Single image non-uniformity correction algorithm

Yohann Tendero, CMLA- ENS-Cachan

Roughly speaking in a camera the image is constructed using sensors photons-counter. Due to variations in the fabrication process the sensors-response to the same amount of photons are unequals. It leads to artifacts in the resulting image called non-uniformity (NU). In many cases sensor-equalization can be done by the manufacturer once and for all. However for some kind of images –such as infrared images– the sensor needs a new calibration quite often (every ten to thirty seconds). The classic solution performs a partial-calibration closing the shutter of the camera thus providing an equalization pattern. It's unsatisfying since it stops the flow of images during the process. We introduce a new way to correct the NU in uncooled infrared-like images [6]. The main defect of these uncooled-like images is the lack of a column (resp. line) time-dependent cross-calibration, resulting in a strong column (resp. line) and time-dependent noise. This problem can be considered as a 1D flicker of the columns inside each frame. Thus, classic movie deflickering algorithms [1] can be adapted, to equalize the columns (resp. the lines). The proposed method therefore applies to the series formed by the columns of an infrared image a movie deflickering algorithm. The obtained single image method works on static images, and therefore requires no registration, no camera motion compensation, and no closed aperture sensor equalization. Thus, the method has only one camera dependent parameter, and is landscape independent. The best parameter can be automatically tuned as shown. This simple method will be compared to a state of the art total variation single image correction [4] on raw real and simulated images. The method is real time, requiring only two operations per pixel. It involves no test-pattern calibration and produces no "ghost artifacts" [5, 2, 3]. The method can be applied to any other kind of images corrupted with such structured noise.

Références

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Yohann Tendero, CMLA- ENS-Cachan
61 av du Pdt Wilson
94235 Cachan cedex -FR.
tendero@cmla.ens-cachan.fr
Jérôme Gilles, UCLA Mathematics Department
Box 951555
Los Angeles, CA 90095-1555 –USA
jegilles@math.ucla.edu
Stéphane Landeau, Délégation Générale pour l'Armement, Centre d'Expertise Parisien
7 Rue des Mathurins
92221 Bagneux -FR
Stephane.Landeau@etca.fr
Jean-Michel Morel, CMLA- ENS-Cachan
61 av du Pdt Wilson
94235 Cachan cedex -FR.
morel@cmla.ens-cachan.fr