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ACCURACY ANALYSIS OF HRSI-BASED GEOPOSITIONING USING LEAST SQUARES COLLOCATION

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Abstract. Rational function model with bias compensation has been widely used in geopositioning of High Resolution Satellite Imagery (HRSI). We studied the geopositioning issue using a pair of QuickBird imagery in the Shanghai urban area with 126 Control Points (CPs) measured by GPS RTK. We proposed in this paper a stochastic model of HRSI geopositioning in which we modeled the random observed error and signal parts, then the Least Squares Collocation (LSC) is suggested to process the geopositioning with such kind of stochastic model. In order to correctly determine the variance components of the observed random error and signal parts, the variance components estimation of MINQUE is applied to compute the variance components for the LSC approach. And the cofactor matrix of signals is computed according to a prior given function. Then the same pair of QuickBird imagery is processed by using LSC approach with the stochastic model of this paper. In the experiments parts of the CPs are used as Ground Control Points (GCPs) to compute the bias-corrected parameters and parts of them are used as check points to calculate the root mean square errors for different schemes. Experimental results show that the proposed LSC approach for affine transformation model could improve geopositioning accuracy significantly, about 15 cm numerically (15% on average), even better than secondorder bias-corrected model with the same GCPs.

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