Non-Local Means Denoising

fdmw97

Algorithm Description

The Non-Local Means algorithm takes an image v consiting of I pixels. Then for each pixel $i \in I$ produces a new value for i that is the result of a a weighted average of all the pixels in the image. This is described by the formula

$$NL[u](x) = \frac{1}{C(x)} \int_{\Omega} e^{-\frac{(G_a * |u(x+.) - u(y+.)|^2)(0)}{h^2}} u(y) dy$$

where $x \in \Omega$, $C(x) = \int_{\Omega} e^{-\frac{(G_a * |u(x+.) - u(z+.)|^2)(0)}{h^2}} dz$ is a normalizing constant [1] In this formula h serves as an adjustable parameter to change the filtering of the image. From the above formula it can be seen that this algorithm weights the pixels in the image such that a pixel is only modified by pixels situated in gaussian neighbourhoods similar to that of x.

References

1. Antoni Buades, and Jean-Michel Morel. *A non-local algorithm for image denoising*. In Proceedings of the 2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'05) - Volume 2 - Volume 02 (CVPR '05). IEEE Computer Society, USA, 60–65.

2. Antoni Buades, Bartomeu Coll, and Jean-Michel Morel *Non-Local Means Denoising*. Image Processing Online.