Pattern Suppressor v2 – Readme

Fourier Transformation plugins and actions for Adobe Photoshop. Version 2.

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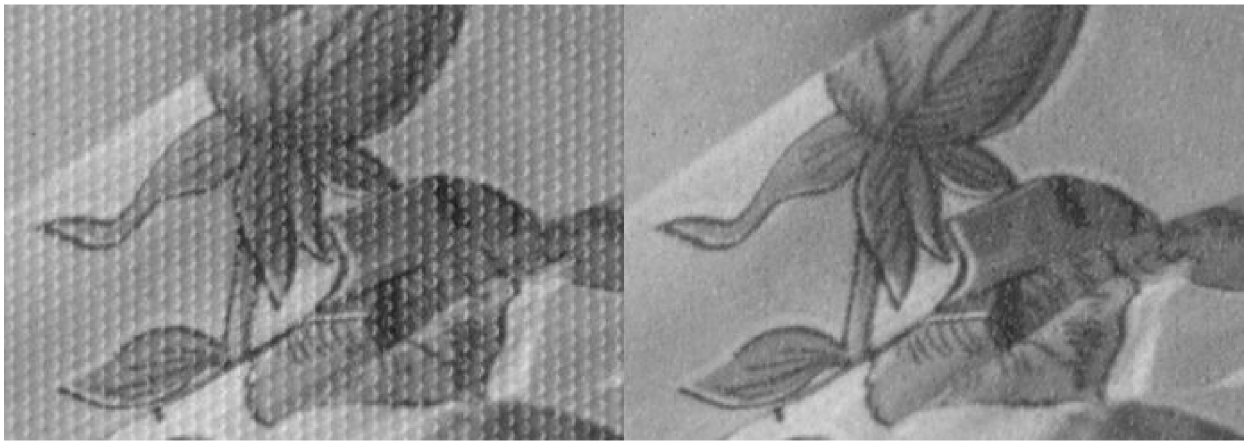
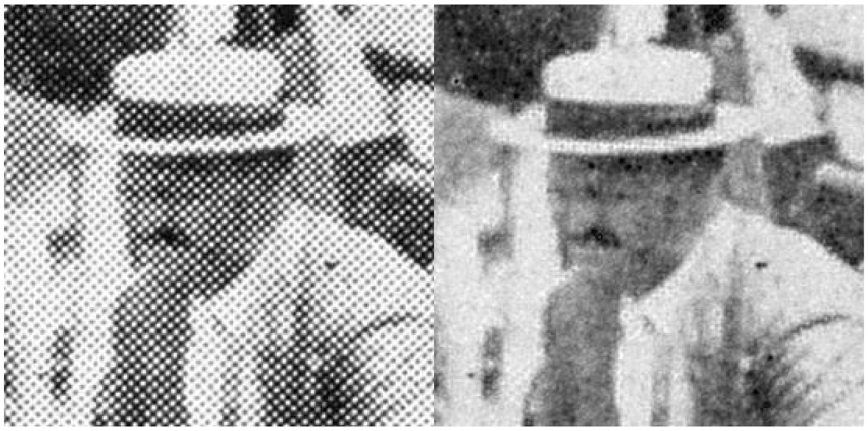
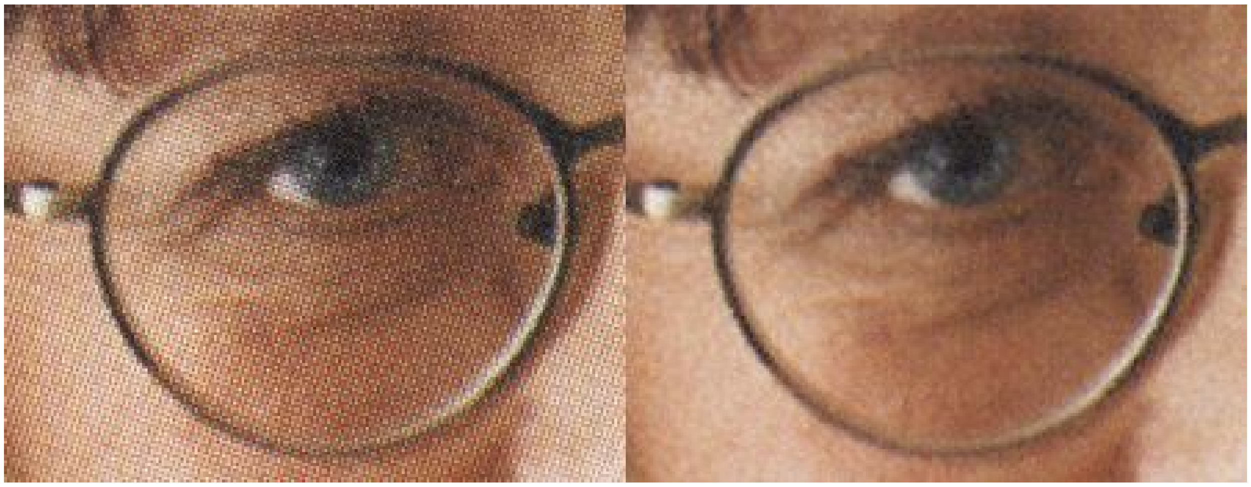
What is this?

This is a set of plugins and actions for Adobe Photoshop that will let you easily remove regular repeating patterns from images that cannot conveniently be removed by traditional means.

Example of results that can easily be achieved:







Files included

- `libfftwx64_3-3.dll` – FFTW library. Required by the plugins.
- `Ft2DS.8bf` – Plugin for doing a Fourier transformation (channels are averaged).
- `Ft2DH.8bf` – Plugin for doing a Fourier transformation (per channel).
- `Ft3DH.8bf` – Plugin for doing a Fourier transformation (in 3D space).
- `iFt2DS.8bf` – Plugin for doing the inverse of Ft2DS.
- `iFt2DH.8bf` – Plugin for doing the inverse of Ft2DH.
- `iFt3DH.8bf` – Plugin for doing the inverse of Ft3DH.
- `Pattern Suppressor v2.atn` – Photoshop Actions for doing pattern suppression.
- `Readme.pdf` – This file. Duh.

Requirements and compatibility

- Requires Adobe Photoshop (64-bit) for Windows.
- Tested on CS6-CC 2018 and Windows 10. But might work on more versions.
- Requires basic knowledge of how to use the Brush Tool, Layers and the Actions Panel.

Installation

1. Copy `libfftwx64_3-3.dll` to your Photoshop installation folder. By default this is `C:\Program Files\Adobe\Adobe Photoshop [version]\`
2. Copy the `8bf`-files to the Photoshop Plug-ins-folder. By default this is `C:\Program Files\Adobe\Adobe Photoshop [version]\Plug-ins\`
3. Restart Photoshop if it was running.
4. Double-click `Pattern Suppressor v2.atn` to install the actions.
   (You can also choose “Load Actions…” in your Actions Panel Menu).

The Plug-ins will be available under *Filter* > *RONC 2018* if you want to run them manually.
The action set will be shown in your Actions Panel (can be found under *Window* > *Actions*).

New in v2

- Major update of actions and new plugins.
- **Now has actions/plugins for processing color images.**
- Improved method for generating the suppression layer. It is more accurate, and subtracts the central “glow” to give much better results close to the central star.

How to use

We <u>highly</u> recommend using the actions for processing images to remove patterns versus using the Ft-plugins manually.
The actions perform several additional processing steps automatically to help you get better results (e.g. padding and nyquist filtering), and it should also save you a lot of time. It still allows manual input and tweaking if needed.

A video tutorial and demonstration can be found here: **https://youtu.be/FDM4lEw65j0**

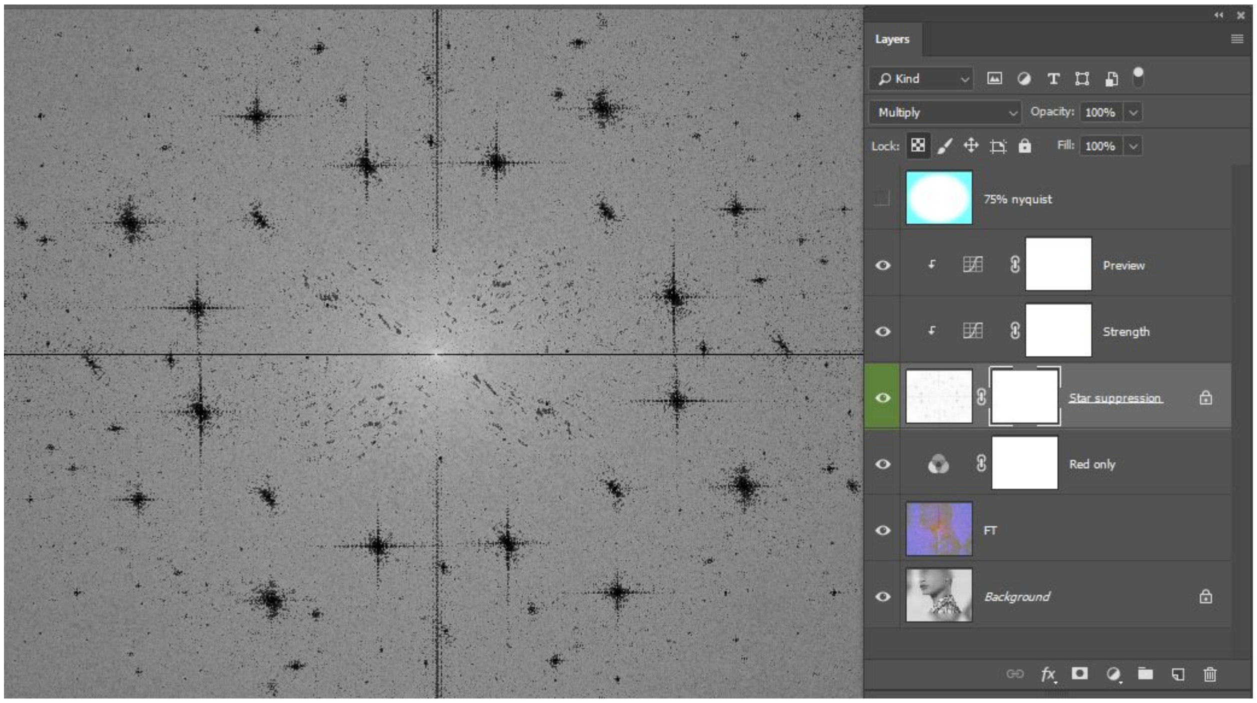
Short tutorial

We recommend watching the video, but here is the short version in written form:

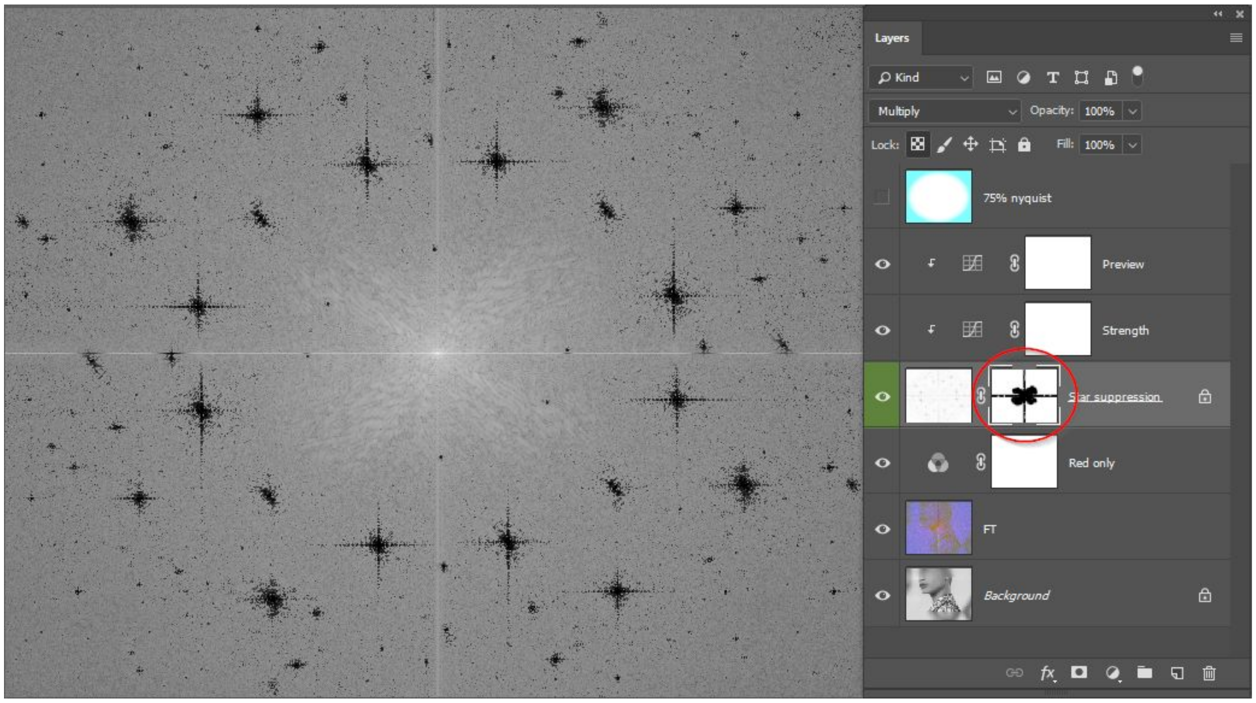
Grayscale images

The “Grayscale” actions will only process the luminosity of the image. Recommended for grayscale images. If you have a tint you want to preserve you will have to blend that back in afterwards or process it like a Color image.

1. **Run one of the first two actions** (NORMAL is usually what you want).
   Read the messages. The resulting image will typically look something like this:



2. As instructed by the action, use your brush tool to paint with black (on the current layer mask) to **reveal all features of the center star and the horizontal/vertical lines**, while keeping all other bright spots covered up. It should then look something like this:



Tip: If you reveal a bit too much, press X (switches foreground/background color) and paint over the area to bring the suppression back.

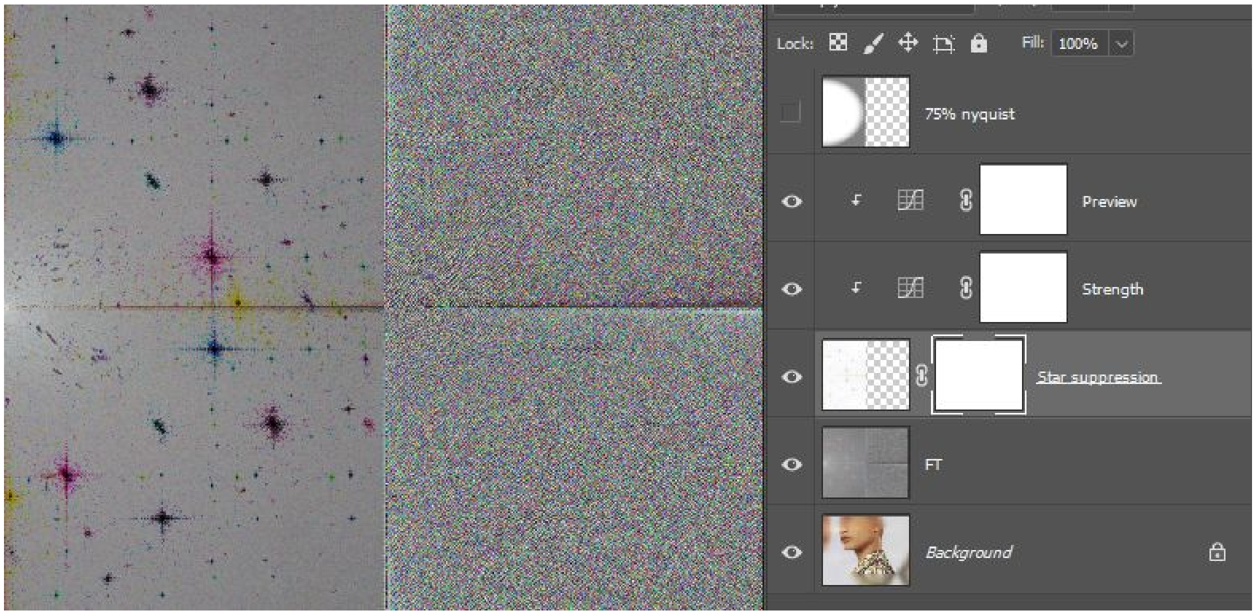
3. **Run the 2nd step “2 – Apply suppression”** to convert it back into a regular image. *Tip: If unhappy with the results, delete or hide the “iFt”-layer, and keep working on the “Star suppression” layer until happy (then run the 2nd step again).*
4. **Run the 3rd step “3 – Merge & trim”**. This will remove the padding and delete the temporary layers.

When done, you will be left with two layers, your original image at the bottom, and the processed image on top.

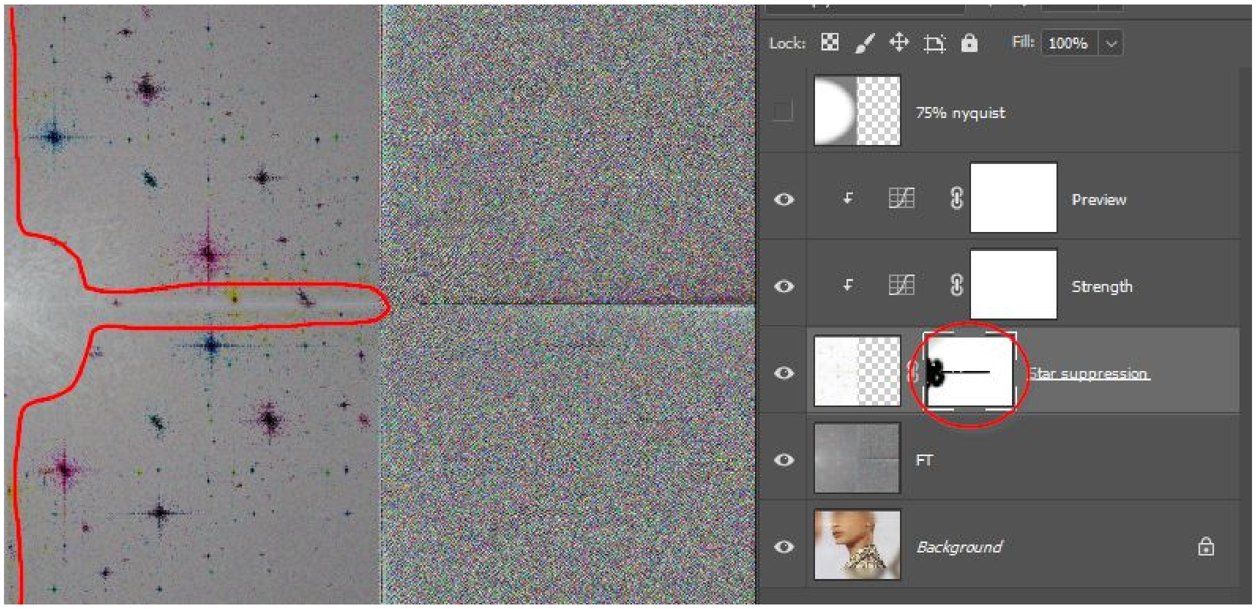
Color images

Choose either “per channel” or “3D” – they should give essentially identical results but we suggest trying “3D” for images with color patterns if unsure.

5. **Run one of the first two actions** (NORMAL is usually what you want).
   Read the messages. The resulting image will typically look something like this:



6. As instructed by the action, use your brush tool to paint with black (on the current layer mask) to **reveal all features of the left center star and the horizontal/vertical lines**, while keeping all other bright spots covered up. Like this:



Tip: If you reveal a bit too much, press X (switches foreground/background color) and paint over the area with white to bring the suppression back.

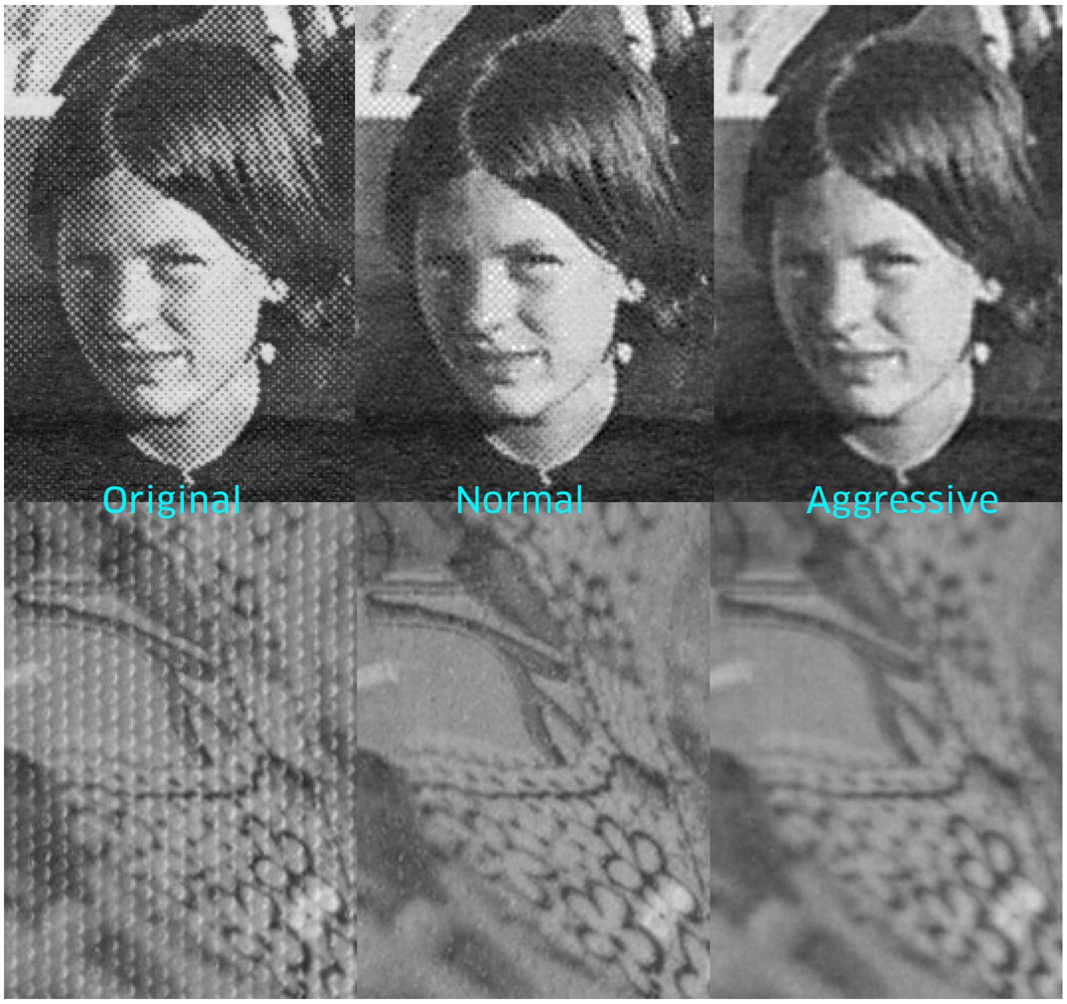
7. **Run the 2nd step “2 – Apply suppression”** to convert it back into a regular image. *Tip: If unhappy with the results, delete or hide the “iFt”-layer, and keep working on the “Star suppression” layer until happy (then run the 2nd step again).*
8. **Run the 3rd step “3 – Merge & trim”**. This will remove the padding and delete the temporary layers.

Normal vs. Aggressive

For most images, you want to use “Normal”. The Aggressive version will murder all fine details in the image – and you probably only want that for certain types of images (like very heavy halftone patterns).

The only differences in the processing are the settings of the Curves layers. So if you want something in-between I suggest you start with the Aggressive version, then tweak the setting of the “Strength”-layer (e.g. clip the highlights slightly).

Here is a comparison between the default settings:



How the magic works

This section is not required reading for using the actions. It is for those with an extra interest who wants to learn more. It is also important information if you wish to understand and modify the actions.

Ft plug-ins

The plugins (filters) use a Fourier transformation to convert the current layer into the frequency domain. The inverse versions converts back. The plugins work on 8, 16 and 32-bit images, but 8-bit is *not* recommended as it does not have the precision required – you get noise generated by truncation errors (you will notice this mainly as unwanted brightness/contrast shifts after you convert it back).

The **Ft2DS**-filter (Fourier Transformation, 2D, Single channel) averages the channels before transformation. Frequency amplitudes are stored in the red channel, phase in the green channel, and the blue channel is used to store a copy of the input (but it is not actually used for anything). Note that the actions using this filter will use it on the Luminosity of the image.

The **Ft2DH**-filter (Fourier Transformation, 2D, Half width) performs the transformation per channel. Frequency amplitudes are stored on the left half, phase on the right half. This can be done because the missing half is actually just a duplicate rotated 180 degrees (as you can see when running Ft2DS). The rightmost 2 columns of pixels from the input will be ignored, so you should pad the image before processing (it needs the 2 extra columns to store all the frequencies).

The **Ft3DH**-filter (Fourier Transformation, 3D, Half width) performs the transformation in 3D space (the three channels being treated like XYZ-coordinates). Frequency amplitudes are stored on the left half, phase on the right half. The rightmost 2 columns of pixels from the input will be ignored, so you should pad the image before processing (it needs the 2 extra columns to store all the frequencies).

When an image is in the frequency domain you should see several bright stars/spots on the left side (or in the red channel for Ft2DS) if your image contains periodic repeating patterns.. Suppressing these frequencies by darkening those bright spots will lead to suppression of the patterns in the image. Note that the large star in the center, and the two lines that usually run through it, should NOT be suppressed (or your image will basically be destroyed).

The iFt-plugins converts the data back from the frequency domain into a regular image.

Action set

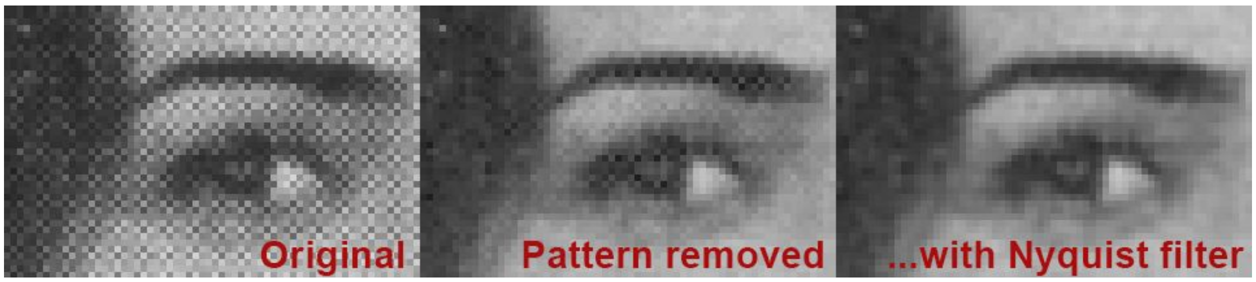
The action set aims to ***drastically*** speed up and simplify the process of suppressing the patterns in the image, and to perform additional processing that is normally missed by users but that will improve quality of the results (**usually tutorials will just tell you to paint over the spikes with a black or gray brush, but just doing that will give inferior results**).

The first part of the action will start by padding the image before doing the Fourier Transformation. This will prevent a lot of the unwanted patterns at the image edges after performing pattern suppression (you can see these patterns in the padding area after performing part 2 of the action). It then duplicates the image layer (so you have a backup of the original) and performs the Fourier Transformation (using the chosen Ft plugin).

To automatically cover up the bright spots in the amplitude data (the source of repeating patterns in the image) the action will make a duplicate of the amplitude information and use radial blur (zoom+spin) to generate an image consisting only of the radial “glow”. This is then subtracted from another copy and squared, leaving isolated dark stars on a white background. It sets that to Multiply over the original amplitude to cancel out the bright spots. In short, it makes dark spots on top of the bright spots to suppress them. A curves layer is used to adjust the suppression to either avoid suppressing too much by clipping the highlights (“NORMAL suppression”), or to exaggerate the suppression by darkening it and not clip anything (“AGGRESSIVE suppression”). You can tweak the curves layer to e.g. get something in-between. It also makes a “Preview”-layer that on NORMAL makes the suppression easier to see while masking (but is ignored when processing)

Some features of the central star and the two lines that usually run through the middle are also covered up by the automatic suppression, so a layer mask is added and the user is asked to bring these back by painting on the mask (painting with black hides parts of the suppression layer).

On top it generates a layer with a Nyquist filter. This is an anti-aliasing filter that prevents unwanted artefacts from the highest frequencies during transformation (almost like moiré). It will have most impact on images with extremely fine (per-pixel) details/patterns. The outer edges of the amplitude data represents the highest frequencies in the image, many of them are outside of the Nyquist frequency and this layer simply suppresses them by 50 % – with a gradual transition. The final image will be slightly softer with this filtering, but this should primarily be due to less high-frequency noise and pixel-sized artefacts (and hopefully not from lack of actual useful image details). You can set opacity to 0% or fill with white to disable it.



The 2nd action (“2 – Apply suppression”) will merge a copy of the relevant layers and run the inverse Fourier transformation on it. It keeps all the layers intact, so if unhappy with the results you can simply remove the “iFt”-layer and keep working on the pattern suppression layer.
Tip: Instead of deleting the layer, you can hide it (and I suggest renaming it as well). This lets you quickly make multiple suppression attempts and compare them.

The 3rd and final action will simply crop away the padding created in the first step, and remove all the extra layers used during the process. You will be left with your iFT-layer (and any extra versions you made) on top, and the original unaltered image at the bottom.

Copyright

In short, these tools are free for personal and commercial use. Here are the details:

Fourier Transformation plugins

Pattern Suppressor v2 actions

Libfftwx64_3-3.dll