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ON-ORBIT HIGH-ACCURACY CALIBRATION METHOD OF REMOTE SENSING CAMERA BASED ON STAR TARGETS

Abstract

Remote sensing technology plays an important role in many fields, such as environmental monitoring, national security and scientific detection. High-accuracy image positioning is the key technology of remote sensing, which has high requirements for the accuracy of internal parameters and external installation matrix of payload. Generally, the optical payload is calibrated precisely in the laboratory before launch. However, the vibration and the environment changes will cause the nonnegligible deviation for the internal and external parameters of optical payload during the satellite launching and long-term operation. Due to the agility of satellites, an on-orbit star-based calibration method of optical payload is proposed. Firstly, we adjust satellite attitude so that the optical payload can image the star targets. By fusing the satellite ephemeris and other information, the star observation reference model of satellite is established to obtain the reference position of the observed star targets. Then, according to the invariance of star angular distance, the internal parameters of the camera are calibrated by least square iterative method. Combined with the attitude information from star tracker, the calibration of the external installation matrix between the payload and star tracker is completed. An on-orbit calibration experiment is conducted in Jilin-1 04 satellite. We took several star maps for calibration analysis and the results shows that the accuracy of self-calibration is 0.1" and the accuracy of mutual-calibration between payload and star tracker is better than 2".