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Accuracy validation of DSM that has been generated by UAV and SfM-MVS, Part3

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Preface

Nowadays, more and more people are drawing attention to a measuring technique using UAV and SfM-MVS(Structure from Motion). Using this technique enable us to obtain the topographical information of the spatio-temporal resolution. This technique has applied to information acquisition of the initial stage of the disaster, measurement of the amount of displayment of landslide configuratio and active fault terrain, and utilizes to generate ultra high quality resolution DSM which only has a few cm resolution images. On the other hand, any of the research has tried to take a shot of a micro object, such as gravel of the riverbed, from sky and then turn it to DSM. Verification of accuracy has not yet done sufficiently as well.

This essay is going to write about the best way to take picture from sky and analyzing method on SfM-MVS, in order to turn a few cm micro objects into DSM, through various experimental set-up.

Experiment technique

Set acrylic plate as a criteria surface, and place three bricks (height respectively 6, 12, 18cm), then photographed them from the air by UAV. These bricks intrinsic merit is fixed. After, process captured images with SfM-MVS software, and produced the DSM. Display DSM on GIS, extracts their DSM of each center of the brick and the criteria plane and tried to calculate individual value. Average, maximum, minimum, and standard deviation of the extracted individual values were compared with other experimental data and intrinsic merit. I used DJI Phantom2 Vision+ as UAV, Agisoft PhotoScan Professional 1.1.2 as SfM-MVS, and ArcGIS 10.2 as GIS.

There are 6 experimental set-ups, for taking pictures from sky.

Exp.1 Take pictures from different height; 5m, 10m and 20m.

Exp.2 Change the number of photo to analyze; 10, 20, 50, 100 and 150.

Exp.3 Change the position of GCP in 4 ways, on the criteria plane and on the bricks, only on the criteria plane, only on the bricks, only on top of the bricks and the criteria plane.

Exp.4. Manually compensate the GCP which is automatically granted by SfM-MVS.

Exp.5. Change the setting of the Camera calibration on SfM-MVS, using the new faculty of PhotoScan1.1.1.

Exp.6 Change the tile angle of the camera.

Setting for Exp.5 and Exp.6 are provided on the day of experiment.

Result

The result of Exp.1 shows that DSM resolution differed by the heights; 0.6cm in ground advanced 5m, 1cm in ground altitude 10m, 2cm in ground elevation 20m. As the flight altitude got higher, the advance height of DSM on bricks and standard deviation became smaller. Also, higher the flight altitude

Keywords: UAV, SfM-MVS, Super high-resolution DSM, Accuracy validation