

A NEW RIGOROUS SENSOR MODEL FOR RADAR IMAGERY BASED ON EXTERIOR ORIENTATION ELEMENTS

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ABSTRACT:

Imaging equation is always considered as the most important and basic part in photogrammetry. Rigourism and conciseness should be held as its necessary characteristics. In this paper, using sensor exterior orientation including three line and two attitude elements as orientation parameters, we derived a new rigorous imaging equation for radar image. The model is based on the distance condition between sensor and object point, and coplanarity condition of sensor scan plane including antenna and radar beam center. By Analysing the influence of attitudes, we can obtain that coplanarity condition is independent of roll angle when we choose pitch-yaw-roll or yaw-pitch-roll rotation angle system. The experiment data is ALOS/PALSAR image (70Km×60Km, pixel resolution is 3.189m in velocity direction and 9.368m in range direction) in a mountainous area of Shanxi province, west China. 21 image points having ground points coordinate were surveyed from 1:10,000 scale relief map, where two of them are used as GCPs and the rest are used as check points. We utilize combined adjustment of photogrammetric and orbit/attitude observation values. When 2 GCPs distributed on right-up and left-down corners of the image are used, the precision of other 19 check points are (unit pixel): RMS_X (azimuth): 1.26, RMS_Y (range): 1.27, RMS_XY: 1.79. The imaging equations have simple form and less orientation parameters than R-D model and G.Konecny model for radar imaging equation. Therefore, It could bring convenience for radar image rectification, stereo positioning and block adjustment and other photogrammetric processing of radar imagery.

TOPIC: Geometric modeling

ALTERNATIVE TOPIC: Microwave remote sensing