Algorithm Description

We have a speckle backscatter intensity image I_0 and we want to find R such that:

$$ R = \arg \min_{I \in \mathbb R^{M \times N}} \mathcal{R}(I) + P(I | I_0). $$

Above $\mathcal{R}:\mathbb R^{M \times N} \to \mathbb R$ is an image regularizer such as the total-variation norm $|I|_1$ or BM3D. The noise model $P(I | I_0)$ is the fully-developed speckle model (see this paper and references therein). This tool is then applied to:

- the "reference image" (called the super-image in the paper): the temporally averaged image from the intensity stack.
- the ratio of each intensity image with the reference image (using a slightly different noise model than the fully developed speckle model).

The final de-sepeckled image is then the (denoised ratio) $\times$ (the denoised reference image). Each denoising step is solved using the Alternating Direction Method of Multipliers (ADMM).

References

Rabasar

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ADMM

- Boyd, et al. Distributed Optimization and Statistical Learning via the Alternating Direction Method of Multipliers, 2010.
- Chan, et al. Plug-and-Play ADMM for Image Restoration: Fixed Point Convergence and Applications, 2016.