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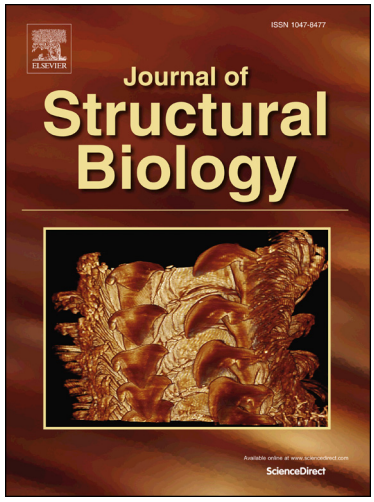

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ACCEPTED MANUSCRIPT

Blind estimation of DED camera gain in Electron Microscopy

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Abstract

The introduction of Direct Electron Detector (DED) videos in the Electron Microscope field has boosted Single Particle Analysis to a point in which it is currently considered to be a key technique in Structural Biology. In this article we introduce an approach to estimate the DED camera gain at each pixel from the movies themselves. This gain is needed to have the set of recorded frames into a coherent gray level range, homogeneous over the whole image. The algorithm does not need any other input than the DED movie itself, being capable of providing an estimate of the camera gain image, helping to identify dead pixels and cases of incorrectly calibrated cameras. We propose the algorithm to be used either to validate the experimentally acquired gain image (for instance, to follow its possible change over time) or to verify that there is no residual gain image after experimentally correcting for the camera gain. We show results for a number of DED camera models currently in use (DE, Falcon II, Falcon 3, and K2).

Introduction

Direct Electron Detector (DEDs) videos have revolutionized the way images are acquired and processed in cryo Electron Microscopy (cryoEM) [5]. Indeed, they have provided access to unprecedented quality images, allowing to obtain 3D maps of a broad range of macromolecules at quasi-atomic resolution. Still, and, as any other image acquisition device, particularly electronic ones, DEDs have non-negligible differences between the gain of the different sensor areas. These differences need to be corrected to produce a reliable image in which all

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