



Precision Improvement of Photogrammetry by Digital Image Correlation

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The combination of aerial triangulation technology and unmanned aerial vehicle greatly reduces the cost and application threshold of the digital surface model technique. Based on the report in the literatures, the measurement error in the x-y coordinate and in the elevation lies between 8cm~15cm and 10cm~20cm respectively. The measurement accuracy for the geological structure survey already has sufficient value, but for the slope and structures in terms of deformation monitoring is inadequate. The main factors affecting the accuracy of the aerial triangulation are image quality, measurement accuracy of control point and image matching accuracy. In terms of image matching, the commonly used techniques are Harris Corner Detection and Scale Invariant Feature Transform (SIFT). Their pairing error is in scale of pixels, usually lies between 1 to 2 pixels. This study suggests that the error on the pairing is the main factor causing the aerial triangulation errors.

Therefore, this study proposes the application of Digital Image Correlation (DIC) method instead of the pairing method mentioned above. DIC method can provide a pairing accuracy of less than 0.01 pixel, indeed can greatly enhance the accuracy of the aerial triangulation, to have sub-centimeter level accuracy. In this study, the effects of image pairing error on the measurement error of the 3-dimensional coordinate of the ground points are explored by numerical simulation method. It was confirmed that when the image matching error is reduced to 0.01 pixels, the ground three-dimensional coordinate measurement error can be controlled in mm level. A combination of DIC technique and the traditional aerial triangulation provides the potential of application on the deformation monitoring of slope and structures, and achieve an early warning of natural disaster.