



TECH TO BUSINESS

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Calibration and Stability Analysis of Medium-Format Digital Cameras

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Background

Photogrammetry is the art and science of deriving accurate three-dimensional information from two-dimensional images. The accuracy of the derived positional information depends on the quality of the interior orientation parameters (IOP) of the utilized camera. To determine the IOP, some control information from a calibration test field is required. A wide diversity of expected users mandates the development of a convenient calibration procedure that does not require professional photogrammetrists and/or surveyors. This technology introduces a methodology for calibrating medium-format digital cameras using automatic extraction of the linear features and the point targets from the images. The calibration procedure aims to reconstruct the bundle of the light rays, as defined by the image points and the IOP, similarly to the incident bundle into the camera at the moment of exposure. A novel approach for testing the camera stability is also implemented where the degree of similarity between the light ray bundles reconstructed from two sets of interior orientation parameters is quantitatively evaluated. The analysis of the internal characteristics of the utilized camera estimated from various calibration sessions reveals the camera's stability over a long period.

Areas of Application

- New photogrammetric, surveying, and mapping with digital cameras.
- High quality, low cost medium-format digital cameras in mapping, industrial, medical, archaeological, surveillance, security, and transportation applications.
- Short and long term stability of off-the-shelf digital cameras for amateur use.

Competitive Advantages

- The manipulation of linear features, especially straight lines, provides a promising alternative for camera calibration.
- The use of straight lines is easily established in a calibration test field and corresponding image space linear features can be precisely and automatically extracted using image processing techniques.
- For camera calibration purposes, object space straight lines are valuable because they will project onto the image space as straight lines in the absence of distortions.
- Deviations from straightness in the image space can be modeled and attributed to various distortion parameters.

TECHNOLOGY



Publications

["Calibration and Stability Analysis of Medium-Format Digital Cameras", Ayman Habib et al., SPIE Conference Presentation, 13 - 17 August 2006, San Diego, California USA](#)