TRUE ORTHOPHOTO CREATION THROUGH FUSION OF LIDAR DERIVED DIGITAL SURFACE MODEL AND AERIAL PHOTOS

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ABSTRACT:

Data fusion between aerial photos and LiDAR provides better estimates in forestry and ecological applications, because LiDAR mainly provides the structural information of objects and aerial photo can add spectral information to them. Without the data fusion, an accurate identification of tree crown information from two dimensional data is difficult due to shaded and shadow pixels cast on the image and image distortion. The aerial photogrammetric techniques cannot reconstruct the objects accurately in three dimensional spaces if they are not clearly visible on the photos. The conventional orthophotos, therefore, still have image distortion due to an inappropriate Digital Surface Model (DSM). LiDAR provides a more suitable surface of tree crown structure in three-dimensional spaces. This LiDAR-derived DSM could be used in conjunction with conventional photogrammetric techniques to rectify aerial photos and produce true orthophotos for each image. The existence of different perspective points from the use of multiple images results in different illumination and shadows cast on the DSM from the angle between the sun and the camera. In previous studies, a Z-buffer algorithm was applied for the occlusion detection and compensation. However, the technique was computationally intensive. In this study, the camera view and sun-oriented hillshade were generated using the LiDAR-derived DSM. The hillshade surfaces distinguished between the exposed and the occluded side of the DSM during the composition process of respective true orthophotos. This technique constituted a simpler approach and is applicable to data fusion between LiDAR and multispectral imagery to make an orthographically rectified image.

TOPIC: Lidar and laser scanning
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