

# **VBS-RTK GPS Supported Positioning and Orientation for UAVS Thermal Images**

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**Abstract:** Thermal infrared images can show the temperature change of sensed scenes to provide the important information that optical image cannot do for various applications, such as disaster prevention and the environment monitoring. With the development of UAVS (Unmanned Aerial Vehicle System), the thermal infrared camera can be carried on the UAV (Unmanned Aerial Vehicle) to collect thermal images efficiently in wide area. While the UAV thermal infrared images are collected for subsequent applications, the precise position and orientation of thermal images should be determined firstly after thermal infrared camera is calibrated. However, the ground control marks for thermal infrared images are uneasy to be designed and set up to show the obvious temperature changes on images for measurements, this study will use VBS-RTK GPS technique to determine the precise trajectory of UAV in order to support the bundle adjustment for the precise positioning and orientation of collected thermal images, i.e. AT (Aerial Triangulation). Besides, in order to improve the problem of thermal infrared camera calibration and avoid the bad result of bundle adjustment, the self-calibration bundle adjustment for AT will be employed to discuss the feasibility of compensation of the imperfect non-metric camera calibrated by the close-range photogrammetric approach. Finally, this study will also discuss the relevant problems and give some suggestions from the test results.

**KEY WORDS:** VBS RTK, Thermal Images, Positioning and Orientation, Bundle adjustment, Thermal Camera Calibration.