

TerraScan: Find Poles

TerraScan, versions 017.018 and above



GeoCue Group Support

5/8/2018

Revision 1.0

Introduction

The “[Find Poles](#)” tool was introduced to the [Railroad Tool Box](#) with the release of TerraScan v017.018. While originally intended to automatically detect pole type objects along roads and railroads, which were collected using mobile or high-density airborne LIDAR data, this tool is designed in a manner where it can be used to detect a variety of objects that can be defined. The limitation will be the resolution of the object which is dependent upon the density of the collected data. In other words, this tool can be considered an object detection tool rather than exclusively a pole detection tool.

Find poles can be used to identify the objects, classify the points to that object class, and place cells representing those objects. It does this by comparing groups of points with object templates and assessing the wellness-of-fit. If the fit is good, then the classification and vector placement will occur.

Point Cloud Preparation

Before this tool can be used, there are a few preparatory steps that must be accomplished. Some are similar to those steps one would take for any classification or feature extraction process, such as the LIDAR data needs to be [calibrated](#), [overlap cut](#), and ground points classified. Additionally, the above ground points need to have group numbers [assigned](#) for those points in which you’d like to detect the objects. The [grouping process](#) requires other routines, such as [Compute Distance](#) and [Classify by Distance](#) be executed on the source points so that it can group points together based on spatial relationships and assign a group number as a point attribute. Once grouped, the classification of points can be performed on a group basis instead of on an individual point basis. The goal here is to have a solitary group per object for best results from the Find Poles routine, which can be difficult in some situations as vegetation encroaches on the objects of interest. It might become necessary to manually correct the assigned groups using the [Create Point Group](#) or [Merge Point Groups](#) tools.

In addition to these required classification steps, it can be useful for performance reasons to restrict the number of groups that the system must examine during the object detection process. The [Classify Groups by Centerline](#) routine using the mobile trajectory for reference (after it has been [drawn](#) into the DGN) can greatly reduce the number of groups to be considered when searching for poles, resulting in faster processing times.

Tool Preparation

For the automatic object detection to occur, sample objects need to be defined. The easy way to do this is to find a good example of the desired object(s) in the lidar data. In the case of a pole object, it’s important that the sample be rotated vertical before saving the point cloud or digitizing it. The points representing that object should then be saved out as an xyz file using object coordinates and placed in the Object Library folder, typically “C:/Terra64/Object_Library”. The detection process will then compare the point groups in the data with this sample point cloud to assess. The software will compare these point groups with sample object point groups.

If you wish for vectors to be placed at the locations of these objects, then one must [create](#) object templates. One starts by using the same example used to generate the point cloud sample and manually digitizing it using MicroStation tools. The sample vectors are then saved as a cell and added to TerraScan’s Object Library (Figure 1).

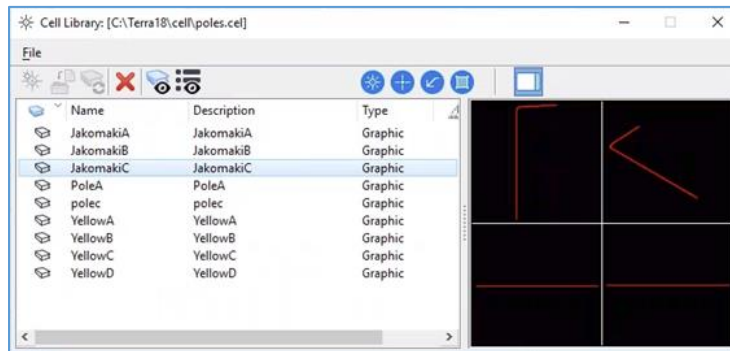


Figure 1: Cell Library containing cells representing street lights pole types. The one selected is a light pole with a single arm.

Detection

The first step in using the Find Poles tool is to activate the desired object template(s) in the Object Library section of the TerraScan [Settings](#) so that the tool knows which objects to seek out (Figure 2). This simplifies the tool interface and allows many object templates to be examined at the same time. To place the cell representing the object be sure to attach the cell library in the Cell Library window of the current MicroStation session.

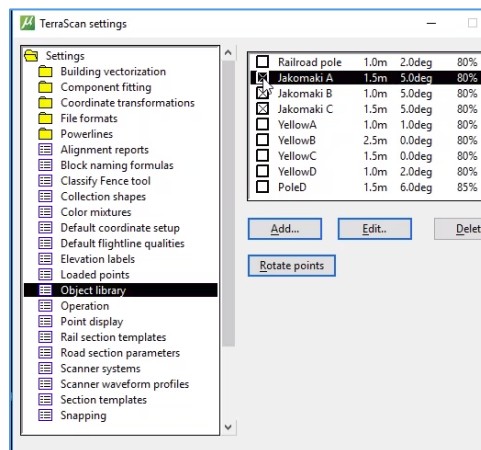


Figure 2: Select the cells that you wish to detect and place

Depending on the object definition, one may select an alignment element (i.e. the drawn trajectory) prior to running Find Poles, to assist in the detection of objects whose orientation is perpendicular to that element. For example, a street light that has a single arm which is always extended toward the road. This will speed up the detection process because it limits the number of orientation checks to be done per object.

The tool's **tolerance** parameter is important (Figure 3), as it defines how tight a point group must fit the template. This can be set to allow for some variance between the template and the group being assessed. For dense mobile data, a value of 0.1m is recommended. The lower the value, the better the results and the longer processing time. A larger value is more suitable for less dense data, but can also result in the detection of false positives.

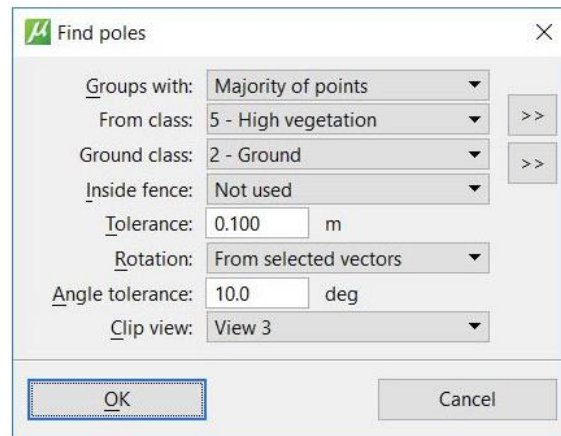


Figure 3: Find Poles dialog

The **Rotation** parameter is also important (Figure 3) if an alignment element is used, allowing for free rotation, or to restrict the rotation to within an angular tolerance of the alignment element.

The Find Pole tool works best when detecting objects, such as poles, along road or rail tracks that have been driven during the data collection. In doing so, all scanners of a system should see a pole from the same side. Thus, most of the points are on the sides of the pole facing towards the road. Poles on side roads/rail tracks, or on bridges away from the data collection path are then not detected automatically as they will not fit the sample point clouds.

Results

After running the tool, the groups that represent the objects will be classified and a vector will be placed based on the object template (Figure 4). The vector is fit to each group in height, and rotated around the vertical axis to best match the point cloud. There is currently no adjustment of any of the components of the cell. For example, if the pole is leaning, the vertical structure is not rotated about a lateral axis to better fit the point cloud, nor would an arm on the pole be rotated to fit an arm that hangs on a different angle than the sample.

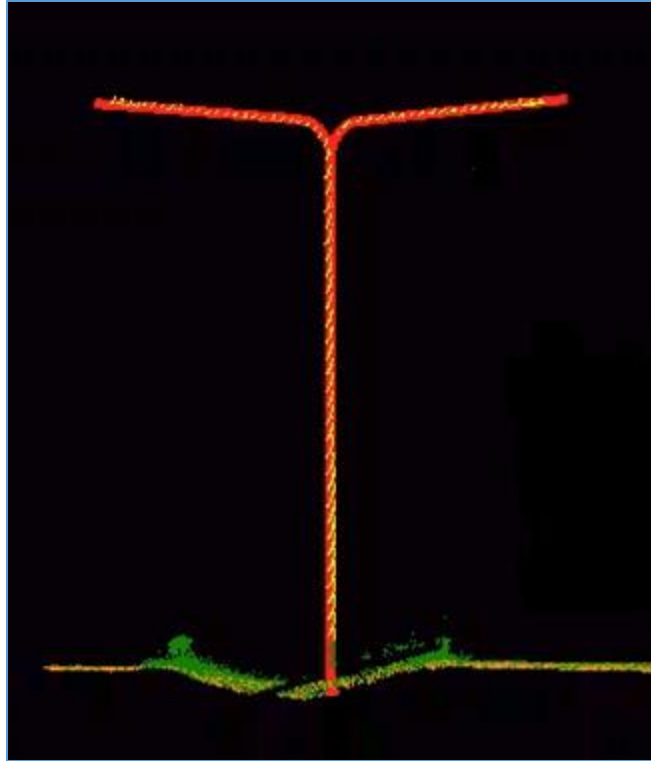


Figure 4: An example of a resulting pole classification (yellow points) and cell placement (red vector)

The Find Pole tool will prove to be a great support to feature digitization in projects that require object detection. In its initial implementation it already satisfies many needs in the industry. We expect there will be additional tools and features added soon to assist in reporting some of the information determined during the detection process, such as the offset from vertical of the point group or the number of objects detected. If you have any questions on this new tool or associated workflow, please do not hesitate to contact us at support@geocue.com.