

Stopping rules for a nonnegatively constrained iterative method for ill-posed Poisson imaging problems

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Image data is often collected by a charge coupled device (CCD) camera. CCD camera noise is known to be well-modeled by a Poisson distribution. If this is taken into account, the negative-log of the Poisson likelihood is the resulting data-fidelity function. We derive, via a Taylor series argument, a weighted least squares approximation of the negative-log of the Poisson likelihood function. The image deblurring algorithm of interest is then applied to the problem of minimizing this weighted least squares function subject to a nonnegativity constraint. Our objective in this paper is the development of stopping rules for this algorithm. We present three stopping rules and then test them on data generated using two different true images and an accurate CCD camera noise model. The results indicate that each of the three stopping rules is effective.