**Using SfM Method in UAS Photogrammetry**

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**ABSTRACT**

As the development of technology, Unmanned Aerial Vehicles (UAVs) are widely used in photogrammetry. With positioning systems consisting of GPS and IMU, the positions and attitudes of camera can be determined while taking photos. Compared with traditional aerial photogrammetry, UAVs have the advantages of more flexible and low cost, however, the engine of UAVs cannot afford heavy machines, the stability is not as good as airplane and it is difficult to take tilt-photos. That is, the photos taken by UAVs have larger rotation or tilt angle and the accuracy of calibration is also not good as traditional aerial photogrammetry. As a result, it will be complex using traditional aerial triangulation in UAVs photogrammetry.

Traditional method in photogrammetry is based on collinearity or coplanarity conditions. With known control points, the orientation parameters of camera can be computed through collinearty or coplanarity equations. After that, the 3D coordinates can be calculated by intersection. Since this method requires stable photo taking, accurate camera calibration and known ground control information, it is not the most appropriate for UAVs applications.

Apart from traditional triangulation, there are some 3D reconstruction algorithms in the field of computer vision. Some of them can be used without too many prior information. Because of the payload limitation, UAVs usually load non-metric camera, as a result, the calibration may varies with the calibration environment, software, etc.

In this study, structure from motion (SfM) algorithm is used to reconstruct 3D information with a group of simulated UAS data and a real UAS data set. To eliminate the effect of inaccurate calibration, SfM algorithm without calibration is used in this study. With essential matrix (E-matrix) and fundamental matrix (F-matrix), the relative orientation can be determined, and the 3D coordinates of scene object by can be reconstruct as well. Last but not least, the result will be compared with using traditional photogrammetry method.

**Suggested Topic: New Generation Sensors and Applications / Presenter: Chiawei Kao /**

**Preference: Poster presentation**