Generation of High Resolution DSM using UAV Images

Uttam PUDASAINI, Biplov BHANDARI, Niroj PANTA, Upendra OLI
utmpudasaini@gmail.com , bionicbiplov45@gmail.com , geomatniroj@gmail.com , upendra.oli59@gmail.com

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Highly-accurate and high-resolution DSMs are highly useful in three dimensional map assessment of damages. Use of UAV in Disaster Risk Reduction (DRR) has already been proved in Indian Ocean Tsunami 2004, Typhoon Haiyan, Haiti 2013, and many other dreadful incidents. In this paper, we present a state-of-the-art photogrammetry and image processing techniques provided by different software and their algorithms for UAV.

Generating High Resolution DSM often demands highly accurate data. This project tests the utility of images acquired by a fixed wing UAV. The key element in a very high resolution images from UAV obtained with large variation in its geometry is the accurate geo-referencing. The data processing of UAV images have been carried out using the algorithms ranging from classical photogrammetry to modern Computer Vision (CV) algorithms.

2.4 cm average spatial resolution, UAV-acquired images of a sand mine at Tielt-Winge, Belgium has been used for this project. All the images have been acquired by a Sony Nex-5R digital camera mounted on a Trimble UX5 Imaging Rover. Although three software: LPS, AgiSoft PhotoScan and PIX4D were used for image processing. The identified algorithms and limitations in processing are valid for most other commercial photogrammetric software available on the market.

The accuracy assessment of DSM result from every process is done using the highly accurate ground control points as the reference data. The comparison of the DSM is performed through difference of DSM, RMSE and visual interpretation. To the nutshell SIFT algorithm and Dense Stereo matching provide good result for UAV data compared to traditional digital image matching and ultimately provided centimeter level accuracy in the output results. However for certain areas like forest and vegetation, poor results were obtained due to poor image matching.