

Generation of Cost Effective Digital Image Base Maps from the Ikonos and QuickBird Commercial Satellites

Elected officials within local governments require timely information products to support policy decisions on issues that are often interrelated and can span several political boundaries. A digital image basemap is a key information layer in many local government GIS systems. Image basemaps are used by city planners and engineers for tax assessment, inventory, construction planning (roads, bridges, etc.), stormwater management, and other civil planning activities (greenbelt preservation, E-911, etc.) A major stumbling block to the effective application of remote sensing imagery within local government is the positional accuracy of the imagery. Our interaction and discussion with basemap users within various local government user communities indicates that planar accuracies of 3-5 m CE90 are required for 1-m resolution digital basemaps to be useful for GIS applications. The recent launch of Space Imaging's Ikonos and DigitalGlobe's QuickBird satellites has opened up a new arena for acquiring up-to-date high-resolution panchromatic digital imagery for use as digital orthoimage basemaps. The Carterra Geo Ikonos product costs \$21/km², but its horizontal precision is poor with a planar accuracy of only 50 m CE90 (Space Imaging, 2000). While this product is affordable for most local government entities, the planar accuracy of 50m CE90 renders this product unusable for traditional basemap applications. The Carterra Precision Ikonos panchromatic image product costs \$63/km² and has a planar accuracy of 4 m CE90 (Space Imaging, 2000). While this meets the planar accuracy requirement for basemap implementation, it is three times more expensive than the Carterra Geo product. This cost can be prohibitive for many local government entities with limited fiscal resources. The challenge then becomes to develop a methodology that would enable the use of the lower-cost Carterra Geo products for creation of digital basemaps.

We have developed and demonstrated a methodology to generate highly accurate orthoimage basemaps from the lowest cost commercial high-resolution satellite imagery. The methodology uses a limited amount of ground control (8-10 GCPs per image), 30-m resolution USGS DEMs, and Commercial Off The Shelf (COTS) software to orthorectify the lowest cost, lowest precision commercial high-resolution satellite imagery. The methodology is equally applicable for both the Ikonos and QuickBird commercial satellite imagery. We have performed rigorous assessments of the horizontal accuracies of the resulting image basemaps. We have quantified the effects of DEM horizontal resolution and vertical accuracy on the resulting horizontal accuracy of the orthorectified image basemaps. Results from multiple test sites have shown that we can routinely produce digital image basemaps with horizontal accuracies of 2-5 m CE90. The methodology we have developed can be used to deliver up-to-date, cost effective orthoimages from the lowest cost Ikonos and QuickBird image products that yield horizontal accuracies suitable for use as digital image basemaps by local governments.

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