

SELF CALIBRATION OF SMALL AND MEDIUM FORMAT DIGITAL CAMERAS

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ABSTRACT:

The knowledge of a camera's interior orientation parameters are a prerequisite for the camera to be used in any photogrammetric project. Historically, the interior orientation parameters have been determined by analyzing the measured ground 3D coordinates of photo-identifiable targets, and their 2D (image) coordinates from multiple images of these targets. Camera self calibration, on the other hand, uses targets on a scene that have not been measured before. In this research, we will discuss existing self calibration techniques, and present two methods for camera self calibration that are being used at the U.S. Geological Survey's (USGS) Earth Resources Observation and Science (EROS) center (USGS/EROS). The first method, developed by Pictometry, uses a series of coded targets on a cage. The coded targets form different patterns that are imaged from nine different locations with differing camera orientations. A free network solution using collinearity equations is used to determine the calibration parameters. The coded targets are placed on the cage in three different planes, which allows for a robust calibration procedure. The USGS/EROS has developed an inexpensive method for calibration, particularly for calibrating short focal length cameras. In this case, the coded targets are pasted on a small prototype box, and imaged from different locations and camera orientations. The design of the box is discussed, and the results of the box and the cage calibrations are compared and analyzed. Finally, the positions of the coded targets obtained using the parameters from the two self calibration procedures are compared and analyzed against the cage target positions which were obtained and measured using a metric camera.

TOPIC: Geometric modeling

ALTERNATIVE TOPIC: Geometric modeling