

## **A Cramér-Rao Lower Bound Analysis of Multi-Frame Blind Deconvolution**

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We present an algorithm-independent analysis of the quality of estimates of object parameters when using a Multi-Frame Blind Deconvolution (MFBD) estimation approach. Our analysis also includes the degenerate case when the PSF parameters are assumed to be known (i.e., the non-blind case). We define quality in terms of signal-to-noise ratios (SNRs) of estimated quantities. Because MFBD algorithms typically do not have closed-form expressions for estimates of the object and PSF parameters, closed-form expressions for the variances needed for the SNR expressions are not available. Furthermore, even if they were available, they would be algorithm specific. For these reasons, we use Cramér-Rao lower bounds (CRBs) in the SNR expressions. The CRBs depend upon the type and quality of the information supplied to the estimation algorithms, and thus reflect the impact of information, not algorithms, on the estimation quality. We investigate the dependence of the CRB-based SNRs on a variety of types and qualities of information included in algorithms when imaging through atmospheric turbulence: strength of atmospheric turbulence, type of PSF parameterization, object structure, accuracy of support constraints, measurement noise, and regularization.