Classify Surface Points Routine

TerraScan for CONNECT, versions 016.022 and above

GeoCue Group Support
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Revision 1.0

Photogrammetric point clouds are notoriously noisy, very dense, and generally lack points located underneath vegetation. Echo information is non-existent and surface roughness are not as useful for ground classification with these point clouds. Point clouds from low quality LIDAR sensors exhibit some similar characteristics. Hence, a different approach is needed (Figure 1).

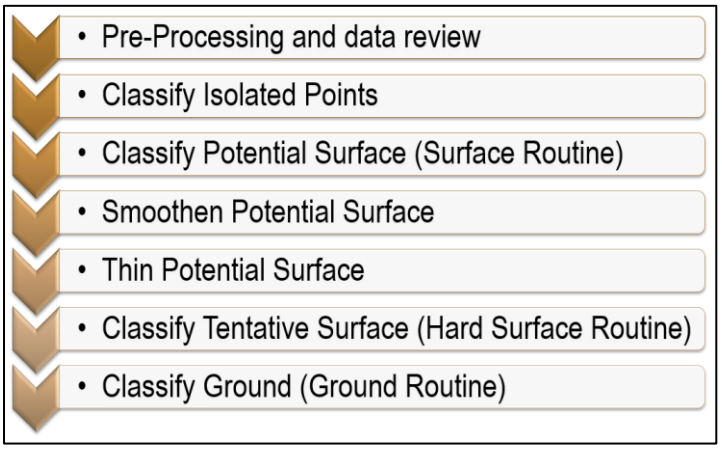

Figure 1: Photogrammetric Point Cloud Workflow

In general, it is a good first step to disregard isolated points because they are never usable and almost always not meaningful (i.e. noise). This can be accomplished using the 'Classify isolated points' routine which reduces noise to some degree.

Next, a potential surface needs to be identified within this still relatively noisy point cloud. One of the most used surface classification routines is the generic 'Ground' classification. This routine iteratively creates a triangulated surface model beginning with low points on the surface. This routine is particularly useful for traditional airborne LIDAR, but not very suitable for these noisy datasets. Its bottom-up logic will be compromised by the noisiness in the data resulting in a potential surface that is not an accurate depiction of the real world. An alternative to the traditional 'Ground' classification routine is the 'Hard surface' Routine. This is based on a planar fit algorithm. The Hard Surface routine classifies the dominant, median points of a surface which provides for better performance on horizontal paved surfaces and is most often used for mobile LIDAR datasets. This tool would work decently for horizontal or fairly flat surfaces within this dataset, but would have a difficult time classifying the median surface of natural terrain and vertical features.

Starting with TerraScan version 016.022 for CONNECT, this planar fit classification idea was expanded to other applications in the form of the 'Surface points' routine. This classification tool enables users to classify points that fit to a planar or rounded surface in any direction, be it: a road, a parking lot, or the sides or rooves of buildings. This routine plays an important role in the pre-classification of not only the ground, but also the non-ground features in these types of datasets. Therefore, the Classify Surface Points routine is the second step in the photogrammetric point cloud workflow (Figure 1). The key

setting for this tool is the Tolerance level (Figure 2), which defines the offset from the median surface that points are to be included in the classification. This offset is given in the units of the data.

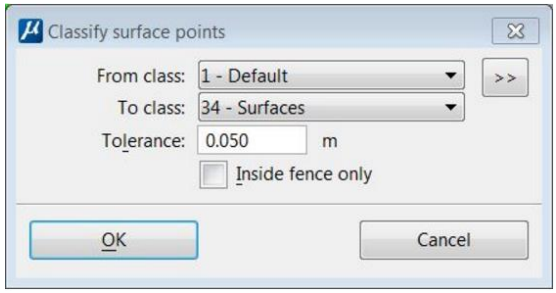

Figure 2: Classify surface points dialog

The results of using this tool is exemplified in Figure 3 below. The magenta points in Figure 3A shows the median points representing a roof and the side of a building. Figure 3B shows the median points representing the extremities of a deciduous tree. Figure 3C shows the outline of a car within the noisy point cloud. Figure 3D shows the median surface of a road with similar results as one would expect from the Hard surface routine. All this was accomplished with one classification step using the 'Surface' points routine.

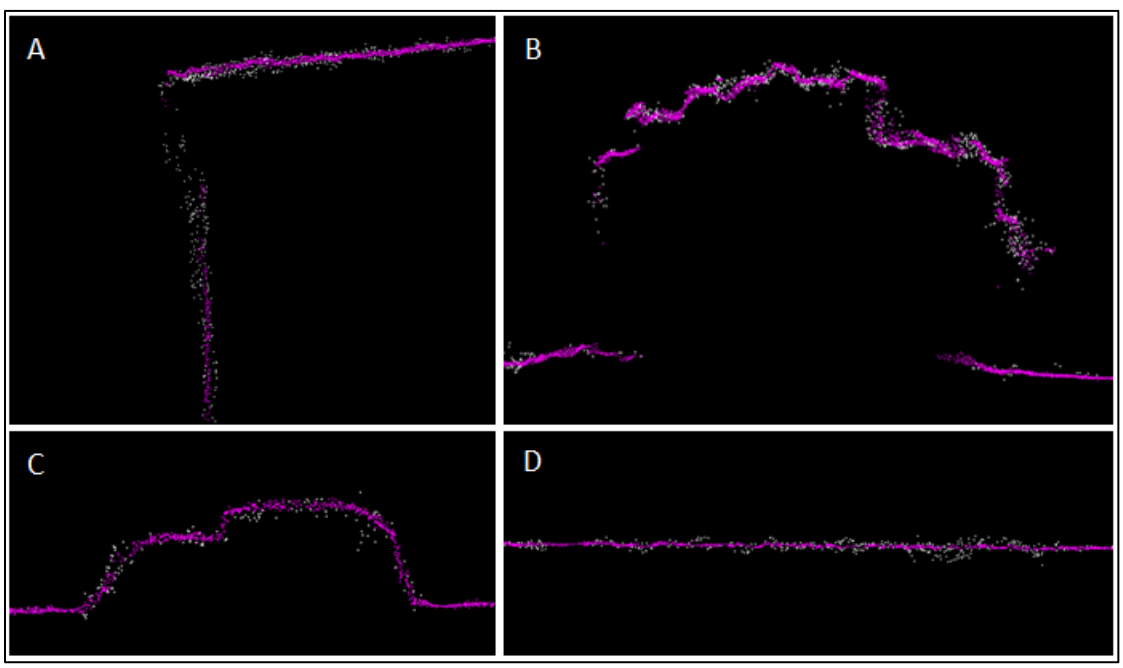

Figure 3: Results of Surface Points Classification

Having identified those points that best represent a potential surface it is best to '[Smoothen points](#)', within the noise tolerances, in an attempt to modify the XYZ positions of the potential surface points to both horizontally and vertically produce a more homogenous representation of the surfaces present. The use of 'Classify isolated points', 'Classify surface points', and the 'Smoothen points' effectively minimizes the noise issue inherent in this kind of data. For photogrammetric point clouds, the point

density can be an issue as it increases the processing times significantly with minimal difference on the end result. Hence, one may use the 'Thin points' routine to reduce the unnecessary density by classifying-out points that fall close to each other or within a grid cell of a given size.

With the dataset now closer in character to a standard airborne LIDAR dataset, the final surface classifications can be conducted using typical TerraScan routines, such as the hard surface and ground classifications, followed by the classification of above ground features such as buildings, trees, cars, poles, etc., using the Classify Groups by Best Match routine to produce a well classified dataset.