A COMPARATIVE STUDY OF GLOBAL AND LOCAL TRANSFORMATION FUNCTIONS FOR HIGH RESOLUTION SATELLITE IMAGE REGISTRATION

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ABSTRACT:

The common approach for the image to image registration employs a polynomial method using well distributed image points. However, for the images taken by different sensors, simple polynomial transformation for the registration may not give satisfactory result in the areas with excessive height undulation. This does not pose a real problem for the low resolution satellite images for the reason that the relief displacements in these images are more or less negligible. Nevertheless, for the high resolution satellite images, the relief displacement may not be negligible particularly in mountainous terrains where it may reach to several pixels. In this paper the registration accuracy is analyzed for the high resolution satellite images. For this analysis, IRS P5 and P6 images are selected over three different topographies of flat, hilly and mountainous terrains. First the insufficiency of the global polynomial transformation is presented by a comparative evaluation of the polynomial methods. It is then demonstrated that the local transformation methods produce more acceptable results in mountainous areas for the registration of the P5/P6 images. Three local transformation approaches are implemented and their performances in registration of the P5/P6 images are compared. The implemented local transformations are: piecewise linear, thin plate spline (TPS) and local weighted mean (LWM) transformations. The local transformation functions produced significantly more accurate transformations than any of the polynomial transformations in the three images. The piecewise algorithm produced slightly more accurate transformation than TPS and LWM transformations in the mountainous terrains. In the flat and hilly areas, the TPS algorithm was slightly more accurate than the piecewise and LWM algorithms.

TOPIC: Data fusion and data assimilation
ALTERNATIVE TOPIC: Change detection and process modelling