NLM based algorithms for noise removal

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Used NLM filter implementations

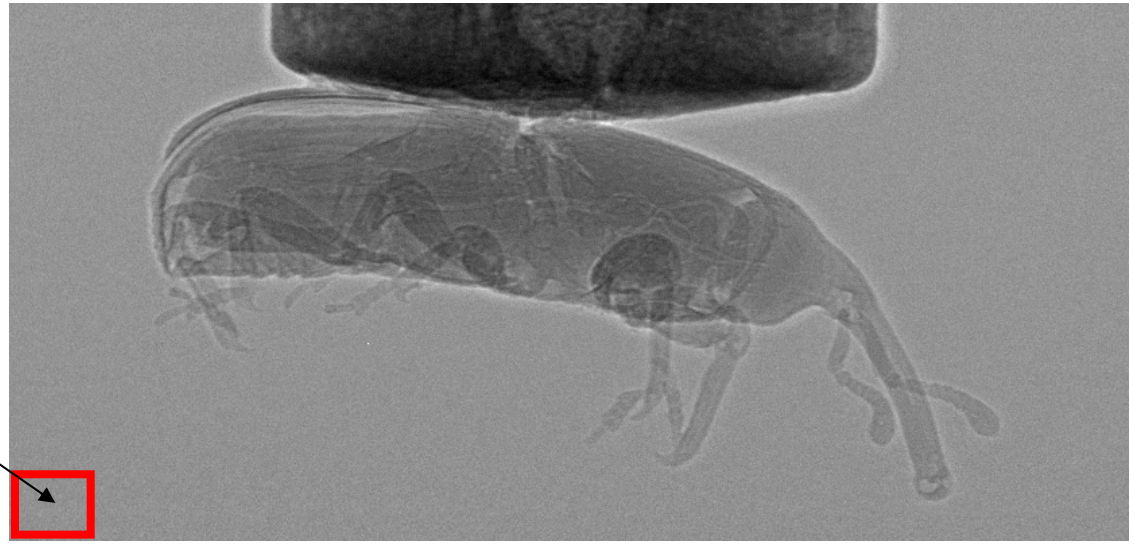
“NLM Base” – the original NLM filter, new pixel values are averaged depending on the whole patch

“NLM CImg” – NLM filter implementation used in CImg library, the original image is preliminarily blurred using an anisotropic exponential filter (Deriche filter of order 0)

“NLM Var” – NLM filter implementation included preliminarily blurring (combination of NLM CImg techniques with more sophisticated weight calculations)

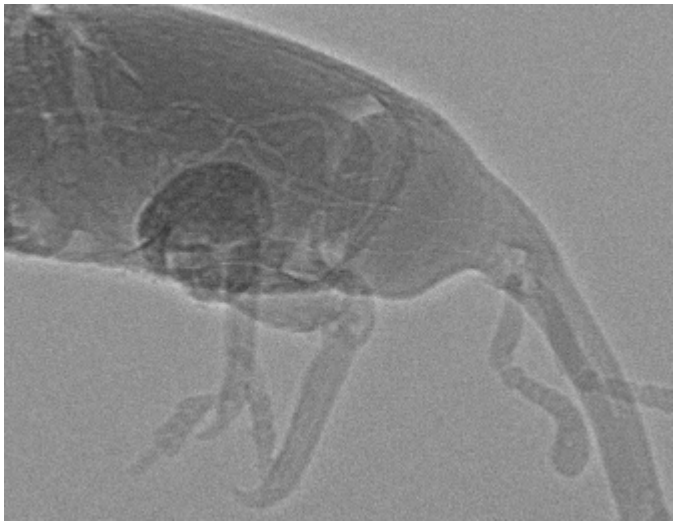
These implementations use different equations for computing weights

Real data – test image (noise standard deviation (sigma) of noisy image = 0.012, 1.21 %)

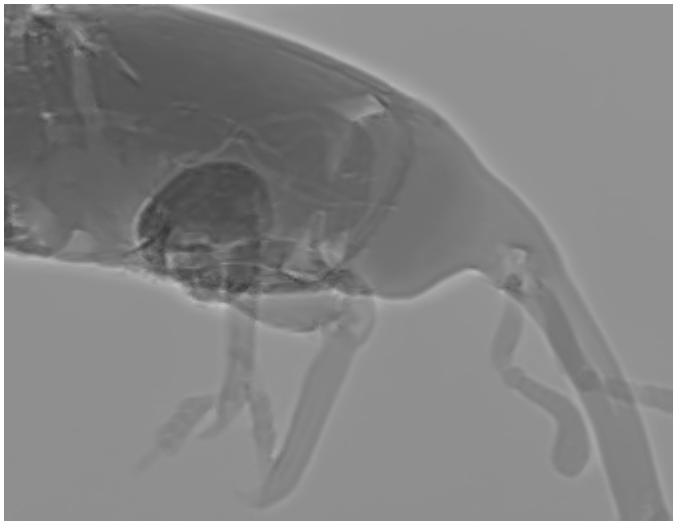


Denoised image fragments, patch radius = 3, search radius = 20

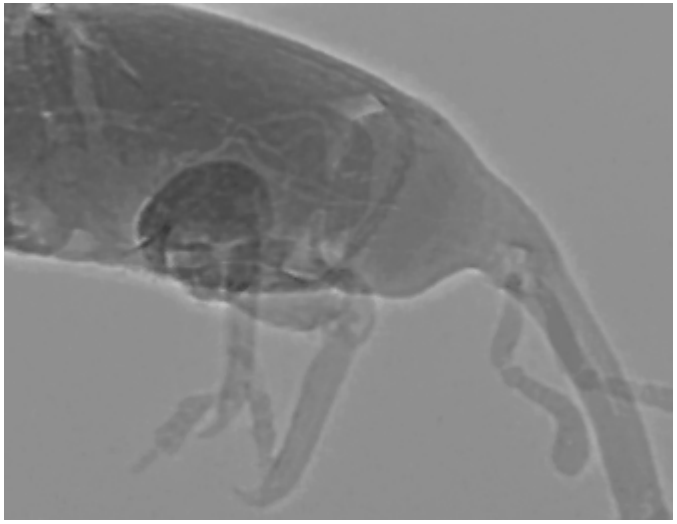
Original image



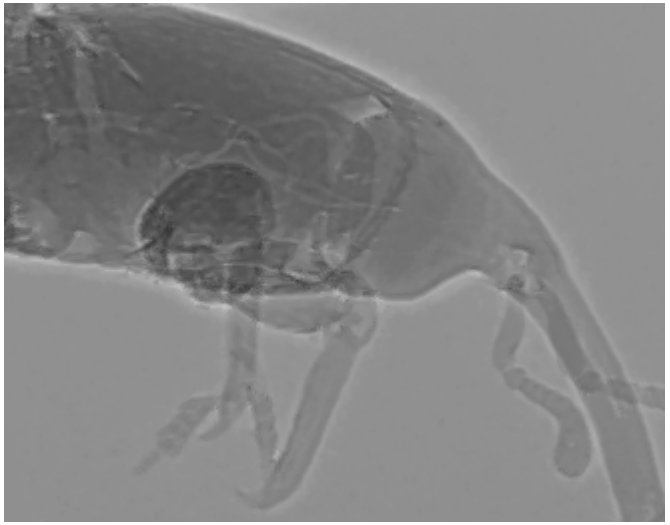
NLM Base



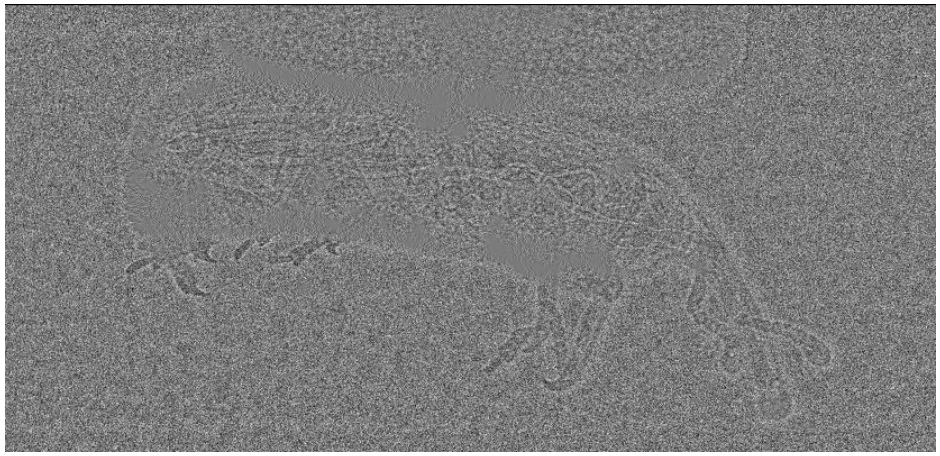
NLM CImg

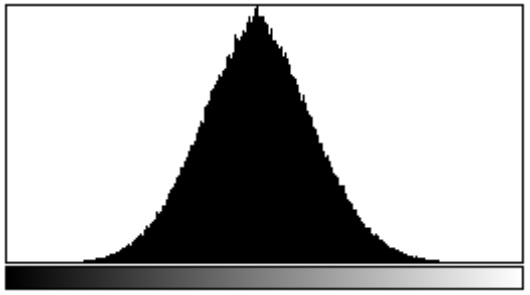


NLM Var

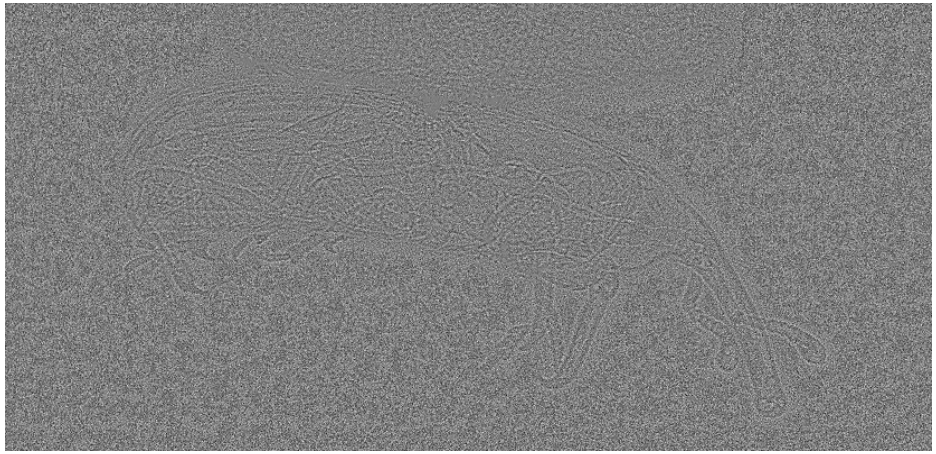


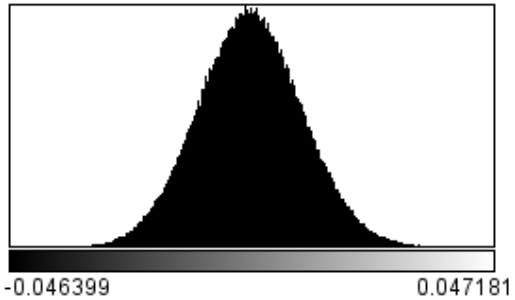
Removed noise, patch radius = 3, search radius = 20



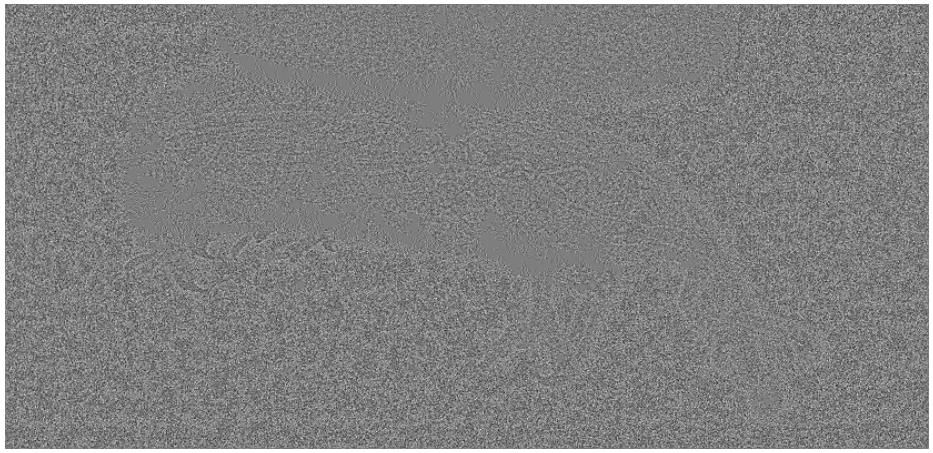


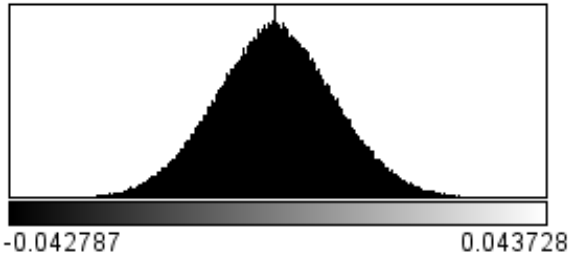
NLM Base





NLM CImg





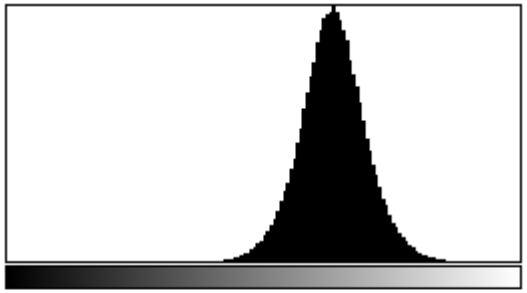
NLM Var

Experiments on the test image

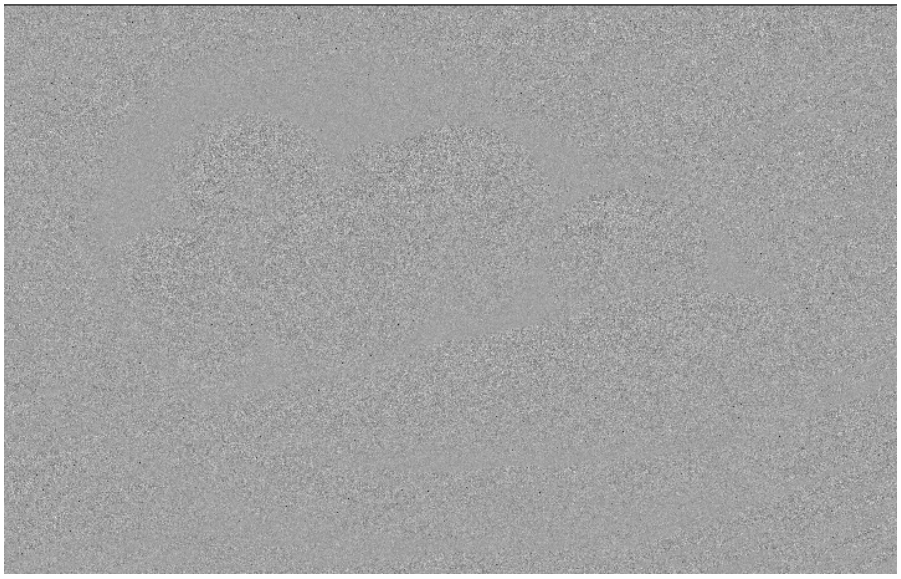
Original image

Noisy image (Poisson noise)

Added noise



Count: 329302	Min: -98
Mean: -0.284174	Max: 56
StdDev: 10.198580	Mode: -0.135484 (14457)
Bins: 155	Bin Width: 0.993548



Images fragments, patch radius = 2, search radius = 10

Original image

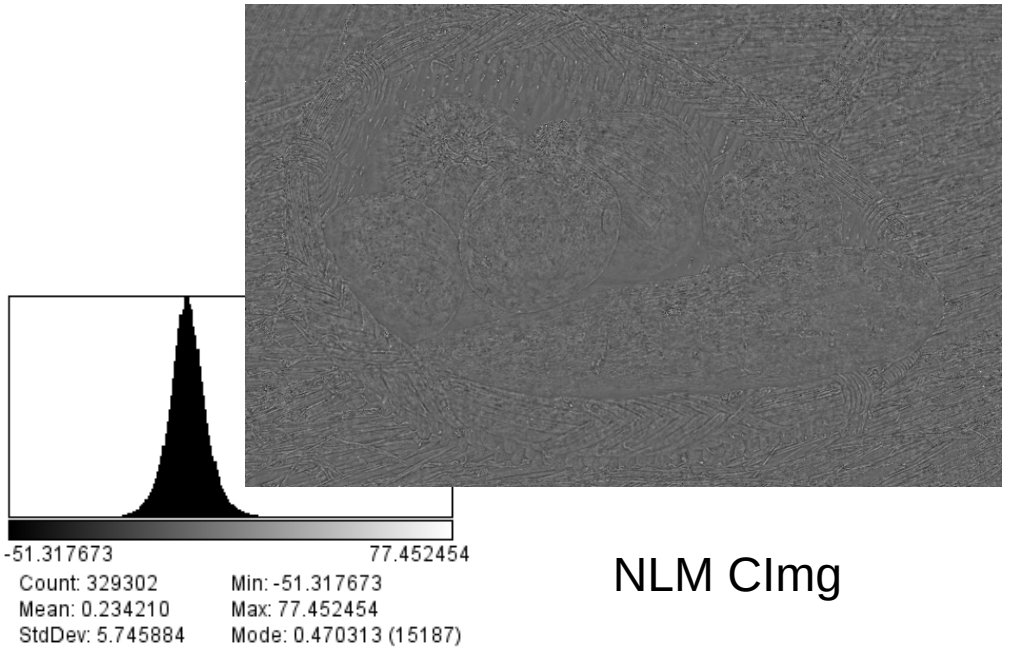
Noisy image

NLM Var

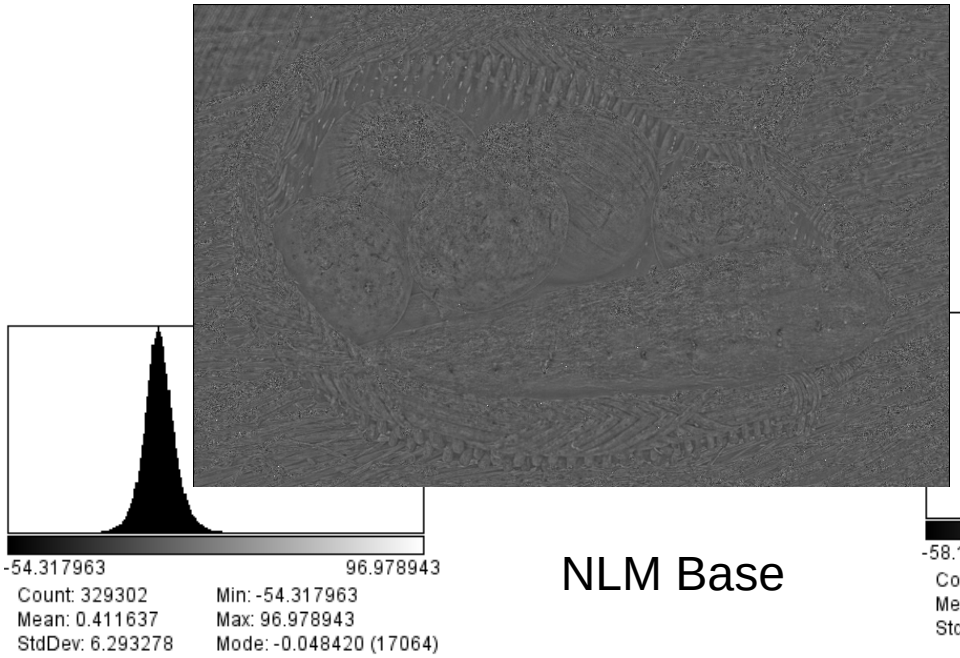
NLM CImg

NLM Base

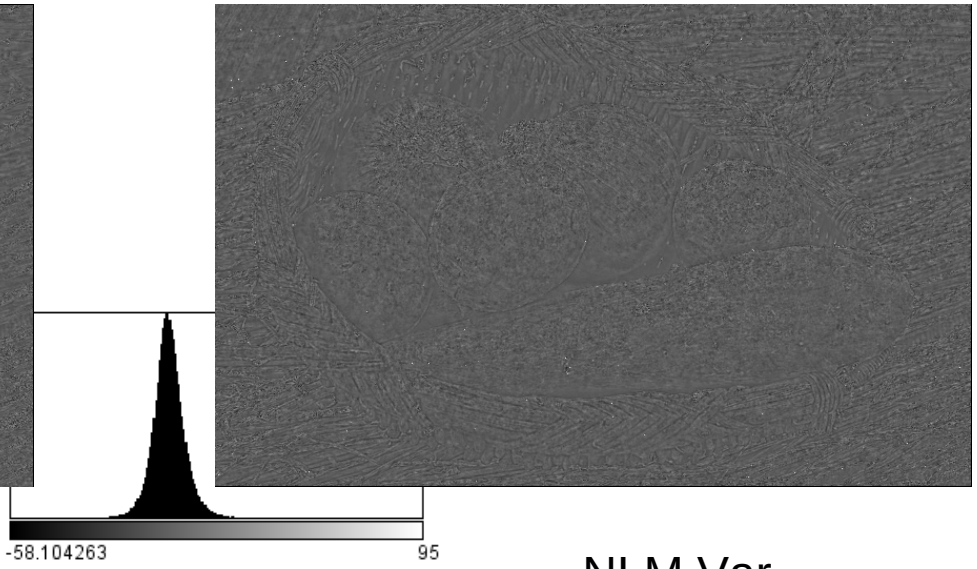
Method noise,
patch radius = 2,
search radius = 10



NLM CImg



NLM Base



NLM Var