Non local means compression

Based on the paper: “A non-local algorithm for image denoising by Buades”

i denoised the image in the following way using the same values has in the original paper.

- neighborhood around each pixel: 7X7
- search radius: 21X21

i calculated the weighting of each patch using the following formula

$$w(i,j) = \frac{1}{Z(i)} e^{-\frac{||v(\mathcal{N}_i) - v(\mathcal{N}_j)||^2_{2,a}}{h^2}}$$

where $v(N_i)$ the neighborhood around the current pixel we want to denoise
and $v(N_j)$ the neighborhood around the pixel we calculate his weight from the search radius.

and

$$Z(i) = \sum_j e^{-\frac{||v(\mathcal{N}_i) - v(\mathcal{N}_i)||^2_{2,a}}{h^2}}$$

a normalization factor.

Using average values

i used the formula

$$NL[v](i) = \sum_{j \in I} w(i,j) v(j),$$

Using average high freqncey values

first i calculate the high frequency image and then the new pixel value is

$$NL[v](i) = \sum_{j \in I} \omega(i,j) highFreq(j) + lowFreq(j)$$

Results

as we can see the non local means using the average of all the pixels and not only the mean of the high frequency is better.
an explanation for this is because the low frequency of the current pixel also have noise in it so averaging the low frequency from all the pixels cleans the noise better.