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Simultaneous colour visualizations of multiple ALS point cloud attributes for land cover and vegetation analysis

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LIDAR point clouds hold valuable information for land cover and vegetation analysis, not only in the spatial distribution of the points but also in their various attributes. However, LIDAR point clouds are rarely used for visual interpretation, since for most users, the point cloud is difficult to interpret compared to passive optical imagery. Meanwhile, point cloud viewing software is available allowing interactive 3D interpretation, but typically only one attribute at a time. This results in a large number of points with the same colour, crowding the scene and often obscuring detail.

We developed a scheme for mapping information from multiple LIDAR point attributes to the Red, Green, and Blue channels of a widely used LIDAR data format, which are otherwise mostly used to add information from imagery to create "photorealistic" point clouds. The possible combinations of parameters are therefore represented in a wide range of colours, but relative differences in individual parameter values of points can be well understood. The visualization was implemented in OPALS software, using a simple and robust batch script, and is viewer independent since the information is stored in the point cloud data file itself. In our case, the following colour channel assignment delivered best results: Echo amplitude in the Red, echo width in the Green and normalized height above a Digital Terrain Model in the Blue channel. With correct parameter scaling (but completely without point classification), points belonging to asphalt and bare soil are dark red, low grassland and crop vegetation are bright red to yellow, shrubs and low trees are green and high trees are blue. Depending on roof material and DTM quality, buildings are shown from red through purple to dark blue. Erroneously high or low points, or points with incorrect amplitude or echo width usually have colours contrasting from terrain or vegetation. This allows efficient visual interpretation of the point cloud in planar, profile and 3D views since it reduces crowding of the scene and delivers intuitive contextual information. The resulting visualization has proved useful for vegetation analysis for habitat mapping, and can also be applied as a first step for point cloud level classification.

An interactive demonstration of the visualization script is shown during poster attendance, including the opportunity to view your own point cloud sample files.