A New Image Matching Algorithm with Greedy Algorithm for Multi-Sensor Satellite Imagery for Image Fusion

Xu-wen Qin, Pei-dong Jin, Xiao-ping Guan
China Aero Geophysical Survey and Remote Sensing Center for Land and Resources
Beijing 100083 China

Since the successful launching of various remote-sensing satellites, we can get remote sensing data with different spatial, spectral and temporal resolution from different remote sensing platforms. These image data formulate a image pyramid, provide user with the Earth observation data from coarse to fine resolution, from multi-spectral to hyper-spectral. However, the data from each sensor only reflects one or several aspects of terrain objects. The information extraction and application of remote sensing image usually require to analyze multi-sensor, multi-temporal, multi-spectral and multi-resolution image together, so as to overcome the problem on insufficient information during image analysis. Image fusion is valuable technique to play a role in this issue.

This paper is on developing methods to perform automatic matching and fusion of multi-sensor data representing multiple spatial, spectral and temporal resolutions.

In traditional image matching algorithms, some criterion, such as the maximum correlation coefficient, is used to decide that a sample is or is not to belong to a certain classification. They do not take spatial relationships into account, and further, they do not use the matching results in the neighborhood to adjust the results of the match. The results from traditional image matching algorithms are therefore inharmonious and unreliable.

To ensure the reliability of the matching results, as well as the computational speed, an image pyramid is used in the image matching procedure. The image pyramid is dynamically generated according to the rule of minimum workload. At the top of the image pyramid (with lowest resolution), a coarse grid is established in the left image and matched to the right image. Matching results on higher levels are approximations of a finer grid on subsequent levels with higher resolution.

After the feature points are detected with SUSAN algorithm interest operator, the initial matching based on the similarity is conducted to find the candidates of the corresponding point in the slave image. The primary matching procedure employed correlation coefficients between -1 and 1.The advantage of this algorithm is that it

tolerates any linear radiometric relationship between the two images. Then the new self-diagnosis image matching algorithms is used to attain reliable results.

This paper analyses the initial matching result, the correspondence points is 57%, null match is 40%, and the rest points have two or three initial candidate matching point. So this paper designs a new matching strategy—Greedy Algorithm. For the correspondence points, they are not real correspondent points. This paper uses the reliability theory to determinate the big error points and interpolate the parallax. For the null match, this paper adopts moving surface fitting to solve the null match problem. According to depth continues, this paper determinate the best candidate point of the rest.

The strategy of image matching mentioned above is used, so that it not only tolerates linear radiometric relationship between the images, but also ensures the reliability of the matching results. This paper using Triangle structure as the minus fusion unit, making triangle using matched points, then affine transformation is using to establish local geometric relation. Then pixels in one image to be spatially related to pixels in other images of the same basic scene are meted demand.