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Terrestrial Laser Scans to Assess Aerial LiDAR Data

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Abstract : The DEMs quality may depend on several factors such as data source, capture method, processing type used to derive them, or the cell size of the DEM. The two most important capture methods to produce regional-sized DEMs are photogrammetry and LiDAR; DEMs covering entire countries have been obtained with these methods. The quality of these DEMs has traditionally been evaluated by the national cartographic agencies through punctual sampling that focused on its vertical component. For this type of evaluation there are standards such as NMAS and ASPRS Positional Accuracy Standards for Digital Geospatial Data. However, it seems more appropriate to carry out this evaluation by means of a method that takes into account the superficial nature of the DEM and, therefore, its sampling is superficial and not punctual. This work is part of the Research Project "Functional Quality of Digital Elevation Models in Engineering" where it is necessary to control the quality of a DEM whose data source is an experimental LiDAR flight with a density of 14 points per square meter to which we call Point Cloud Product (PCpro). In the present work it is described the capture data on the ground and the postprocessing tasks until getting the point cloud that will be used as reference (PCref) to evaluate the PCpro quality. Each PCref consists of a patch 50x50 m size coming from a registration of 4 different scan stations. The area studied was the Spanish region of Navarra that covers an area of 10,391 km2; 30 patches homogeneously distributed were necessary to sample the entire surface. The patches have been captured using a Leica BLK360 terrestrial laser scanner mounted on a pole that reached heights of up to 7 meters; the position of the scanner was inverted so that the characteristic shadow circle does not exist when the scanner is in direct position. To ensure that the accuracy of the PCref is greater than that of the PCpro, the georeferencing of the PCref has been carried out with real-time GNSS, and its accuracy positioning was better than 4 cm; this accuracy is much better than the altimetric mean square error estimated for the PCpro (<15 cm); The kind of DEM of interest is the corresponding to the bare earth, so that it was necessary to apply a filter to eliminate vegetation and auxiliary elements such as poles, tripods, etc. After the postprocessing tasks the PCref is ready to be compared with the PCpro using different techniques: cloud to cloud or after a resampling process DEM to DEM.

Keywords : data quality, DEM, LiDAR, terrestrial laser scanner, accuracy
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