mode (you can select the mode using the Tools > Standard mode and Advanced Mode menu items). The Standard mode described above provides a simple control set, recommended for beginners who just start using Neat Image. The Advanced mode provides the most complete control set with maximum manual control over noise profiling and filtration processes. The Advanced mode is recommended for power users. If you want to use the Advanced mode then please read this sub-section, otherwise skip it.

As compared with the Standard mode, the Advanced mode offers a more extensive set of filter controls. There are also two filters – noise reduction filter and sharpening filter – but these have more settings now. Please follow the guidelines below to adjust both filters.

[1] We recommend disabling the sharpening filter when adjusting the noise filter. To disable the sharpening filter, set the Sharpening: Amount to 0%.

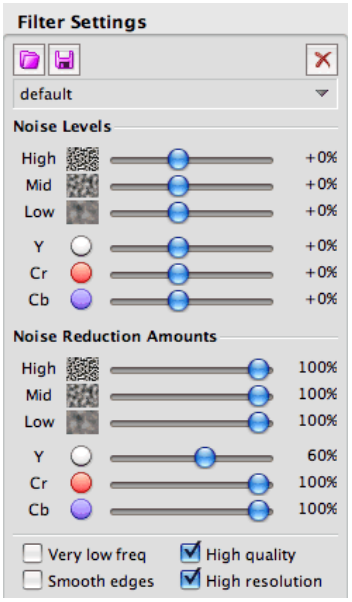
Adjusting noise filter settings in Advanced mode

In Advanced mode, the noise filter has separate settings for all frequency and channel components of the input image. There are also pairs of *noise level - noise reduction amount* controls for each of these image components. The meaning of each *noise level - noise reduction amount* pair is the following:

- a noise level control adjusts the threshold that determines which image elements are considered noise in the corresponding image component and which elements are considered not noise;
- a noise reduction amount control determines how much reduction is applied to the image elements identified as noise in the same image component.

In Advanced mode, you can adjust the noise levels as well as noise reduction amounts for each image component. The noise levels are adjusted relative to the noise levels of the current noise profile that have been measured during profiling.

For example, the noise level of the Y (luminance) channel could be measured in the noise profile at 8.55 units.[1] This number tells the noise filter which image elements should be considered noise and which – image details: the image elements that are weaker than 8.55 units are considered noise and reduced by the noise filter; the image elements that are stronger than 8.55 units are considered details and not reduced.



If you do not change the default noise filter settings (Noise Levels: Y: +0%) then noise reduction in the Y channel is completely determined by the measured number from the noise profile (8.55 units). However, if you do adjust the filter setting for the Y noise level then this adjustment is also taken into account. For example, if you set the Noise Levels: Y control to +15% then what is considered by the noise filter as the actual noise level is:

8.55 * (100% + 15%) => 9.83 units

With this adjustment, the image elements in the Y channel that are weaker than 9.83 units are considered noise and reduced, and elements that are stronger than 9.83 units are preserved.

Thus, with a *noise level - noise reduction amount* pair of settings you can adjust what should be considered noise in a component of the input image and how much of this noise should be reduced. You have access to six such pairs – three for channel components (Y, Cr, Cb) and three for spatial frequency components (High, Mid, Low) of the input image.

Because the noise level controls are relative to the device noise profile, the default filter settings usually produce good results when the noise profile is accurate[2]. The noise level defaults are 0%, which means the noise levels are completely determined by the noise profile. When you adjust the level controls, the noise level estimations are raised or lowered accordingly. A noise level control can be in the range from –100%, which means no image elements are considered noise, and therefore, no noise reduction is applied in the corresponding image component; to +150%, which means noise reduction is applied to the image elements that are weaker than 250% of the noise profile's noise level.

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 noise in all but the luminance (Y) channel where only 60% of detected noise is removed.

Decreasing the noise reduction amounts can have a positive effect if the input image contains some natural noise. For example, when you filter images of asphalt, sand, or anything else that contains fine natural noise-like features, it may be helpful to reduce amounts down to 30-50%. Our experience shows that these values generally provide a good balance between preserving image details and noise removal.

[1] All measured noise levels are shown in the Profile Viewer (use the menu Profile > Profile Viewer to open it).

[2] Use the Quality and Match indicators in the Device Noise Profile box to estimate the accuracy of the profile. The Quality indicator shows how accurate and complete is the noise profile itself. The Match indicator shows how closely this profile corresponds to the input image. Both indicators have to show high values for the noise reduction to be accurate.

Adjust noise reduction amounts[1]

- Use the Noise Reduction Amounts: High, Mid, Low; Y, Cr, Cb sliders.

You can vary the noise reduction amount for each frequency and channel component of the input image. The higher a certain 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 unnaturally looking (over-smooth, plastic-like) results. Too low amounts may be not enough to sufficiently remove the objectionable part of the noise. You have 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.

> 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.

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

Adjust additional filter settings (optional)

- If the input image contains strong low frequency noise (for example, a very coarse-grained color splotches) then you may want to switch on the very low frequency filter (check the Very low freq checkbox in the Filter Settings box).
- Check the Smooth edges checkbox to make edges and lines look smoother.
- Check the High quality checkbox to enable the higher-quality noise reduction filter. This will slightly slow down processing but will deliver the most accurate results in return.
- Check the High resolution checkbox to enable the higher-resolution noise filter. This may be useful when processing images with very fine details that should be better preserved by the filter.

Use preview

As you make changes to the noise filter parameters, check preview on different parts of the image to get a better feeling for the results of noise reduction.

If the noise filtration looks too aggressive try to decrease the noise reduction amounts for appropriate channels or frequency components. If the noise filtration is not sufficient then increase the amounts.

Adjust noise levels (only when necessary)

Usually it is not necessary to change the noise levels if the noise profile is accurate. You only have to adjust the noise levels if you see that some noise elements are not reduced even if you set the noise reduction amounts to 100%. Such residual noise elements are usually caused by inaccurate noise profile (providing inaccurate estimations of actual noise levels). This may be compensated by adjusting (increasing) the noise levels in the filter settings.

- Use the Noise Levels: High, Mid, Low; Y, Cr, Cb sliders.

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

The higher a certain noise level, the more image elements in the corresponding image component are considered noise. Be careful, setting a noise level setting too high can lead to removal of important image details. Setting a noise level setting too low can lead to incomplete filtration: residual noise and 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 color noise, it is recommended to increase the Cr and Cb noise

[1] We recommend disabling the sharpening filter when adjusting the noise filter. To disable the sharpening filter, uncheck all channels in the Sharpening box.

levels to +30%. In some cases, it may be useful to increase these noise levels up to +100%.

If adjusting noise levels still does not help and some noise elements remain visible in the preview and output image, probably the device noise profile is not good at all. Return to Stage II, page 9, and rebuild the profile from scratch.

Adjusting sharpening settings in Advanced mode (optional)

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

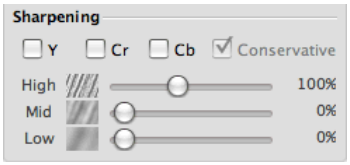
The default values of the sharpening settings should produce satisfactory results (when sharpening is enabled for any of the channel components) but you are encouraged to vary the settings to find values that produce the desired level of sharpness. Zero sharpening amounts will not sharpen the image at 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. As with any other sharpening method, you have to balance the amounts to avoid over-sharpening.

Use the preview when adjusting the sharpening settings.

Select color channels to be sharpened

- Use checkboxes in the Sharpening section.

  Usually you only want to sharpen the luminance channel – Y.



Select sharpening mode

- Check the Conservative checkbox to enable more accurate sharpening, which produces much less halo effect around sharpened image details.

Adjust sharpening amounts

- Use the High, Mid and Low sliders in the Sharpening section.

  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).

As soon as you are happy with the preview results regarding both noise reduction and sharpening, proceed to save the filter settings into a preset (see the subsection below), or directly to the Stage IV. Apply filter, page 17.

5.3.5. Save filter settings into a preset (optional)

To save the current filter settings into a preset

- Click  (the Save filter settings as preset... button) in the Filter Settings box.

  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 re-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 precisely reproduce the filtration results.

To load a previously saved filter preset

- Click  (the Load filter preset... button) in the Filter Settings box. In the Load Filter Preset dialog box, specify the name of the filter preset to be opened.

  or

➡ Click  (the drop-down button) in the Filter Settings box to open the popup menu with all available presets and then select one of them.

There are several pre-written filter presets in your home folder[1]:
/Users/<username>/Documents/Neat Image for Aperture/Presets/

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).

5.4. Stage IV. Apply filter

To apply filter to the image

➡ Click 

(the Apply button in the bottom of the plug-in window).

The plug-in window will be closed and filtration will start. Processing may take some time (from seconds to minutes, depending on the speed of your computer's processor and size of the image).

Neat Image is a processor-intensive plug-in, so the processor's speed is the most important. On Core Duo 2GHz, processing a 10-megapixel image takes about 5 seconds (Neat Image v7 plug-in for Aperture). On a computer of typical configuration, the processing time is linear with respect to image size (in megapixels).

After that the filtered output image is displayed in Aperture along with the original and you can compare them.

After filtration, the Neat Image plug-in will automatically save the current settings (the device noise profile and filter preset), which will enable applying the same filtration to the next image without re-doing the stages II-III.

[1] You can check and adjust the location of that folder using the menu Tools > Preferences > Folders > Preset folder.

6. Batch processing

The Neat Image plug-in for Aperture can be used to process several images at a time. This can be done in a regular Aperture style:

➡ Select several images in Aperture and invoke Neat Image to process them:
select the Images > Edit With > Neat Image... menu item in Aperture.

Unlike the case of a single image, the plug-in will open its Batch window to set up and execute the batch with all selected images:

To configure the batch you have to specify how Neat Image should process all selected images: how should noise profile(s) be prepared for these images and which filter preset should be used.

➡ To specify how Neat Image should prepare noise profile(s) for the images select one of the following options in the Batch Settings: Device Noise Profile box:

- Use Recent Profile
  the plug-in will use the last used noise profile for all images; you may want to process one image manually (before running a batch) and then immediately run a batch that will use that last used profile;

- Auto Profile
  the plug-in will use Auto Profile to build new noise profiles using the input images;

- Auto Match
  the plug-in will search and load the best matching profiles from the profile set on the disk;[1]

[1] To let this option work, several noise profiles should be available to the Auto Match function: the profiles should be stored in the folder ***/Users/<username>/Documents/Neat Image for Aperture/Profiles/*** (and its subfolders). These can be profiles from the Neat Image online profile library or from other sources. You can also use profiles built by you. The input images as well as profiles in the profile set should contain the EXIF information to make matching possible.

- Smart Profile
  the plug-in will use both Auto Profile and Auto Match to prepare two noise profiles and then will select the better of two resulting profiles; this provides higher overall quality at expense of slightly longer processing time; to be fully efficient, this option also needs a pre-built set of noise profiles (for Auto Match to work); you can configure the behavior of the Smart Profile function using the settings link;

- Use Specified Profile
  the plug-in will load the specified profile from the disk for all images;

- Auto Fine-Tune
  the plug-in will additionally apply Auto Fine-Tune to adapt the loaded profile(s) to the input images; this option is available when you select Use Recent Profile, Auto Match or Use Specified Profile.

➡ To specify which filter preset should be used by Neat Image to process the batched images please select one of the following options in the Batch Settings: Filter Preset box:

- Use Recent Preset
  the plug-in will use the last used filter settings for all images; you may want to process one image manually (before running a batch) and then immediately run a batch with that will use that last used preset;

- Use Specified Preset
  the plug-in will load the specified preset from the disk for all images.

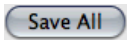
As soon as the above settings are adjusted, you can start the batch processing:

➡ Click 

(the Start button) in the Batch Processing box. Neat Image Batch will immediately start processing one image after another and will log the results in the Batch Log box.

Any errors (for example, profile matching errors) will also be logged so that you could distinguish correctly processed images from those that were not processed after the batch is completed. You can select to additionally display the log after the batch is completed (the Show Batch Log File after Returning to Aperture option), to help you check which images need your attention in Aperture after batch processing.

Once the processing is completed, you can either accept all results of the batch processing or cancel the whole batch.

➡ Click 

(the Save All button) to accept all results of the batch processing and return them to Aperture. Please note that **all** batch images will be returned to Aperture, even those that were not processed by Neat Image due to any errors. Not processed images will appear in Aperture as copies of their originals. Correctly processed images will appear as modified versions of their originals. You may have to manually remove duplicate images in Aperture.

or

➡ Click the Cancel button to cancel the whole batch and do not return any processing results to Aperture. This may be useful if you want to correct some of the batch settings and start it again.

7. Device noise profiles

A *device noise profile* (or *noise profile*, or simply *profile*) describes the properties of noise produced by an imaging device (e.g., digital camera, scanner, etc.) working in a certain mode. Several noise profiles corresponding to different modes of a device constitute a *profile set*. Neat Image can use profiles from such a set to process images produced in any of the modes covered by the set.

You can find some pre-built noise profiles or build your own profiles for your camera or scanner. Learn how to find, build and use device noise profiles in Neat Image in the subsections 7.1-7.4 below.

7.1. Getting ready-made noise profiles

You can find some free profile sets for different cameras and scanners in:

- Profiles section of the Neat Image web page:
  http://www.neatimage.com/mac/aperture/profiles.html
- Device noise profiles section of the Neat Image community forum:
  http://www.neatimage.net/forum/viewforum.php?f=5
- other digital imaging forums and web pages from users of Neat Image.

To use a profile set from one of these sources, download the archive with profiles and unzip all profiles to the following folder[1] and/or its sub-folder(s):
/Users/<username>/Documents/Neat Image for Aperture/Profiles/

After that you can load individual profiles from this set in Neat Image to process images produced in device modes covered by this profile set.

Please be aware that using ready-made profiles built by other people may produce less than optimal results with your images because of possible slight differences in noise properties of cameras (scanners) as well as due to different imaging processing workflows used. Therefore, we advise to use ready-made noise profiles built by others only as a starting point to learn how to use Neat Image. To achieve the best results consider building your own profiles as explained in the subsections below.

7.2. Building profile for a device mode (standard profiling procedure)

In this subsection, you will find out how to build a single noise profile for an image produced in a certain shooting or scanning mode (such a profile can also be called “a profile for a certain mode of the device”).

Building a new noise profile generally consists of three stages:

Stage I. Building a profile;
Stage II. Documenting the profile;
Stage III. Saving the profile.

The Stage I, building a profile, can be done with the use of a *regular image* (for example, the image that you want to denoise or any other regular image) or with the use of the *Calibration Target*. These two cases are described as two alternative versions of the Stage I:

Stage I. Case of building a profile using a regular image
Stage I. Case of building a profile using the Calibration Target

You may want to follow the case of building a noise profile using a regular image if you only need a single-use profile to process selected input image. In this case, the input image (or an alternative regular image from the same series; it should be produced by the same device working in the same mode) should contain enough uniform featureless areas for noise analysis.

A uniform area (with minor variation in all channels of the image) may be overcast sky, clear sky (without clouds and birds), or any other part of the image, where there are no visually perceptible details (except the noise). Neat Image needs uniform featureless areas of around 128x128 pixels (minimum is

[1] You can check and adjust the location of that folder in menu: Tools > Preferences > Folders > Profile folder.

32x32 pixels). You can see some examples of uniform featureless image areas in the Examples section, page 31.

If the input image does not contain such areas and you have no suitable alternative regular image that contains such areas, you can prepare a special test image and follow the case of building a noise profile using the Calibration Target. That is also recommended if you want to prepare a reusable noise profile for a certain mode of your camera or scanner.

7.2.1. Stage I. Case of building a profile using a regular image

To build a noise profile using a regular image you have to take 2 steps:

Step 1. Preparing a regular image for noise analysis;
Step 2. Analyzing the image noise.

Step 1. Preparing a regular image for noise analysis

To analyze noise in a regular image, you can use the input image or an alternative regular image that was produced by the same camera (or scanner) in the same or similar shooting (scanning) mode. Using the input image usually produces most accurate noise profile that perfectly matches the noise properties of this input image. However, if there are not enough flat featureless areas in the input image then you have to use an alternative regular image.

Case of using the input image

In this case, simply open the input image in the plug-in.

To build a profile, work with this image in the step 2 below.

Case of using an alternative image

If there is no large enough uniform featureless areas in the input image, use an alternative image. The alternative image is supposed to be produced by the same device working in the same or similar mode. This can be just another image from the same series; the image should contain at least one large enough uniform featureless area suitable for analysis.

Find and select an alternative image in Aperture and then open this image in Neat Image plug-in for analysis below.

Step 2. Analyzing image noise (profiling)

Analyzing noise is the main part of building a noise profile for an imaging device working in a certain mode. The current version of Neat Image plug-in for Aperture offers three ways of conducting the noise analysis (profiling): automatic, semi-automatic and manual one. Using automatic profiling is easier and therefore recommended for beginners. In difficult cases (for example if Neat Image cannot automatically find a uniform featureless area in analyzed image), automatic profiling may not work well or may produce less than perfect results. You can always override automatics and use semi-automatic or manual[1] profiling.

➡ Make sure you use the Device Noise Profile tab:

Case of automatic profiling

To analyze noise properties, Neat Image uses uniform image areas that contain noise but no visible or important details. With automatic profiling, Neat Image tries to find one such area automatically and then uses this area to analyze image noise.

➡ Click 

(the Auto Profile button).

Neat Image will try to automatically find image areas suitable for analysis and will analyze them, first the primary selected area and then the rest of the image. If the primary selected area shown in

[1] Manual profiling is available in Advanced mode only.

viewer indeed contains no visible details then the resulting noise profile will be accurate.

To be sure, check the profile Quality indicator in the bottom of the Device Noise Profile box. A profile built using a uniform and featureless image area will show a high value in this indicator.

If the profile quality is high (for example, higher than 75%) then you can be sure that the noise profile is accurate. Please proceed to Stage II. Documenting noise profile, page 25.

If the automatically-selected image area does contain visible details or the profile quality is not very high then try to use the semi-automatic profiling instead (see below).

Case of semi-automatic profiling

1) Find a uniform featureless image area

➡ Manually find and select an image area that contains no visible details.[1]

The area should be at least 32x32 pixels large. That is the minimum size; the recommended size is 128x128 pixels or more (you can resize the selection frame).

Scroll, pan, zoom the image to find a uniform image area and then select this area for analysis.

If you cannot find a large enough uniform area in the input image, consider using an alternative regular image or use the Calibration Target as explained in the next section (Stage I. Case of building a profile using the Calibration Target, page 23).

2) Analyze selected image area

➡ Click 

(the Auto Profile button).

Neat Image will automatically analyze the selected image area and the rest of the image.

At this point the profile is ready. Please proceed to Stage II. Documenting noise profile, page 25.

Case of manual profiling (Advanced Mode only[2])

1) Find a uniform featureless area

➡ Manually find and select an area that contains no visible details.

The area should be at least 32x32 pixels large. This is the minimum size; the recommended size is 128x128 pixels or more (you can resize the selection frame).

2) Analyze selected area

➡ Click 

(the Auto Profile button).

Neat Image will automatically analyze the selected area and build a noise profile.

3) Additionally manually fine-tune the profile

Fine-tuning uses additional flat featureless frame areas to make the noise profile more accurate. You have to manually select and analyze several such areas one after another.

1) Find and select a uniform featureless area

➡ Scroll, pan, zoom the frame in the viewer in the Device Noise Profile tab to find a new uniform area.

The size of an area may be from 16x16 to 256x256 pixels. Using larger areas makes fine-tuning more accurate. The selection edges will change their thickness according to the selection size.

[1] You can see some examples of uniform featureless image areas in the section Examples, page 31.

[2] You can enable Advanced mode using the Tools > Advanced Mode menu item.

2) Analyze selected area with Manual Fine-Tune

➡ Click  (the Manual Fine-Tune button) or use the Profile > Fine-Tune Using Selected Area menu item.

The analysis results will be shown in the noise profile equalizer: the graphs of the equalizer will change some of the values (see the picture on the right). You can switch from one channel to another in the equalizer to better see a specific channel's graph, or select to show them all together.

The goal of manual fine-tuning is to fill the equalizer with measured values (shown as graph-color knots) in all points of the graphs. The previous steps (specifically, the Auto Profile function) may have already filled some of the values. Manual fine-tuning can further improve the analysis by filling out the still missing or interpolated values (shown as yellow knots) and/or making some of already measured values more precise.

3) Repeat 1-2 above with other uniform areas of different brightness

To make a device noise profile more accurate, fine-tune it using several uniform image areas. Select areas of different brightness for best results. Try to choose and analyze uniform areas to cover all or most elements of the equalizer in all its color channels. The more elements of profile are analyzed, the higher is the quality of the profile.

4) Complete fine-tuning using Auto Complete

➡ Click  (the Auto Complete button) or select the Profile > Auto Complete menu item to automatically complete the fine-tuning by adjusting the unmeasured values using interpolation based on the measured data.

At this point the profile is ready. Proceed to Stage II. Documenting noise profile, page 25.

7.2.2. Stage I. Case of building a profile using the Calibration Target

The Calibration Target is specially designed to enable easy profiling of various imaging devices. It can be used to build a single profile for a certain device mode or a set of profiles for different modes.

Follow the steps below to prepare a single profile using the Calibration Target.

Step 1. Preparing the Calibration Target

To use the Calibration Target, either use the menu Tools > Calibration Target and then click the Display target... button, or download the image of the Target from the Neat Image web page:
http://www.neatimage.com/mac/aperture/testtarget.html

There are two ways of using the Calibration Target: you can open it on the screen and take a shot (with a digital or film camera, depending on your workflow) or you can print it out and shoot the hardcopy.

Shooting the Calibration Target off the screen is faster, especially with a digital camera. However, be careful when shooting it off the screen of a CRT monitor because you may occasionally capture scan bands. These bands may spoil a part of the shot. If you cannot avoid these bands, prepare a printed version of the Calibration Target or shot it off an LCD monitor, which does not produce this effect. Also, try to avoid glares when using a monitor with a glass or glossy screen.

Case of shooting the Calibration Target off the screen

➡ Open the Calibration Target image on the screen (menu Tools > Calibration Target and then click the Display target... button). Then use the displayed Calibration Target in the Step 2 below.

Case of shooting the printed Calibration Target

➡ Open the Calibration Target image in an image editor and print out the image on a sheet of white

matte paper; make the image fill the whole page. Then use the printed target in the Step 2 below.

Step 2. Preparing a shot or scan of the Calibration Target

Case of digital camera

Use the displayed or printed Calibration Target to prepare a test shot for building a device noise profile for your camera:

1. Set the camera to a certain shooting mode (ISO level, etc.) you want to build a profile for;
2. **Important**: set the focusing system on infinity or in macro mode to get a slightly-out-of-focus image of the target;
3. Make sure the Calibration Target fills the whole frame and make a shot;
4. Open the resulting shot in Neat Image plug-in.

Case of flatbed scanner

Use the printed Calibration Target to prepare a test scan for building a device noise profile for your flatbed scanner:

1. Set the scanner to a certain scanning mode (resolution, light level, etc.) you want to build a profile for;
2. If possible set the scanner slightly out of focus (an out of focus scan is preferred for profiling); a possible way to achieve this is to raise the page over the scanner glass a bit;
3. Scan the printed Calibration Target;
4. Open the resulting scan in Neat Image plug-in.

Case of slide scanner

Use the displayed or printed Calibration Target to prepare a test scan for building a device noise profile for your film scanner:

1. Set the camera to a certain shooting mode (film type, exposure, etc.) you want to build a profile for;
2. **Important**: set the focusing system on infinity or in macro mode to get a slightly-out-of-focus image of the target;
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 certain scanning mode (resolution, light level, etc.) that you want to build a profile for and scan the slide;
6. Open the resulting scan in Neat Image plug-in.

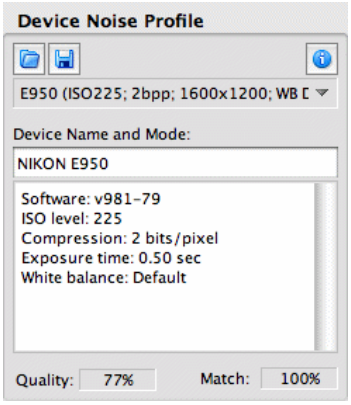
Step 3. Analyzing image noise

Having the shot or scan of the Calibration Target, Neat Image can build a noise profile automatically:

➡ Use the Profile > Auto Profile with Calibration Target menu item.

After the analysis is completed, proceed to the Stage II below.

7.2.3. Stage II. Documenting noise profile



At this point of building the noise profile for your camera or scanner, the noise analysis is done and all important noise characteristics are gathered in the profile. You may still want to manually document the profile if Neat Image has not done this automatically. With most images from digital cameras, Neat Image is able to automatically extract the crucial information about the camera mode from the EXIF data fields of the analyzed image and put this information to the noise profile (you can see that in the Device Name and Mode fields in the Device Noise Profile box.

If Neat Image has not automatically placed any information to the Device Name and Mode fields after noise analysis, you can fill out these fields manually.

➡ Use the Device Name and Mode fields in the Device Noise Profile box. Here, you can specify the model of the image acquisition device and describe the device mode, which can be something like the data in the picture on the right.

About the Device name and mode notes

It is highly recommended to specify these details to keep record of devices, device modes, and corresponding device noise profiles that you use.

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 keep track of them when you do manual profile matching, i.e., when you manually select a suitable profile to process an image.

Automatic profile matching available in Neat Image uses the EXIF information from the image files and profiles, not the Device Name and Mode fields, so filling out these fields may not be necessary for automatic profile matching. However, filling out these fields is highly advisable both for the clarity purposes and for the cases of EXIF-less input images (in such cases, you have to manually select a suitable profile based on the Device Name and Mode fields).

See the Preparing profile set for different device modes section below to learn more about camera and scanner parameters that may need to be documented in the Device Name and Mode fields.

7.2.4. Stage III. Saving the noise profile

➡ Use  (the Save Device Noise Profile As... button) in the Device Noise Profile box.

In the Save Device Noise Profile As... dialog box, select the file name to save the profile to. The default name is based on the device name and device mode when these are available from the EXIF data fields of the analyzed image. If the EXIF data are not available then the default profile name is based on the name of analyzed image file. Use the suggested default or change the name of the file to store the device noise profile. Device noise profiles are saved in ***.dnp*** files.

File naming considerations

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

See Preparing profile set for different device modes: Stage III. Structuring profile set, page 28, for additional information.

A saved noise profile includes the complete noise analysis. Therefore, by re-opening 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.

7.3. Preparing profile set for different device modes

Usually an imaging device can work in several different modes. Therefore, there should be several device noise profiles, corresponding to each mode to enable accurate processing of arbitrary images produced by this device. If a 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.

This subsection explains how you can prepare a reusable set of profiles for a range of modes of an imaging device.

As an owner of a certain imaging device you are in perfect position to prepare a profile set because you have direct access to the device hardware. Moreover, using your own set of profiles makes noise reduction more accurate because such profiles better reflect the specifics of the camera or scanner as well as the workflow you use.

When building a set of profiles, please follow the guidelines below that will help you structure the profile set in such a way as to make consequent reuse of the set easy for you[1].

7.3.1. Stage I. Selecting device parameters for profile set

To build a set of profiles for particular camera or scanner, you have to identify different device parameters that affect the noise characteristics and that you will take into account during profiling. There may be many device parameters but not all of them influence image noise and those that do differ by the strength of their influence. Naturally, you are only interested in those parameters that appreciably affect noise. Different noise profiles should be prepared for different values of important parameters, so you have to identify these parameters in the first place.

In the tables below, those parameters are described that appreciably affect noise characteristics (from the most to the less important ones) for digital cameras and scanners:

Digital camera parameters in the order of decreasing importance		
ISO rate	50, 100, 200, 400, etc.; depends on a camera	Higher ISO rate produces more noise.
Camera noise reduction	High, Normal, Low, etc.; depends on a camera	In-camera noise reduction can reduce levels of noise in photos (usually at expense of some details).
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 for the best results.
Resolution	1:1 (original resolution, like 4288x2848), 1:2 (downsized in camera, e.g., 2144x1424), 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.
Exposure	1/16s, 1.0s, 16s;	Longer exposures produce more hot-pixel noise; also, some cameras switch on the automatic noise reduction when exposure is longer than a certain threshold – this may affect the noise levels.

[1] ..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 model. You can submit a set of profiles to the Neat Image team to publish the set in the profile library in www.neatimage.com (see Contacts, page 40) or just share them with other people directly.

Scanner / camera parameters in the order of decreasing importance		
Film type	For example, Kodak Tmax 400, Kodak Tri-X Professional 320, Fuji Superia 200, etc.	Every film type produces specific grain pattern, which depend on film materials. Strength of the grain depends on ASA/ISO rate of the film.
Scanning resolution	For example, 300 dpi, 3200 dpi, 4000 dpi, etc.	Higher scanner resolution emphasized film grain and makes it more evident in the scanner image.
Number of scan passes	Single pass, 2x pass, 4x pass, etc.	Multi-pass scanning can potentially produce less grainy images.

If two images were captured in the same or similar conditions (most of the above device mode parameters 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 images with good results. If the shooting or scanning conditions were different then the noise in two images could be significantly different. In this case, cross-use of one noise profile is not recommended. Instead, two different profiles should be built and used to filter these two images.

Based on these considerations and tables above, identify the device mode parameters of your camera or scanner that (1) are important from the noise standpoint and (2) are changed in your imaging tasks. For example, if you never change the sharpness adjustment of your digital camera then there is no need to build profiles for different values of the sharpness adjustment parameter. On the other hand, if you do shoot with different ISO rates then you have to build profiles for every ISO rate you use. Some parameters are less important (for example, the White Balance or Exposure) and you may simply choose to ignore the difference in noise characteristics caused by such device mode parameters.

Identify and make a list of the device mode parameters that are important for your needs. For example, you could include the ISO rate: ISO 100, 200, 400; and JPEG compression level: HQ, SHQ. Then it is straightforward to write down all combinations of the selected parameters:

JPEG HQ, ISO 100
JPEG HQ, ISO 200
JPEG HQ, ISO 400
JPEG SHQ, ISO 100
JPEG SHQ, ISO 200
JPEG SHQ, ISO 400

Now you have to prepare an individual profile for each combination from this list. Please proceed to the Stage II to build profiles for all combinations.

7.3.2. Stage II. Building individual profiles

To build individual profiles for the profile set, you can either use the standard profiling procedure described earlier, or employ a special Neat Image tool – the Batch Profiler.

Using standard profiling procedure

To build individual profiles using the standard profiling procedure, follow the guidelines of the Building profile for a device mode section, page 20. Using those guidelines, build a new profile for every combination of the device mode parameters included in your list as described in the Stage I above. The resulting set of noise profiles (several ***.dnp*** files on the disk) can be further structured as explained in the Stage III below.

Using Batch Profiler

The Batch Profiler is a dedicated tool that can automatically build several noise profiles using shots or scans of the Calibration Target (please note that the Batch Profiler is **not** for regular images). To use this tool, you must prepare several shots (scans) and then analyze them all at once using the Batch Profiler.

1. Preparing set of images of the Calibration Target

To prepare shot or scan of the Calibration Target for every combination of device mode parameters, please follow the two initial steps of Stage I. Case of building a profile using the Calibration Target:

Step 1. Preparing the Calibration Target, see page 23.
Step 2. Preparing a shot or scan of the Calibration Target, see page 24.

Do the Step 2 for every combination of device parameters in your list. Then place all resulting image files (***.jpg, *.tiff***) to a new folder (and subfolders if necessary) on the hard drive, for example:
/Users/<username>/Target Images/

2. Preparing profiles

To prepare profiles using the images of the Calibration Target:

1. Select the Tools > Batch Profiler... menu item to open the Batch Profiler window.

2. In the Batch Profiler window, specify the folder with images of the Calibration Target and the folder where the Batch Profiler should save prepared device noise profiles.

3. Click the Start button to initiate profiling process.
   When profiling is finished, new noise profiles are saved in the selected target folder.

4. Click the Close button to close the Batch Profiler window.

As the result, you have a set of noise profiles (several ****.dnp*** files on the hard drive) that can be further structured as explained in the Stage III below.

7.3.3. Stage III. Structuring profile set

In the Stage II, you have prepared a set of profiles on the disk. You have assigned names to these profiles that reflect the device modes they correspond to.

For example, profiles for Olympus C5050Z could be named like the following:

🗁 **Olympus C5050Z** C5050Z (ISO100; JPEG HQ; SharpNormal; 2560x1696).dnp C5050Z (ISO100; JPEG HQ; SharpNormal; 2560x1920).dnp C5050Z (ISO100; JPEG SHQ; SharpNormal; 2560x1696).dnp C5050Z (ISO100; JPEG SHQ; SharpNormal; 2560x1920).dnp C5050Z (ISO200; JPEG HQ; SharpNormal; 2560x1696).dnp C5050Z (ISO200; JPEG HQ; SharpNormal; 2560x1920).dnp C5050Z (ISO200; JPEG SHQ; SharpNormal; 2560x1696).dnp C5050Z (ISO200; JPEG SHQ; SharpNormal; 2560x1920).dnp C5050Z (ISO400; JPEG HQ; SharpNormal; 2560x1696).dnp C5050Z (ISO400; JPEG HQ; SharpNormal; 2560x1920).dnp C5050Z (ISO400; JPEG SHQ; SharpNormal; 2560x1696).dnp C5050Z (ISO400; JPEG SHQ; SharpNormal; 2560x1920).dnp C5050Z (ISO100; TIFF; SharpNormal; 2288x1712).dnp C5050Z (ISO100; TIFF; SharpNormal; 2560x1696).dnp C5050Z (ISO100; TIFF; SharpNormal; 2560x1920).dnp C5050Z (ISO200; TIFF; SharpNormal; 2288x1712).dnp C5050Z (ISO200; TIFF; SharpNormal; 2560x1696).dnp C5050Z (ISO200; TIFF; SharpNormal; 2560x1920).dnp C5050Z (ISO400; TIFF; SharpNormal; 2288x1712).dnp C5050Z (ISO400; TIFF; SharpNormal; 2560x1696).dnp C5050Z (ISO400; TIFF; SharpNormal; 2560x1920).dnp	🗁 – disk folder **C5050Z** – camera name **ISO ###** – ISO rate of camera mode **JPEG SHQ / JPEG HQ / TIFF** – file format and compression level **Sharp#####** – sharpness adjustment **#### x ####** – image size

When the profiles are named like this, manual selection of a suitable profile is simple. You can check the device mode of the input image in Aperture or in Neat Image (using the info button in the bottom of the image viewer in the main plug-in window) and then select a noise profile for this device mode from the list of profiles.

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

🗁 **Olympus C5050Z** 🗁 **TIFF** 🗁 **2288x1712** ISO 100.dnp ISO 200.dnp ISO 400.dnp 🗁 **2560x1696** ISO 100.dnp ISO 200.dnp ISO 400.dnp 🗁 **2560x1920** ISO 100.dnp ISO 200.dnp ISO 400.dnp 🗁 **JPEG** 🗁 **HQ** 🗁 **2560x1696** ISO 100.dnp ISO 200.dnp ISO 400.dnp 🗁 **2560x1920** ISO 100.dnp ISO 200.dnp ISO 400.dnp 🗁 **SHQ** 🗁 **2560x1696** ISO 100.dnp ISO 200.dnp ISO 400.dnp 🗁 **2560x1920** ISO 100.dnp ISO 200.dnp ISO 400.dnp	🗁 – disk folder **Olympus C5050Z**, **JPEG / TIFF**, **#### x ####** - the names of disk subfolders containing device noise profiles for corresponding device modes; ISO ###.dnp - device noise profiles; Note that constant parameter (Sharpness adjustment) is not reflected in the folder structure. However, if there were profiles with different values of these parameters then additional subfolder should be added. Parameters that can be disregarded, such as exposure time, are not reflected in the folder structure too.

In this case, the folder tree stores device noise profiles in a structured way, which helps to select one profile from the set given the device mode of the input image.

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 selection of profiles, while automatic profile matching can handle both cases equally well.

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

7.3.4. Stage IV. Documenting profile set

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

- Author of the profile set and profiling date
- Device name, firmware version
- Device modes that have been profiled in this set
  - Device mode parameters that change within the profile set
  - Device mode parameters that are constant for all profiles in the set
- Post-processing applied (after receiving image from imaging device and before Neat Image)

An example of such a description is below:

> Olympus C5050Z noise profiles
> by John Smith, October 28, 2011
>
> A set of profiles for Olympus C5050Z TIFF and JPEG files. The profiles were built using shots of the Calibration Target for the following file formats and image sizes:
>
> TIFF: 2048x1536 / 2288x1712 / 2560x1696 / 2560x1920
>
> JPEG HQ / 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 would help you figure out any set of profiles you prepared as well as let other people understand your results if you decided to share your profiles.

7.4. Using noise profiles

When you have a set of profiles for your camera or scanner, you can directly use these profiles to process images in Neat Image. Usually there is only one profile that is most suitable to process a given input image. Therefore it is very important to select the right profile, which would provide the best match between profile and image. Profiles in a set usually correspond to different modes of the imaging device. To make a perfect match between a profile and image, the device mode of a profile should be the same or very close to the device mode used to capture the image.

There are two ways to select a device noise profile that matches the input image:

- To automatically select the most suitable profile from a pre-built set of profiles using Auto Match (see page 10 to learn how to use Auto Match);
- To manually select the most suitable profile from a pre-built set of profiles using their device mode comments.

When you select and open a profile in either way, Neat Image shows the degree of match between the profile and input image. This degree is shown by the Match indicator in the Device Noise Profile box. The match degree is calculated on the basis of the image and profile's metadata (the EXIF data fields). If the profile's device mode is exactly the same as device mode used to capture the image then the match is 100%. There is always 100% match between an image and profile built using this very image (Neat Image displays that using the note "(AP)" in the Match indicator). If the device modes of a profile and image are very close then the match degree is close to 100%. The more different the device modes of profile and image, the smaller the match degree. Use the match degree as an indication of match accuracy. If the match degree is low then it is likely that building a new profile (using the current input image or the Calibration Target shot in current device mode) would produce better noise reduction results.

Obviously it is preferable to build a new noise profile for each new input image (unless the image does not allow building a quality profile because it contains no large uniform areas for analysis), because such a profile would perfectly match the noise of that image. Nevertheless, any noise profile can, with some degree of accuracy, be used to process other images captured by the same device working in the same or similar mode. This is less accurate than building a profile for each image but saves time because building a new quality profile can take more time than re-using a pre-built one. This is especially important if one profile is re-used many times, for example to process a series of images produced in one device mode. Also, it may not always be possible to build an accurate profile using input image when it contains no flat featureless areas.

When using pre-built profiles, you may also want to pay attention to the Quality indicator in the Device Noise Profile box. A properly-built and fine-tuned profile will show a high value in this indicator. If the profile quality is high (for example, higher than 75%) then you can be sure that the profile is accurate.

Both Quality and Match indicators should usually show high values for the noise reduction of the current input image using the current noise profile to be accurate.

8. Preferences

There are several preferences that adjust the behavior of the Neat Image plug-in.

Use the Tools > Preferences... menu item to open the Preferences dialog box.

8.1. General preferences

Auto zoom to fit on image open

Check this option to make the image viewer automatically adjust zoom level to fit the image into the window.

Show hints over interface controls

This option switches on/off the hints. The hints are displayed when the mouse pointer is placed over any control in the Neat Image interface.

8.2. Defaults

Default Device Noise Profile

There are several possible ways to prepare a noise profile when you open the Neat Image plug-in to process one image:

- Do not prepare noise profile automatically
  If this variant is selected then no device noise profile is automatically prepared by Neat Image when you open the plug-in to process an image. You will have to manually prepare a profile (either build a new or load an existing profile) to process the image.

- Load last used profile
  If this variant is selected then Neat Image loads the profile that was used the last time. You still can manually override that by preparing another profile manually after the plug-in will open and show the input image.

- Auto Profile
  If this variant is selected then Neat Image automatically builds a new profile by analyzing the input image. The profile is build immediately after you open the plug-in.
  Using Auto Profile this way provides the most accurate noise analysis when the input image contains enough flat featureless areas for analysis.

- Auto Match
  If this variant is selected then Neat Image automatically finds the most matching profile. This is done immediately after you open the plug-in.
  Using matching provides shorter overall processing times when pre-built noise profiles are available and can be matched against the input image.

- Smart Profile (Auto Profile and Auto Match)
  If this variant is selected then Neat Image uses both Auto Profile and Auto Match to prepare two noise profiles and then selects the better of two resulting profiles. This provides higher overall quality at expense of slightly longer processing time. To be fully efficient, this option also needs a pre-built set of noise profiles (for Auto Match to work). You can configure the behavior of the Smart Profile function in the Smart Profile section of the Profiling tab.

- Use specified default profile
  If this variant is selected and a valid profile is specified then Neat Image automatically loads this profile when you open the plug-in to process an image.
  Useful when all input images were produced by the same device working in the same or similar device modes, so one fixed profile can be used to process them all. This variant is faster than Auto profile and Auto match too.

Auto fine-tune
If this option is checked then Neat Image additionally fine-tunes assigned noise profile by analyzing the input image.
This provides higher accuracy of resulting noise reduction but takes a bit more time for analysis.

Default Filter Preset

There are three ways to automatically prepare a filter preset when you open Neat Image plug-in to process an image:

- Use program's default settings
  If this variant is selected then no preset is automatically loaded by Neat Image when you open the plug-in to process an image. Instead, Neat Image uses the hardwired default filter parameters. You still can manually adjust the filter settings or load another filter preset.

- Load last used preset
  If this variant is selected then Neat Image loads the preset that was used the last time. You still can manually adjust the filter settings or load another filter preset.

- Use specified default preset
  If this variant is selected and a valid filter preset is specified then it is automatically loaded when you open the plug-in to process one image.
  This setting is useful when you want to apply the same filter settings to process many input images.

8.3. Profiling preferences

Save noise samples in profiles

Enable this option to make Neat Image save a noise sample from the analyzed image area into 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 noise sample).

Show warnings about selected image area

Enable this option to let Neat Image display warnings about selected image area during profiling. For example, Neat Image may warn you about clipping or non-uniformity detected in the selected area, thus helping you select a better area for profiling.

Smart Profile

Smart Profile is one of the possible ways to prepare a noise profile to process an input image. Smart Profile uses both Auto Profile and Auto Match (with Auto Fine-Tune) to prepare two candidate profiles and then selects the better of two profiles.

Use the settings in the Smart Profile box to configure the behavior of the Smart Profile function.

Automatically select the best profile

Use this option to let Neat Image automatically decide which noise profile to use.

Prefer profile prepared by Auto Profile

Let Neat Image preferably select the profile prepared by Auto Profile when it can find a good area for analysis in the input image. When the area is not very good then Neat Image will use the profile prepared by Auto Match with Auto Fine-Tune.

Prefer profile prepared by Auto Match and Auto Fine-Tune

Let Neat Image preferably select the profile prepared by Auto Match when it can find a matching profile among the pre-built noise profiles, even when Auto Profile provides a good profile as well.

8.4. Matching preferences

8.4.1. Profile Matching

Use profile matching preferences to adjust the way Neat Image should conduct matching of noise profiles to input image.

Look for noise profiles in the following folder:

Neat Image will look for matching noise profiles in the specified folder. If you have several sub-folders with profiles, select the topmost folder of all those subfolders to let Neat Image search in all of them.

By default, the folder used to store profiles (see the Folders > Profile folder setting in the same Preferences window) is used. You can use any other (sub-)folder for profile matching as well.

Matching parameters priorities

To automatically match profiles to the input image, Neat Image compares the device parameters of the input image and candidate profiles from the folder specified by the above option. Different parameters usually have to be matched with different priority. Using Matching parameters priorities controls, you can select the priorities of such parameters as Input device, ISO rate, Compression, Resolution, Sharpness, 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.

8.5. Performance preferences

The first group of settings in this tab selects the computing devices to be used for image processing. This group of settings is optional, it is shown only if at least one supported GPU (graphic processing unit) is available along with the regular CPU (central processing unit, or processor). This group includes the following items:

Use CPU only

This option makes Neat Image perform all image processing using only CPU.

Use GPU only

This option makes Neat Image perform all image processing using only GPU.

Use CPU and GPU

If you select this option then Neat Image will process images using both CPU and GPU.

Depending on individual performance of each computing device (CPU and GPU), each of the above options may be the most efficient. You can try different settings and measure the resulting speed using the Benchmark tool below.

CPU

Number of used cores

This option adjusts the number of CPU cores used by Neat Image for processing. The number of used cores can go up to the total number of cores in all CPUs in your computer (like 2 cores in Core Duo, 4 cores in Core Quad, 8 cores in a desktop version of i7 with enabled hyperthreading, etc.). If the computer includes two physical CPUs then the number of cores is correspondingly higher. Ideally, using all cores should provide the best overall performance. In some cases however, processing speed may be even higher if fewer cores are used (especially on CPUs with hyperthreading). For example, using fewer than all 8 virtual cores in i7 is in some cases faster, so you may want to test different values of this setting.

GPU

In this box, yon can specify which of the available computation-capable (CUDA-capable[1]) GPU devices should be used for image processing (in addition to CPU or instead of CPU). When you have one or more GPUs, you can allow Neat Image to use it and specify how much GPU memory may be used for Neat Image's image processing. When you also have other software using the GPU, you may want to reserve only a part of the GPU memory for Neat Image and leave the rest free for other purposes. In any case, you can try different values and see which setting gives the best results.

Benchmark

Use the Benchmark button to measure the image processing speed with the current settings specified in the CPU and GPU boxes.

Optimize

Use the Optimize... button to open a specialized dialog designed to measure image processing speeds achieved with different combinations of the CPU and GPU settings. It allows to automatically benchmark all possible combinations of settings and to identify the best combination. This is the easiest way to optimize the performance of Neat Image for specific CPU and GPU hardware.

8.6. Folders preferences

Profile folder

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. Neat Image will display all profiles (stored in all subfolders of the specified folder) in the popup menu in the Device noise profile panel of the plug-in window and in other parts of Neat Image.

By default, the Profile folder is located in your home folder:

/Users/<username>/Documents/Neat Image for Aperture/Profiles/

You can select another location to store and use your Neat Image profiles if you prefer.

Preset folder

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. Neat Image will display all presets (stored in all subfolders of the specified folder) in the popup menu in the Filter Settings panel of the plug-in window and in other parts of Neat Image.

By default, the Preset folder is located in your home folder:

/Users/<username>/Documents/Neat Image for Aperture/Presets/

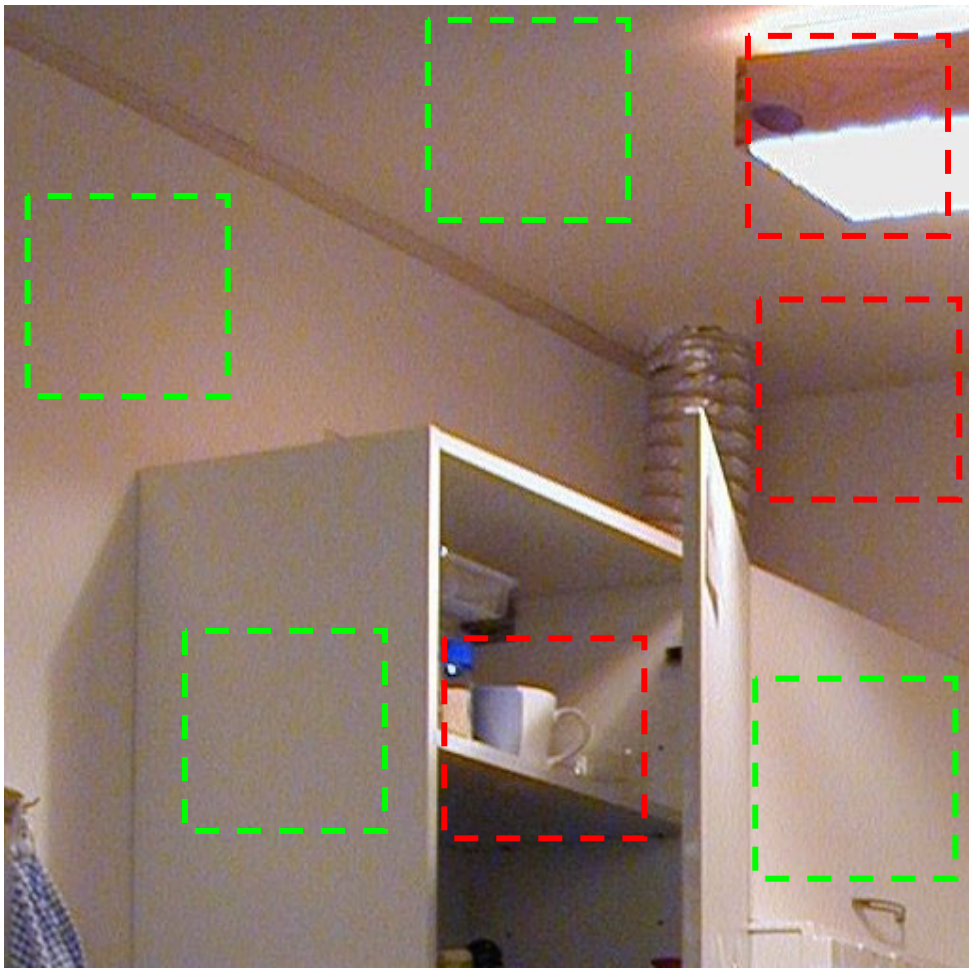
You can select another location to store and use your Neat Image presets if you prefer.

[1] A CUDA-capable GPU with a recent CUDA-driver (v4.0 or newer) is required. You can download the latest versions of the CUDA drivers from http://www.nvidia.com/

9. Examples

9.1. Images to build a noise profile

The image below contains examples of areas that are “good” and “bad” from the standpoint of profiling. Here, “good” image areas are highlighted in green, these should be at least 32x32 pixels large, preferably more than 128x128 pixels; “bad” ones are highlighted in red. If the input image you have does contain similar ‘good’ flat featureless noise-only areas as shown in the example then you can be sure that automatic profiling will produce an accurate noise profile. However if there are no such flat featureless areas in the input image, then automatic profiling will not work well with the image because building a profile using an area with details produces an inaccurate profile that will then lead to very inaccurate filtration. In such a case, you have to use either an alternative image with flat featureless areas or to use the Calibration Target to produce test images with flat featureless areas.



Additional comments regarding the “good” and “bad” areas in this example are available on the next page.

These image areas are good to build device noise profiles, as they contain no visible details:

– **GOOD**, because this area contains no important details

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

Examples of “bad” areas that contain visible details:

– **NOT RECOMMENDED**, because this area contains a detail: corner – junction of wall and ceiling

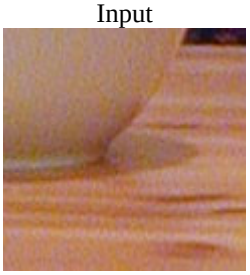
– **UNACCEPTABLE**, because this area contains many details

– **NOT RECOMMENDED**, because this area contains some details: clouds (this area is from another image)

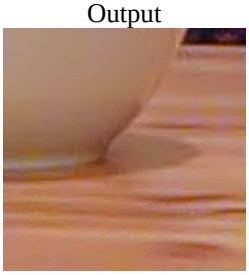
9.2. Filtration results

Here are some examples of Neat Image performance.

Input

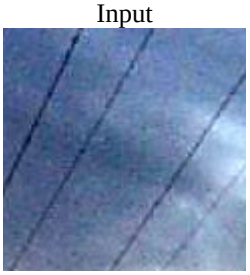


Output

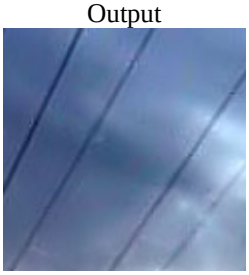


This is a small portion of a digital photo taken with a Nikon CoolPix 950 digital camera. The original image contains easily visible noise. In this case, the source of noise is the camera's image sensor (CCD) put in high ISO mode.

Input



Output



This image was also taken with a digital camera. Along with the strong 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 in the Neat Image web page:
http://www.neatimage.com/mac/aperture/examples.html

10. Questions and answers

10.1. General questions

Q What is the difference between Demo, Home and Pro plug-in?

A The Demo plug-in is limited by size of image area that can be processed: it only processes a part of the input image if the image is larger than 1024x1024 pixels. The Home plug-in is not limited by size of image area but only processes 8-bit images. The Pro plug-in additionally supports 16-bit images. Another difference is the number of images that can be processed in one batch. Please also see the Detailed feature map, page 39, for more details.

Q Should I uninstall Demo plug-in prior to installing Home / Pro plug-in?

A That is not necessary. The Home / Pro plug-in can be installed over the Demo plug-in.

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

A Usually that is not necessary. A newer version can be installed over the older one; it will replace the old version.

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

A Please use the online bug report form: http://www.neatimage.com/mac/aperture/brf.html
Please fill it out to let us know all the details necessary to reproduce the problem.

See more information about bugs in the Issues subsection, page 39, and about bug fixes in the ***WhatsNew.txt*** file supplied with the software. Also see the history section in the Neat Image web page for the most up to date information: http://www.neatimage.com/mac/aperture/history.html

10.2. Filtration-related questions

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

A Presence of many residual noise elements is usually a consequence of using a poorly built noise profile or a profile built for another device and/or device mode. Using a more accurate profile usually helps. 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.

Q Filtered image looks 'plastic'. Why?

A The reason is that too much filtration was applied. Let Neat Image keep some noise to produce natural-looking results. Adjust the noise reduction amounts; for example, reduce the noise reduction amount in the luminance channel to 50% or lower. Also, make sure the device noise profile does match the image processed. Using an incorrectly chosen or poorly built profile can either produce plastic-looking results or leave residual artifacts (see the previous question).

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

A Set the value of the luminance (Y) noise reduction amount to 0%. This will disable filtration in the luminance (brightness) image component.

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 noise profile is built and applied at the same stage of image processing. For example, do not use a device noise profile built with an unprocessed (with the color correction not yet applied) 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 profile that matches the device mode of the input image.
On the other hand, image sharpening applied to a noisy image makes it much noisier. It is best to apply Neat Image filtration before sharpening. However, the sharpening and noise filters of Neat Image can be used together because the sharpening is applied AFTER noise filtration.

If you are not sure, try to use Neat Image as close to the source of the input image as possible.

11. Tips and tricks

11.1. 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 used:

1. Open the input image in your image editor;
2. Copy the input image in a new layer on top of the original image;
3. Apply Neat Image noise reduction to the top layer;
4. Adjust the transparency of the top layer so that noisy areas look fine;
5. Select and delete the areas of the top layer where filtration is not necessary or excessive (you may want to use the eraser tool with adjustable transparency and shape).

12. Information

12.1. Issues and bugs

Please report any bugs or issues you encounter while working with Neat Image. Use the online bug report form: http://www.neatimage.com/mac/aperture/brf.html

Your feedback will greatly help us improve the software and provide you with newer and better versions of Neat Image.

12.2. Plans

The current version of Neat Image plug-in for Aperture is going to be further improved in the consequent updates. We continue to work on the core noise reduction algorithms to improve the quality and speed of noise reduction.

Please let us know if you have ideas that can make Neat Image better for you. Participate in discussions in the Neat Image community forum, express your opinion, make suggestions, and ask questions. The more people that ask for a feature the more likely that it will be implemented.

12.3. Detailed feature map

Features		**Edition**		
		Demo plug-in	Home plug-in	Pro plug-in
Images	8 bits/channel (24-bit RGB, 8-bit Grayscale)	+*	+	+
	16 bits/channel (48-bit RGB, 16-bit Grayscale)	–	–	+
Batch	Maximum size of one batch, images	10	100	unlimited
Files	File formats supported	all formats supported by Aperture		
Device noise profiles	Automatic and semi-automatic profiling	+		
	Automatic matching profiles to images	+		
Noise reduction	Channel-wise (Lum/Chr; Y, Cr, Cb)	+		
	Frequency-wise (High, Mid, Low, Very low)	+		
Smart sharpening	Channel-wise (Y, Cr, Cb)	+		
	Frequency-wise (High, Mid, Low)	+		
Filter presets (reusable filter settings)		+		

* - a limited part of the input image is processed if the image is larger than 1024x1024 pixels.

12.4. Contacts

We really appreciate your opinion of Neat Image. Please let us know what you think about the software. 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:

E-mails

info@neatimage.com	— for general inquiries
aperture@neatimage.com	— for inquiries regarding use of Neat Image plug-in for Aperture
sales@neatimage.com	— for inquiries regarding purchase of licenses for Neat Image

Community forum

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 versions of the software;
- questions about use of Neat Image;
- examples of Neat Image performance with comments and suggestions;
- feedback from Neat Image users: suggestions of new features and improvements;
- contacts and general comments.

Web page

http://www.neatimage.com/mac/aperture/index.html

12.5. Legal information

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Distribution

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

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

12.6. Registration

To become a registered user and to get a fully functional Neat Image Home or Pro plug-in for Aperture you have to purchase a license (a single- or multi-user license). This can be done through an online software shop in the Neat Image website. Please find the detailed information in the Purchase section of the web page: http://www.neatimage.com/mac/aperture/purchase.html

After you have purchased a Neat Image license, you receive an e-mail with detailed download and registration instructions. These instructions will help you download, install and register the Neat Image plug-in for Aperture.

By becoming a registered user of Neat Image plug-in for Aperture you will:

- Encourage the authors to further develop and improve the software;
- Get access to advanced functionality of Neat Image (see the Detailed feature map, page 39);
- Be able to use Neat Image for commercial and other purposes;
- Get free access to updates of the software with the same major version number (at least);
- Enjoy reduced upgrade prices for new major versions of Neat Image or will get a free upgrade;
- Receive the primary attention of Neat Image support group;
- Receive the primary attention of Neat Image development group (tell us what you want to see in the next version).

Message from the Neat Image team

By becoming a registered user you are helping us to further develop and improve the software.

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

12.7. Acknowledgments

Thank you to all the users who have contributed to Neat Image plug-in for Aperture by proposing improvements and new features.

Thanks to all the people who help us to find and fix bugs in Neat Image plug-in for Aperture.

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, ABSoft

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