



Aerial survey and aerial image processing

CURRENT METHODOLOGIES

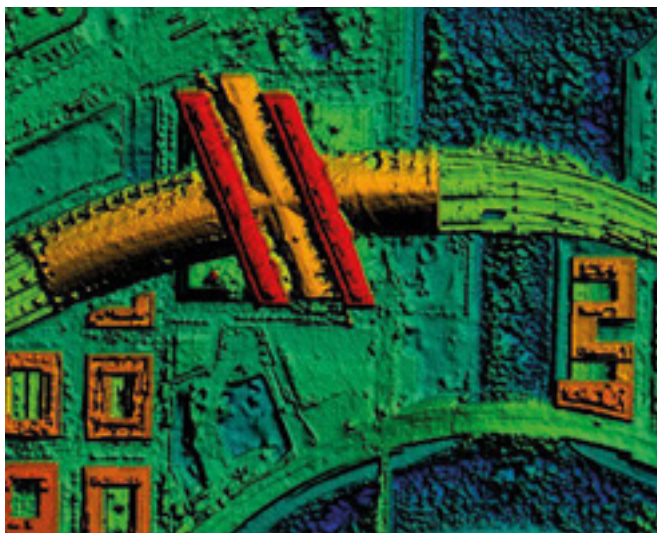
AERIAL DATA CAPTURE



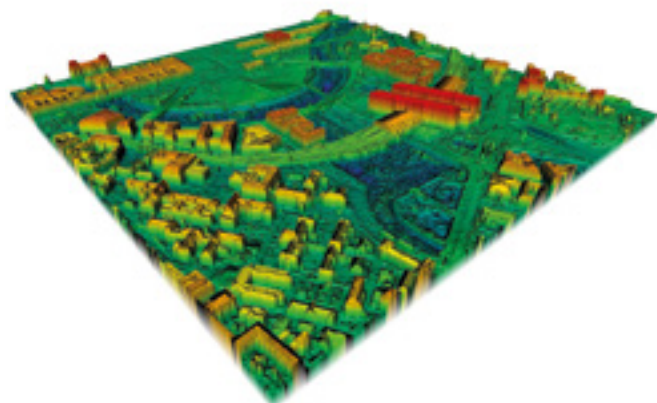
Orthophotos and image based 3D surface models



Digital orthophoto (Berlin main railway station and surrounding area. 27.03.2017)



iDSM (Berlin main railway station and surrounding area)



iDSM as a 3D image (Berlin main railway station and surrounding area)

Hansa Luftbild was recently contracted by the Berlin Senate for Urban Development and Housing to conduct an aerial survey, with a ground resolution of 10 cm, of the Berlin urban area (approximately 900 km²). The aerial imagery was used, amongst other things, to produce up-to-date digital orthophotos (DOP). Using the image data Hansa Luftbild produced a homogeneous image mosaic of Berlin which was delivered in 1 km * 1 km tiling. DOPs are distortion free, true-to-scale, geo-referenced photographic images of the earth's surface. For municipal use high resolution DOPs are usually delivered with a pixel size of 5 to 10 cm. DOPs form the basis for every type of geoinformation system and should be updated at least every three years.

Utilising a new methodology the aerial imagery was also used to produce a digital surface model (DSM). A DSM represents the surface of the earth, in which vegetation and man-made structures are modelled using a representative sample of 3D co-ordinates of ground and non-ground points. Up until this point DSMs were chiefly produced using LiDAR point-clouds.

This method of semi-global matching enables aerial imagery to be used directly for the calculation of an image based digital DSM (iDSM). The method uses an automated image classification process which correlates digital aerial images with each other using their orientations. The result of this digital image correlation is a triangulated point cloud of objects generated from aerial imagery.

In contrast to a DSM an iDSM shows all objects present on the surface terrain (eg buildings, facilities, vegetation).

Many avenues of application are available:

- > simulations for flooding and noise protection
- > derivation of 3D building models
- > support for the development of solar cadastre
- > planning of radio signal networks
- > forest mapping
- > landscape planning

Of special interest is the ability to track changes in height differences using iDSMs generated at specific time intervals (change detection).

Orthophotos versus true orthophotos



Orthophoto (Berlin Bersarinplatz)



True orthophoto (Berlin Bersarinplatz)

An important follow-on product of the iDSM is the so-called true orthophotos. Due to radial displacement it is impossible to avoid distortion of above ground objects using conventional orthophotos. Only true orthophotos allow objects on the earth's surface to be represented with orthogonal and positional accuracy. While DOPs are produced on the basis of digital terrain models (DTM), true orthophotos are now produced on the basis of DSM/iDSM - without the need for an additional LiDAR survey.

Since for the entire image height information is available, all image pixels can also be accurately rectified. Formerly hidden sections in the imagery (eg areas behind houses) can be filled in using information from adjacent images. For this reason aerial surveys for true orthophotos must be carried out with a high overlap (eg 80 % forward overlap / 60 % lateral overlap). A true orthophoto is an orthophoto with removed occlusions and no invisible spots.

The result can be clearly seen in the above illustration. The photo on the left (a digital orthophoto) shows relief distortion eg in buildings and in parts of facades which can be seen. In contrast in the photo on the right (a true digital orthophoto) the buildings have been corrected and areas running alongside the buildings which were hidden in the digital orthophoto are now visible.

IN SUMMARY:

With one aerial survey multiple photogrammetric products can be used to produce:

- > geo-referenced aerial images for further stereoscopic mapping
- > digital orthophotos
- > image based digital surface model
- > true orthophotos

Technologies for the aerial capture of geo-data

Founded in 1923 Hansa Luftbild has been primarily known as a company which used its aircraft and aerial photography cameras to conduct aerial surveys in Germany and abroad for governmental and private organisations.

Currently Hansa Luftbild has 3 aircraft, digital large format cameras and LiDAR systems. Aerial sensor systems have become much more varied in recent years, so Hansa Luftbild now offers (partially with partners) the following services:

- > Aerial surveys for local, utility, and infrastructure authorities as well as the production of orthophotos, true orthophotos and iDSM
- > Photogrammetric mapping (eg roofs of buildings to analyse solar potential)
- > Oblique aerial photography
- > Colour-Infrared (CIR) aerial imagery including vegetation mapping using interpretation and image processing
- > Airborne LiDAR surveys of alignments (with helicopter) as well as large areas (with aircraft)
- > Airborne thermal surveys
- > Airborne hyperspectral surveys (to assess vegetation, mining etc)
- > Airborne bathymetric survey (underwater LiDAR surveys for pipeline construction, determining of water depth etc)
- > Drone aerial surveys (small areas, inspections etc)
- > Combination of aerial surveys with imagery acquired from vehicles on the ground (mobile mapping)

THE ADVANTAGES OF USING HANSA LUFTBILD'S SERVICES:

- > Over 90 years experience in aerial survey and image processing
- > Three aircraft guarantee flexible and reliable aerial surveys
- > Aerial survey is increasingly showing itself to be cost effective in the acquisition of geodata.
- > Innovative solutions and individualised consultancy services
- > Wide range of products (aerial imagery, LiDAR, hyperspectral imagery)
- > Advanced range of services eg local authority cadastre, (green space, streets, trees, sealed surfaces etc)

OUR SERVICES:

- > Remote sensing and photogrammetry
- > Geoinformation, specialised cadastre, and planning
- > Software consultancy and development
- > International consulting and development

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