Removing Repeating Patterns from Photographs

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A couple of years ago, I scanned this photograph of my father that had been taken when he was about four years old. Yes, its my dad! This was taken in 1912, when they dressed small boys like that and long hair was a thing. He was the youngest of 10 children, so had many older sisters to dote on him and dress him. This photo was in a frame on the telephone table when we were children and we were all shocked when our dad fessed up that it was him, as we had assumed it was our mother or an aunt.

The one thing you may notice is that it is hand coloured, which was not uncommon for portraits back then, since the Lumière autochome colour process was still quite rare and presumably very expensive, and not available in a rural Australian town like Ballarat. Most photographic studios employed colourists. Kodachrome colour film did not appear until 1935 and only became common after WWII. Hand-coloured prints can have a beautiful artistic look, so someone at a camera club might want to think about submitting such a print in a competition - how could the judge possibly declare “It’s not sharp!”?.

Whether one is using dyes, watercolours, crayons, pastels, pencils or oil paints, these all require the material on which the black and white image is printed to be of a sufficiently rough texture. Texture provides abrasion and grip when applying the colour. An economical means of achieving this was to use paper with a repeating embossed pattern as evident in the image to the right, which is an enlarged portion of my father’s portrait.

Having scanned this colourised portrait, the issue then was how to remove this distracting pattern from the digital image? Any attempt at using conventional noise filtering just results in a very unsharp image that is less acceptable than the original patterned image. The only answer is to use a Fourier filter. This filter is based on a two-dimensional frequency analysis of the image that removes the specific spatial frequencies that contribute to the pattern. Post-processing noise and sharpening filters are ultimately frequency based. Noise filters are low-pass filters that remove those high-frequency components that contribute to the small noisy elements in the image. Sharpening filters are high-pass filters that remove those low-frequency components that contribute to blurred edges of objects in the image. The Fourier filter is one that determines the spatial frequencies of the pattern and then removes just those specific frequencies. It uses a mathematically complex algorithm known as the Fast Fourier Transform followed by the Inverse Fourier Transform and allows the user to fine-tune the differentiation and removal of the pattern’s frequencies from the frequency spectrum of the rest of the image.

I have wanted to use this Fourier filter for years but never found a suitable software package until recently. Affinity Photo by Serif is a powerful post-processing package that incorporates a Fourier filter but at the time it was only for black and white images and I was reluctant to buy into yet another editor. Just a few days ago, I found and downloaded Pattern Suppressor V2.6[1], a plugin for Photoshop that is available for no charge. It is brilliant! It works very well on both monochrome and coloured images, on Windows or Mac platforms. You install a series of plugin Fourier filters and a set of Photoshop Actions that orchestrate the process. There is a video to guide you.

The image below left is the output of the Fourier filter. Hopefully you can see that most of the pattern from the textured paper has largely been removed. What remains are all the other imperfections of ageing, scratches, dirt and paint blotches you'd expect of a 108 year old photograph. These were then easily repaired using conventional noise and dust filters, and spot healing and cloning, to produce the image below right.

In the final overall image shown here, you may not really notice the change, given the resolution here and the small pattern size. The scanned image is approximately 6000 x 8000 pixels. I could not be happier with the result.

An interesting question is whether the character of the original photograph is diminished in any way. Personally, I don't think so. The original choice of paper texture or embossed pattern size would have been somewhat arbitrary. The artwork of the colourisation is preserved and the pattern removal meant the image cleanup process became a viable proposition. I can now even reprint it on the same embossed paper, which was not appropriate previously as the old and new embossed patterns would never have aligned.

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[1] https://ft.rognemedia.no/ Pattern Suppressor V2.6