

CAMERA CALIBRATION REPORT

Nikon D810, 135 mm

Back snr. 6042688

Lens snr. 5150702

Calibration date: 2017-11-19

Calibration ID: YC030054_2017-02

Oslo, 2017-12-01

Bjørn Barstad

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Process owner, Aerial triangulation



Summary

The calibration was made as an integral part of project "ProRail 2017-10".
Boresight misalignment was estimated as part of the works.

Input material

Flight	No. of flight lines	No. of images	No. of GCPs	Image overlap
40869 Calibration field Arnhem, * GSD 1.0 cm**. Flight date: 2017-11-04	4 + 3 cross lines	452	12	fwd. 55 side 60 %

*) See calibration field layout page 4

**) At image center

Methodology

Software

- Image measurements / block adjustment / estimation of camera calibration parameters: Match-AT and inBlock ver. 8.0.6 (Inpho)

Estimation of physical parameters

Focal length, principal point (PPA) and lens distortion (3 parameters radial distortion) was estimated using aerial triangulation (AT) and subsequent block adjustment with GNSS/IMU support.

Estimation of boresight misalignment

Boresight misalignment was estimated after application of the calibration.

Result

Physical parameters

Parameter	Symbol	Value	Std. dev.	Unit
Image size	-	7360 x 4912	-	pixels
Image resolution	-	4.9		μm
Calibrated focal length	f	131.566	2.6	mm/μm
Calibrated PPA	Xp Yp	-0.028 -0.124	6.2 4.9	mm/μm
Calibrated radial distortion	K0 K1 K2 K3	0 -1.40159e-05 4.31439e-09 1.15657e-11	- 3.2e-07 1.6e-09 2.3e-12	-
Calibrated decentering distortion	-	-	-	-
correction for radial distortion $DX = X * (K_0 + K_1 * R^2 + K_2 * R^4 + K_3 * R^6 + K_4 * R^8 + K_5 * R^{10} + K_6 * R^{12} + K_7 * R^{14})$ $DY = Y * (K_0 + K_1 * R^2 + K_2 * R^4 + K_3 * R^6 + K_4 * R^8 + K_5 * R^{10} + K_6 * R^{12} + K_7 * R^{14})$ correction for decentering distortion $DX = P_1 * (R^2 + 2 * X^2) + 2 * P_2 * X * Y$ $DY = 2 * P_1 * X * Y + P_2 * (R^2 + 2 * Y^2)$ with $R = (X^2 + Y^2)^{1/2}$ X and Y are with respect to principal point (PPA=PPS)				

Boresight misalignment

Parameter	Omega	Phi	Kappa
Applied correction (°)	-0.3805	-0.0490	-0.3415

Notes on usage of the calibration

Parameter values:

- The tabulated lens parameters are distortion values. The signs of the parameter must be adapted to the actual software (e.g. Inpho software expects input of correction values and consequently requires opposite sign of lens distortion parameters)

Calibration field layout

