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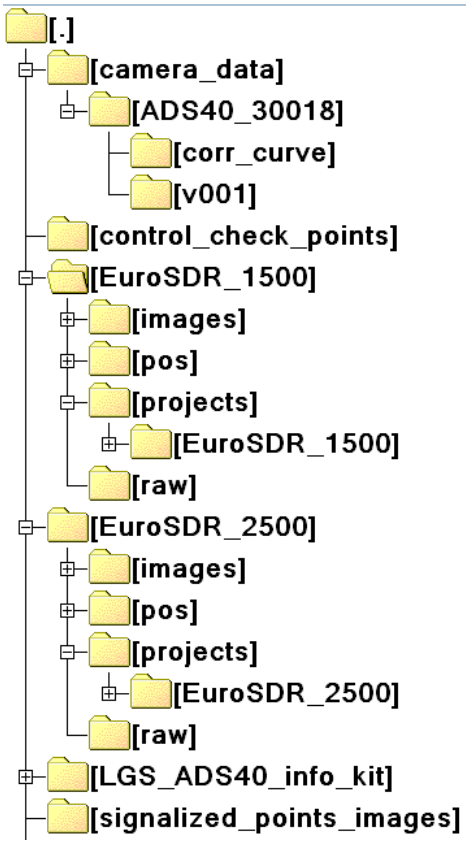
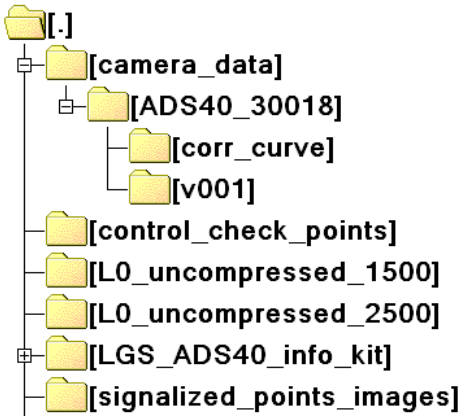
Phase II – Empirical Data Set Description
ADS40 data, test site Vaihingen/Enz Germany

Data structure on storage discs

ADS40_1 (left) and ADS40_2 (right)





Data provider	ifp University of Stuttgart / Germany http://www.ifp.uni-stuttgart.de
Mission flight	June 26, 2004
Test site	Vaihingen/Enz

Test site

.\control_check_points	Coordinates of ground control points and check points. due to changing visibility conditions check points given separately for high and low altitude flight Check point coordinates are only given with 1m accuracy level Coordinates given in different coordinate systems the **local cartesian topocentric system** should be used for data processing Corresponding local origin is given in separate file

Vaihingen/Enz - Germany

Maintenance	Institute für Photogrammetrie (ifp), Uni Stuttgart
Test site extensions	4.8 km x 7.5 km main flight direction from east to west
Control / check points	>200 object points (check points ChP (signalized (Figure 2) / natural (Figure 3)) and control points GCP (signalized (Figure 1)) available not all ChPs visible in all images
Reference frame	WGS84 ellipsoid, ellipsoidal heights Local cartesian topocentric coordinate frame Local origin (WGS84) B 48.9353285709 deg L 8.9468605205 deg h 0.0000 m

.\signalized_points_images	point measurement sketches generated from original ADS images, for each check/control point one sketch is provided

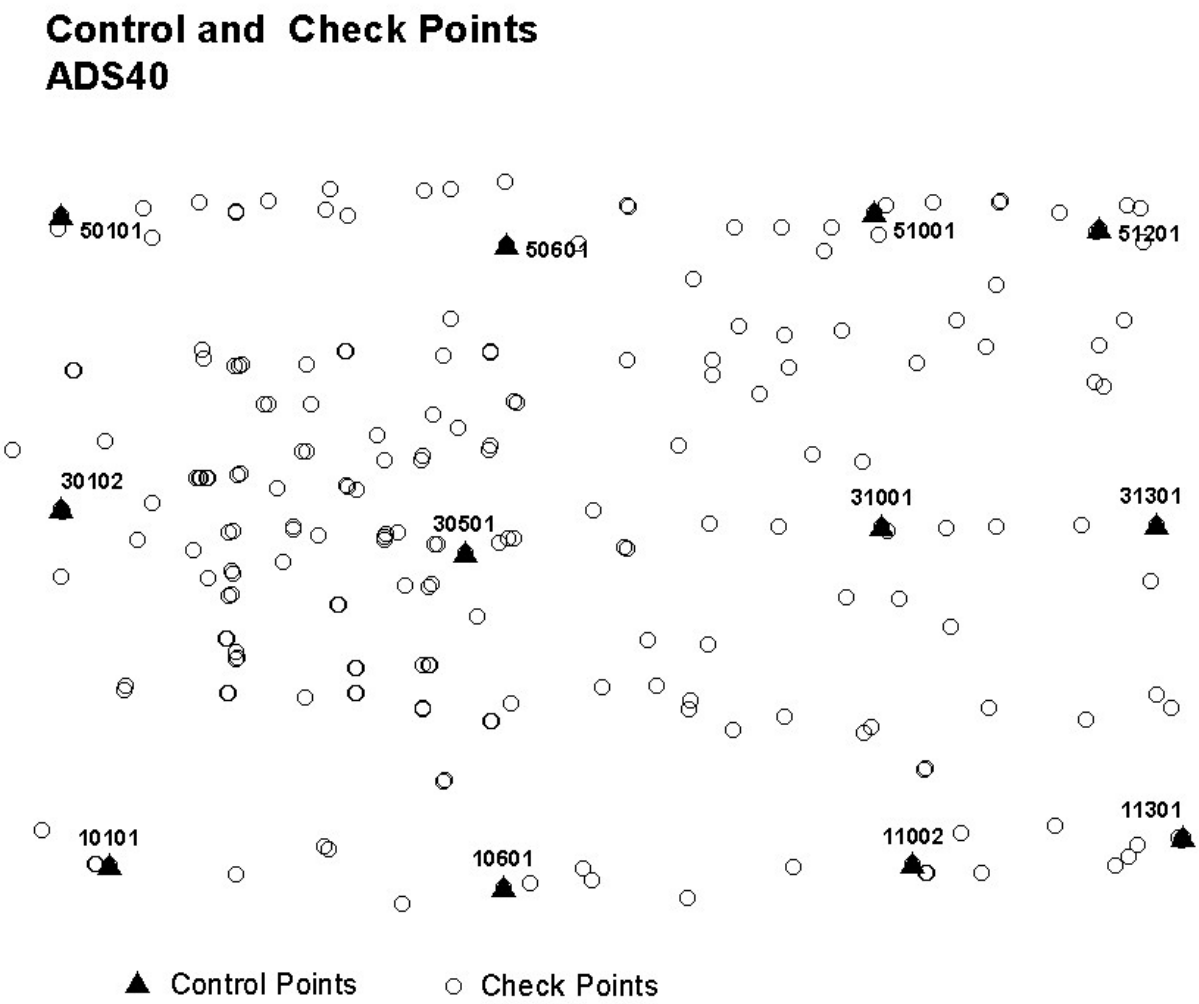


Figure 1, Distribution of check point information (Vaihingen/Enz test range)

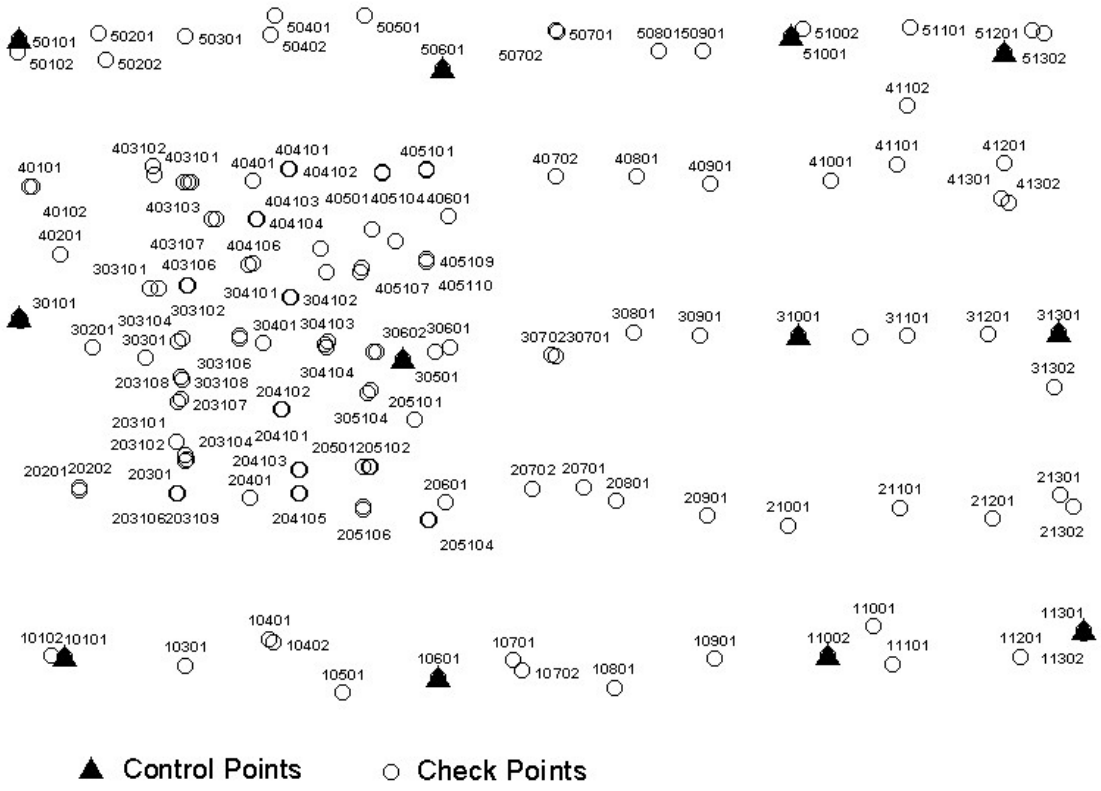


Figure 2, Distribution of signalized control and check point information (Vaihingen/Enz test range)

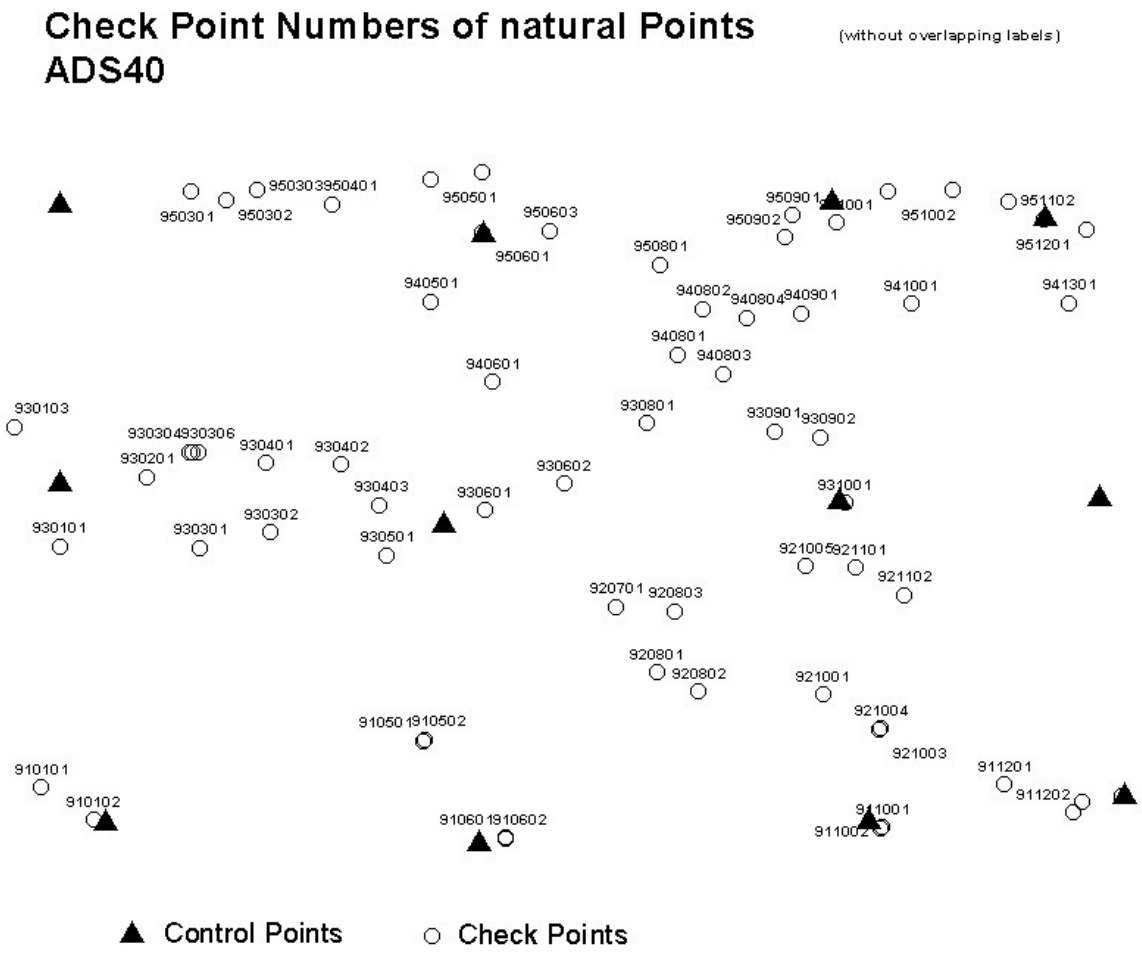


Figure 3, Distribution of natural check point information (Vaihingen/Enz test range)

Camera Data / interior orientation

.\camera_data\ — Camera data file for each image line, including Image coordinates for each pixel of CCD line given

Additional information on boresight angles between IMU and camera

Image data

Flight configuration

ADS-low (Figure 4)

flying height 1500m, GSD 0.18m (non-staggered), 4 long strips, 2 cross lines, 100% forward lap, 44% side lap, 36 strip images

ADS-high (Figure 5)

flying height 2500m, GSD 0.26m (non-staggered), 3 long strips, 3 cross lines, 100% forward lap, 70% side lap, 36 strip images

Data Disc Eurosdr_ads40_1

.\Eurosdr_1500\ .\Eurosdr_2500\	directories including all relevant image data for both flying heights. The given directory structure is fully conformal to the standard Leica Geosystems GPro project definition. A regular GPro project can be set up from this project directories. **Note**: The files in the projects do include absolute data-paths. These data-paths require, that the disc-drive is connected as drive R:\
.\Eurosdr_1500\images	L0 imagery given in Leica proprietary format jpg compressed 12bit/pix with 1 overview
.\Eurosdr_1500\images\L1	L1 imagery given in Leica proprietary format tiled tiff, uncompressed 16bit/pix with overviews
.\Eurosdr_1500\pos	results from GPS/inertial trajectory processing. Data conformal to Applanix formats. The SBET file is base for generation of so-called ODF orientation data files.
.\Eurosdr_1500\projects	directory includes all relevant project support files.
.\Eurosdr_1500\projects\odf	time tagged orientation data files, for each line in each ADS image one orientation is given. ODF data is given in binary format (see ADS info toolkit). The data is related to the local topocentric coordinate frame, as already described above.

Data Disc Eurosdr_ads40_2

.\L0_uncompressed_1500\ .\L0_uncompressed_2500\	directories including the converted ADS L0 image data for both flying heights, respectively in converted format: tiled tiff, uncompressed, no overview, 16bit/pix

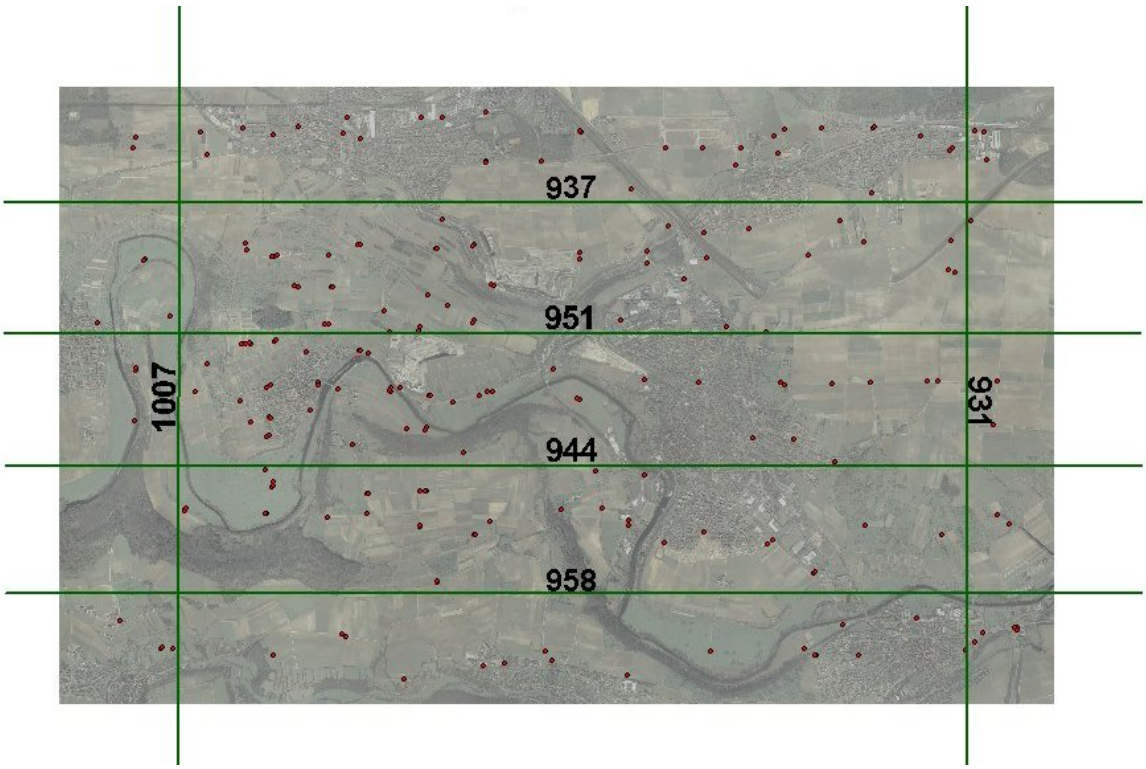


Figure 4, Flight configuration ADS-low altitude (1500m) mission

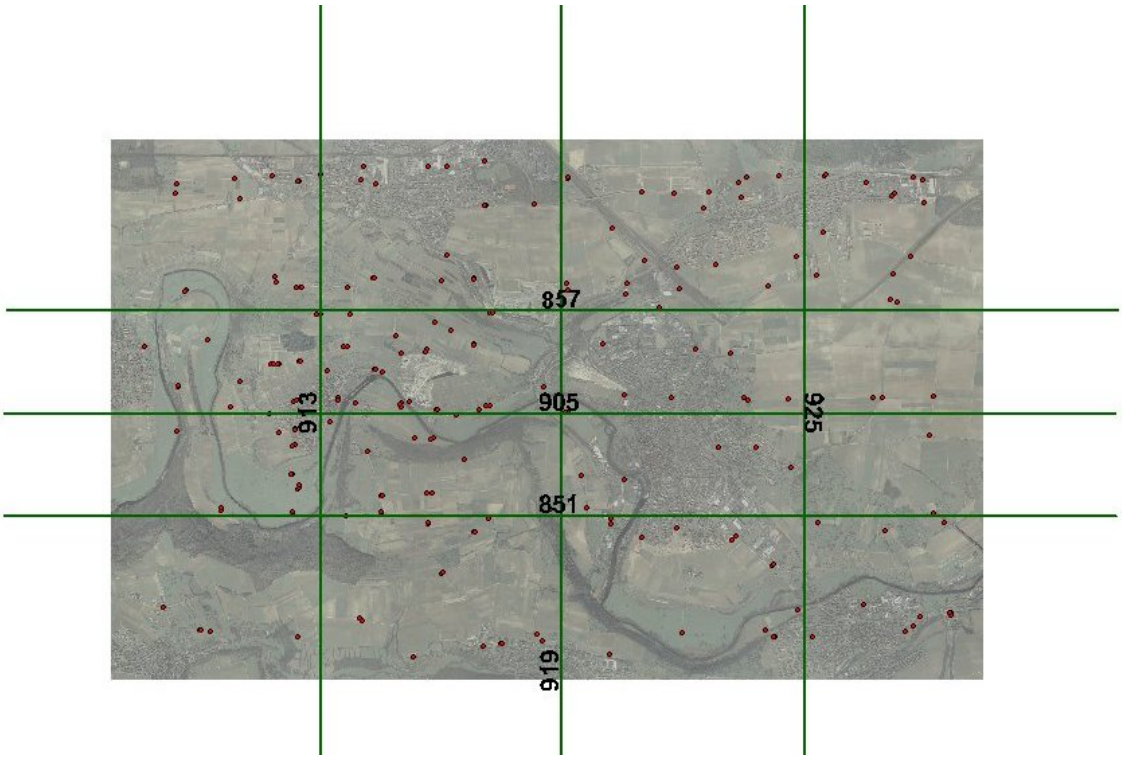


Figure 5, Flight configuration ADS-high altitude (2500m) mission

Final remarks

The ADS40 line scanner data has a quite complex structure. Many additional information which is necessary for deeper insight view on this data definition can be found from the **ADS Info Toolkit** kindly provided by Leica Geosystems. This information is given on a separate directory .\LGS_ADS40_info_kit within each of the two data discs.

The definition of rotation matrix is conformal to the Manual of Photogrammetry, 4th Edition, pp. 50 – 51. Please find the relevant text below (scanned from document)

2.2.3.2.3 PROJECTIVE TRANSFORMATION EQUATIONS

Assuming that light rays travel in straight lines, that all the rays entering a camera lens system pass through a single point and that the lens system is distortionless, then a projective relationship exists between the photographic coordinates of the image points and the ground coordinates of the corresponding object points as illustrated in figure 2-10. It will be shown in this section that this projective relationship can be represented by the following set of projective transformation equations:

$$
\begin{aligned}
X_j - X_i^c &= \lambda_{ij}\left[m_{11}(x_{ij} - x_p) + m_{21}(y_{ij} - y_p) + m_{31}(-f)\right] \\
Y_j - Y_i^c &= \lambda_{ij}\left[m_{12}(x_{ij} - x_p) + m_{22}(y_{ij} - y_p) + m_{32}(-f)\right] \\
Z_j - Z_i^c &= \lambda_{ij}\left[m_{13}(x_{ij} - x_p) + m_{23}(y_{ij} - y_p) + m_{33}(-f)\right]
\end{aligned}
\tag{2.22}
$$

in which

$$
\begin{aligned}
m_{11} &= \cos\phi_i \cos\kappa_i \\
m_{12} &= \cos\omega_i \sin\kappa_i + \sin\omega_i \sin\phi_i \cos\kappa_i \\
m_{13} &= \sin\omega_i \sin\kappa_i - \cos\omega_i \sin\phi_i \cos\kappa_i \\
m_{21} &= -\cos\phi_i \sin\kappa_i \\
m_{22} &= \cos\omega_i \cos\kappa_i - \sin\omega_i \sin\phi_i \sin\kappa_i \\
m_{23} &= \sin\omega_i \cos\kappa_i + \cos\omega_i \sin\phi_i \sin\kappa_i \\
m_{31} &= \sin\phi_i \\
m_{32} &= -\sin\omega_i \cos\phi_i \\
m_{33} &= \cos\omega_i \cos\phi_i .
\end{aligned}
\tag{2.23}
$$

X_j, Y_j and Z_j are the object space coordinates of object point j; X_i^c, Y_i^c and Z_i^c are the object space coordinates of the exposure center of photo i; x_{ij} and y_{ij} are the image coordinates of object point j on photo i; f is the focal length of the camera; λ_{ij} is the photo scale factor at image point j in the newly rotated photo-coordi- about the $\bar{x}$-, $\bar{y}$- and $\bar{z}$-axis of the photo coordi- nate system.