Improving the Geometric Correction Accuracy of HJ-1 Satellite Imagery Based on the Rational Function Model Solved by Partial Least Square Approach

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Abstract: HJ-1 satellite has the capacity of high spectral, great vision and high revisit cycle. It plays a significant role in Environment Monitoring and protection in China. But the image geometric distortion is very serious and the orientation parameters are not accurate. Therefore it is necessary to build a terrain-dependent model to correct the displacement. The rational function model (RFM), as a generalized sensor model representing the imaging geometry between the object space and the image space, has been widely applied in photogrammetric processing. However, the application of terrain-dependent RFM is limited due to the requirement for numerous observation data (ground control points, GCPs), and the strong correlation between the coefficients. It usually becomes ill-conditioned when use traditional least square estimation to solve the model and can't get a stable solution. The Partial Least Square (PLS) method has been proposed to solve the RFM in this paper. Compared to traditional Least Square Estimation，PLS can overcome the strong correlation among the coefficients and eliminate the influence of multi-collinearities. It can achieve a high fitting accuracy. The RFM solved by PLS is used in the geometric correction of HJ-1 satellite image. The experimental results show that the RFM can be applied in the geometric correction of HJ-1 satellite image and PLS is a robust method to solve RFM.

Keywords：rational function model; partial least square; HJ-1 satellite imagery; geometric correction.