Erratum

Correction to the affiliation of the authors of the paper entitled,
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Self-Calibration of Rotating and Zooming Cameras

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Abstract. In this paper we describe the theory and practice of self-calibration of cameras which are fixed in location and may freely rotate while changing their internal parameters by zooming. The basis of our approach is to make use of the so-called infinite homography constraint which relates the unknown calibration matrices to the computed inter-image homographies. In order for the calibration to be possible some constraints must be placed on the internal parameters of the camera. We present various self-calibration methods. First an iterative non-linear method is described which is very versatile in terms of the constraints that may be imposed on the camera calibration: each of the camera parameters may be assumed to be known, constant throughout the sequence but unknown, or free to vary. Secondly, we describe a fast linear method which works under the minimal assumption of zero camera skew or the more restrictive conditions of square pixels (zero skew and known aspect ratio) or known principal point. We show experimental results on both synthetic and real image sequences (where ground truth data was available) to assess the accuracy and the stability of the algorithms and to compare the result of applying different constraints on the camera parameters. We also derive an optimal Maximum Likelihood estimator for the calibration and the motion parameters. Prior knowledge about the distribution of the estimated parameters (such as the location of the principal point) may also be incorporated via Maximum a Posteriori estimation. We then identify some near-ambiguities that arise under rotational motions showing that coupled changes of certain parameters are barely observable making them indistinguishable. Finally we study the negative effect of radial distortion in the self-calibration process and point out some possible solutions to it.

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