Sensor Saturation in Fourier Multiplexed Imaging - Errata

Gordon Wetzstein
wetzste1@cs.ubc.ca
The University of British Columbia

Ivo Ihrke*
ivoihrke@cs.ubc.ca
The University of British Columbia
(*) now at Saarland University

Wolfgang Heidrich
heidrich@cs.ubc.ca
The University of British Columbia

Our objective function is incorrectly given in Equation 5 as

$$\min ||(RF + \alpha S)(L_{\text{unsat}} + L_{\text{sat}})||_2^2. \tag{1}$$

It should be the following:

$$\min_{L_{\text{sat}}} ||RF(L_{\text{unsat}} + L_{\text{sat}})||_2^2 + \alpha ||S(L_{\text{unsat}} + L_{\text{sat}})||_2^2. \tag{2}$$

Rather than modifying the error matrix RF directly, we augment the unregularized least-squares system with a separate least-squares smoothing term S, which is the standard approach for regularization approaches.

Derivation

Defining $b_1 = RFL_{\text{unsat}}$ and $b_2 = SL_{\text{unsat}}$, we can find the closed form solution of Equation 2 by equating its derivative to zero as

$$\begin{aligned} 0 &= \nabla_{L_{\text{sat}}} \left((RFL_{\text{sat}} + b_1)^* (RFL_{\text{sat}} + b_1) + \alpha (SL_{\text{sat}} + b_2)^* (SL_{\text{sat}} + b_2) \right) \\ &= \nabla_{L_{\text{sat}}} (L_{\text{sat}}^* F^* R^* RFL_{\text{sat}} + 2L_{\text{sat}}^* F^* R^* b_1 + b_1^* b_1 + \alpha L_{\text{sat}}^* S^* SL_{\text{sat}} + \alpha 2L_{\text{sat}}^* S^* b_2 + \alpha b_2^* b_2) \\ &= F^* R^* RFL_{\text{sat}} + F^* R^* b_1 + \alpha S^* SL_{\text{sat}} + \alpha S^* b_2. \end{aligned} \tag{3}$$

Reformulating this so that the unknown part L_{sat} is on one side and the measured data on the other yields

$$\begin{aligned} (F^* R^* RF + \alpha S^* S)\, L_{\text{sat}} = \\ -(F^* R^* RF + \alpha S^* S)\, L_{\text{unsat}}, \end{aligned} \tag{4}$$

which is Equation 6 in the paper and implemented to solve the actual equation system as stated in the paper.