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OCCLUSION DETECTION BY HEIGHT GRADIENT FOR TRUE ORTHOPHOTO GENERATION, USING LIDAR DATA

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Abstract. Nowadays, the use of orthophoto in urban areas has become common. It is known that in most parts of urban areas there are a great number of tall buildings which can cause occlusion regions during image acquisition. These occlusions appear both in aerial images and in the orthophotos generated from these images. It happens due to perspective projection of the imaging sensor, and also if digital models that represent only relief is used in the orthorectification process, instead of the Digital Surface Model (DSM) that takes into account the relief and all objects on the surface. Considering this context, the aim of this article is to introduce an alternative procedure for occlusion detection in aerial images, using LiDAR (Light Detection And Ranging) data, aiming at the generation of true orthophotos. The presented method for occlusion detection is based on height gradient computation applied to a DSM of the region, instead of the building model that is considered in some approaches. These height gradients computed in radial directions are important for the identification of the beginning of the occlusions in these directions. The final limits of the occlusions are obtained from the projection of these initial points in the DSM. To evaluate the proposed method, both simulated and real data were considered. The simulated data correspond to an ideal urban area, without noise, and this experiment was only used to validate the implementation method. The real data set is composite by digital aerial images and LiDAR data. The LiDAR data available has the average density of 8 points/m^2. As preliminary results, the occlusion areas were detected and highlighted in the orthorectified images. To accomplish the evaluation of the proposed method, besides a visual analysis, a numerical evaluation based on index of completeness was computed, using as reference a manual detection of occlusion. It is possible to observe the potential of the proposed occlusion detection method, although improvements are necessary in the proposed method.

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