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STEREO IMAGE PROCESSING FOR A DAILY-REVISIT SATELLITE

Abstract

With the daily-revisit capability, FORMOSAT-2 has taken the first images and continuously monitoring after large disasters over the world to support the aftermath relief and precaution of secondary disasters, especially for the southern Asia tsunami on 2004.12.26, the Wilkins Ice Shelf disintegration on 2008.2.28, the Sichuan earthquake on 2008.5.12, the typhoon Morakot over Taiwan on 2009.8.8, and the Japan earthquake on 2011.3.11. FORMOSAT-2 imaged areas in nine years are about 8 times of the worldwide land areas. But due to poor resolution near the borders of the 14 strips of the coverage, rare population in some regions, and continuously imaging for the large disasters, the image map shows it has taken images over half areas of the worldwide lands.

FORMOSAT-2 frequently repeats to image the same area, but there are still different in the view angles of several degrees. This is a challenge to process the stereo images for those images with small differences of the viewing angles, because they are mostly in same direction, rather than in forward/backward or rightward/leftward directions as the traditional way. In this paper, we develop an algorithm for the registration of the stereo pair and the derivation of the surface elevation with arbitrary viewing angles. The computed results show the root-mean-square errors can be satisfactorily within 10 m for the panchromatic images of 2 m resolution. Applications of the processing include the 3D change detection, terrain features monitoring, disaster area reconstruction, and animation display.