

A Coarse-to-Fine Approach for Remote-Sensing Image Registration Based on a Local Method

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Abstract- Multispectral satellite imagery registration is a fundamental step for remote sensing applications such as global change detection, feature classification, and image fusion. Since image registration via the manual selection of control points is a repetitive and time-intensive task, a more efficient automatic coarse-to-fine algorithm for multispectral remote sensing image registration is proposed in this paper. First, for the coarse registration, the Haar Wavelet Transform (HWT) is adopted to produce lower-resolution levels of reference and input images; then, the Speeded Up Robust Features (SURF) algorithm is utilized for quickly searching for matching points. After the coarse registration is completed, the Harris operator is used to extract feature points, and initial correspondences are established using the normalized cross-correlation to achieve the fine registration. Second, in order to remove mismatched points, the RANdom SAmples Consensus (RANSAC) algorithm is applied to putative correspondences. Due to large amount of satellite image data available, we used block processing in the refined registration to increase the efficiency in memory use. Finally, the final transformation function is obtained via the local weighted mean method in order to deal with local geometric differences between the reference and input images. Compared to global registration by manually selecting the control points, the proposed method is fully automatic and computationally efficient. Experimental results with well-known data sets (Worldview-1,2 and Quickbird remote-sensing images) again demonstrate the accuracy and effectiveness of the proposed algorithm for multispectral remote-sensing image registration.

Index terms: Multispectral satellite image, Image registration, SURF, RANSAC