

We introduced monotonic noise suppression and applied it to improving fMRI activation maps. Now we are using monotonic noise suppression to increasing contrast in images. Almost any noise reduction algorithm can be used to enhance contrast. Monotonic noise suppression has some advantages over the wavelet denoising based contrast enhancement method we introduced previously.

The basic idea is to subtract two versions of the image obtained by using two different noise thresholds. The first image is filtered to remove just the noise. The second image is filtered to remove noise and small features leaving only the large features. When the second image is subtracted from the first, the large features are subtracted away leaving the small features. Actually the second image times some factor less than one is subtracted; so the large features are reduced rather than eliminated. The amount of contrast enhancement can be changed by changing the linear combination of filtered images.

Two features of the monotonic noise reduction method make it attractive for this application. First, it is not band-limited. Edges are not blurred at all. There is no reduction of sharpness in the contrast enhanced image. Second, there is no ringing caused by undersampling. When a noise reduction method that introduces ringing into the image, the ringing can be amplified and distorted to look like small features in the contrast enhanced image. Fourier noise reduction methods are infamous for introducing ringing and wavelet denoising also introduces ringing although to a lesser extent.