Systematic Correction Mechanism of Geometric Distortions in the KITSAT-1 CCD Earth Images

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Various geometric distortions inherent in remotely sensed images have been usually corrected by two methods. The first one called a systematic correction is to use the sufficiently accurate geometric model based on the geometry of the sensor, the satellite, the orbit and the Earth. The second one called a manual correction is to use a set of control points that correspond to those in real maps. Many microsatellites carry experimental Earth imaging payloads. However, since they usually provide very limited information about their positions and attitudes due to insufficient and rather inaccurate sensors, this makes it difficult to perform accurate geometric corrections of their images. The images from those satellites have been mostly geometrically corrected using the second method, which may cause additional distortions in the corrected images. The geometric model in the KITSAT-1 can be represented by mainly six inaccurately determined parameters: the pitch, yaw and roll angles of the satellite attitude and the latitude, longitude and altitude of the satellite position. In particular, the parameters of the attitude information are inaccurate as the KITSAT-1 can only provide pointing errors on its attitude. We estimate the parameter values of the KITSAT-1 geometric model by using a lease mean square algorithm to utilize the relationships of the selected control points between the satellite images and the real maps. We apply the systematic correction mechanism based on the estimated parameter values to correct the geometric distortions in the KITSAT-1 images and compare the results with those of the manual correction.