RECENT DEVELOPMENTS OF DIGITAL CAMERAS AND SPACE IMAGERY

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Abstract

Digital aerial cameras have replaced analog film cameras. An information contents corresponding to aerial photos up to 2010 was only possible with digital system cameras as Vexcel Ultracam and Z/I Imaging DMC or line scanning cameras as Leica Geosystems ADS80 or Jena Optronic JAS-150. Now with very large size CCDs the panchromatic band of the DMC II has between 140 and 256 Mega pixels from one CCD and this with excellent image geometry. With large size digital camera images more precise results as with analog photos can be reached. A strong development came for mid-format digital cameras having now up to 60 Mega pixels. Some of them are also used in configurations of 2 up to 4 cameras, leading to a similar imaging capacity as the large format digital cameras, but not with the same geometric quality. Usually such cameras have to be supported at least by relative kinematic GPS-positioning or even inertial measurement units. Standard mid-format cameras have only one CCD-array, where 3 color bands can be generated by Bayer pattern, while system cameras usually have 4 color bands. Unmanned aerial vehicles (UAV) are becoming popular; partially they are equipped with tiny digital cameras with just 1.8µm pixel size, but still satisfying potential.

With available 0.5m ground sampling distance (GSD) very high resolution optical satellites are competing with aerial cameras. Usually their image quality is on the same level. The absolute geo-reference in the range of 3m without use of ground control points (GCP) for GeoEye and Worldview images is satisfying for several applications. So for example a comparison of digital surface models (DSM) generated with IKONOS and with GeoEye stereo pairs was leading without GCP to discrepancies in X and Y below 10m and in the height below 2m. 0.5m up to 1.0m GSD allows the generation of 3D city models with satellite images. With semi global matching (SGM) sharp building contours can be generated.

In near future even 0.3m GSD will be possible with GeoEye-2 and Cartosat-3. Just now there is still a limitation of the USA to distribute space images with not below 0.5m GSD, but caused by the Indian competition this may change.

Keywords: digital aerial cameras, geometric potential, optical space imagery, use of space imagery