Tools, Tips, and Workflows

Automatic Building Extraction

BSAU | AWG

Andrew Walker
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Revision 1.0

Last month's tool tip discussed using the Planar Point Filter to filter buildings from point cloud data. This month's tool tip discusses building extraction, essentially the next step after creating a building filter. The **Point Group Tracing and Squaring** Point Cloud Task will allow you to further refine the point cloud data classified as building and extract the building outlines into shapefiles.

With the building points already filtered, you now want to set up a new **Point Group Tracing and Squaring** Point Cloud Task. (Figure 1)

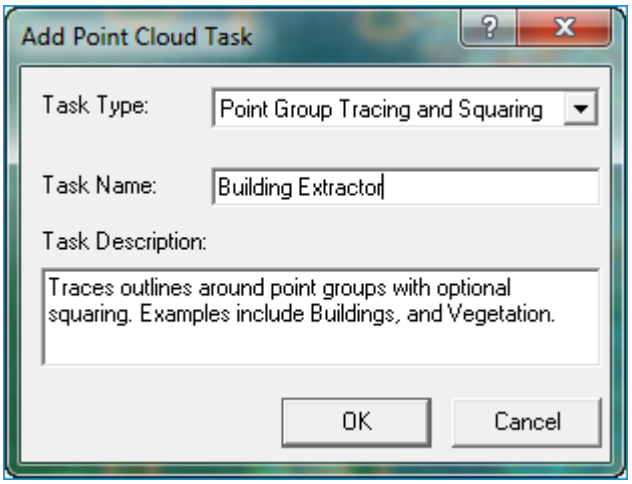

Figure 1: Point Group Tracing and Squaring Task

In this task, you already have the **Boundary Trace Class** set for **Building** (Figure 2), so any points classified as building will be outlined when you execute this task. Setting the class for other objects will result in those objects being outlined.

QCoherent Software LLC
www.LP360.com
256-461-8289 (phone)
256-461-8249 (fax)

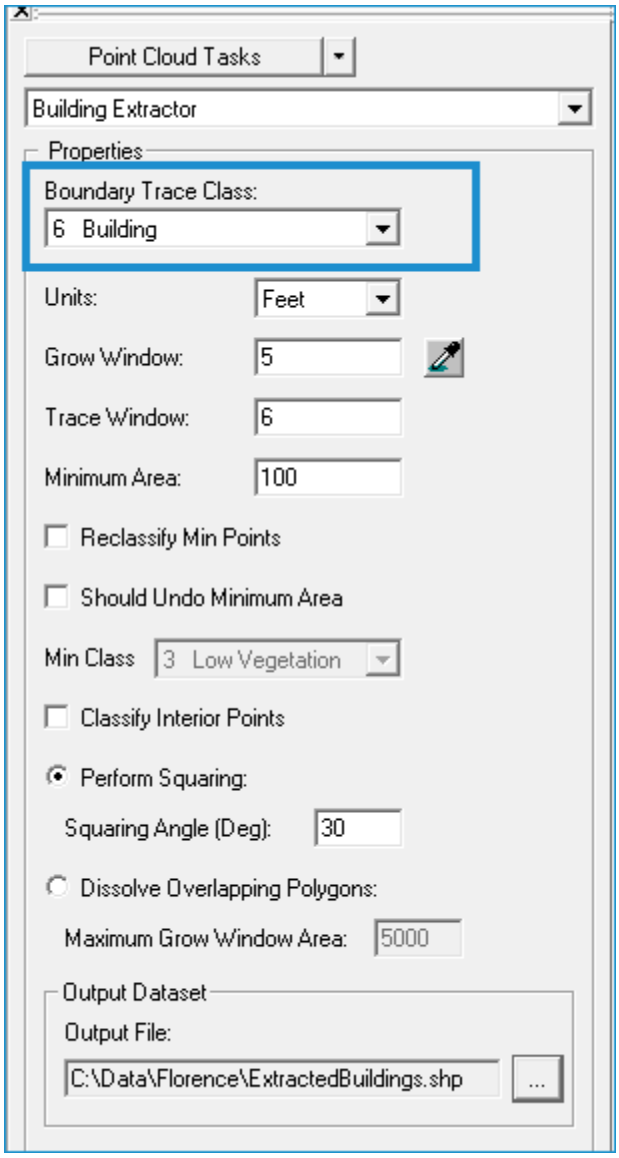

Figure 2: **Point Group Tracing and Squaring** Properties

Set which units (**Feet** or **Meters**) you will use for the parameters that define the building outlines.

The dropper tool (Figure 3) can be used as a guide to draw a polygon around a focal location in the map to calculate point spacing for the buildings inside the area. This value will populate the **Grow Window** value. The surface growing process will group building points within a distance specified by this value. The polygon you draw will also help you define the **Trace Window** (another moving window that traces a ground set of points). This value should not be less than the ground sample distance or the **Grow Window** value. The values added by the dropper tool may need slight adjustments, as it is meant to be a guide to help determine the values needed.

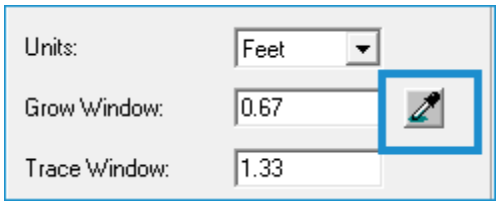

Figure 3: Dropper Tool outlines the focal point to calculate point spacing and ground set of points

The **Minimum Area** helps you to remove features that are too small to be buildings. Objects that are smaller than the value you provide will not be included in the output file.

> Note: Remember to click **Apply** before executing the task to see parameter updates in the map and Preview window.

The Preview windows in Figures 4 and 5 below show smaller objects that were removed as a result of increasing the **Minimum Area** value.

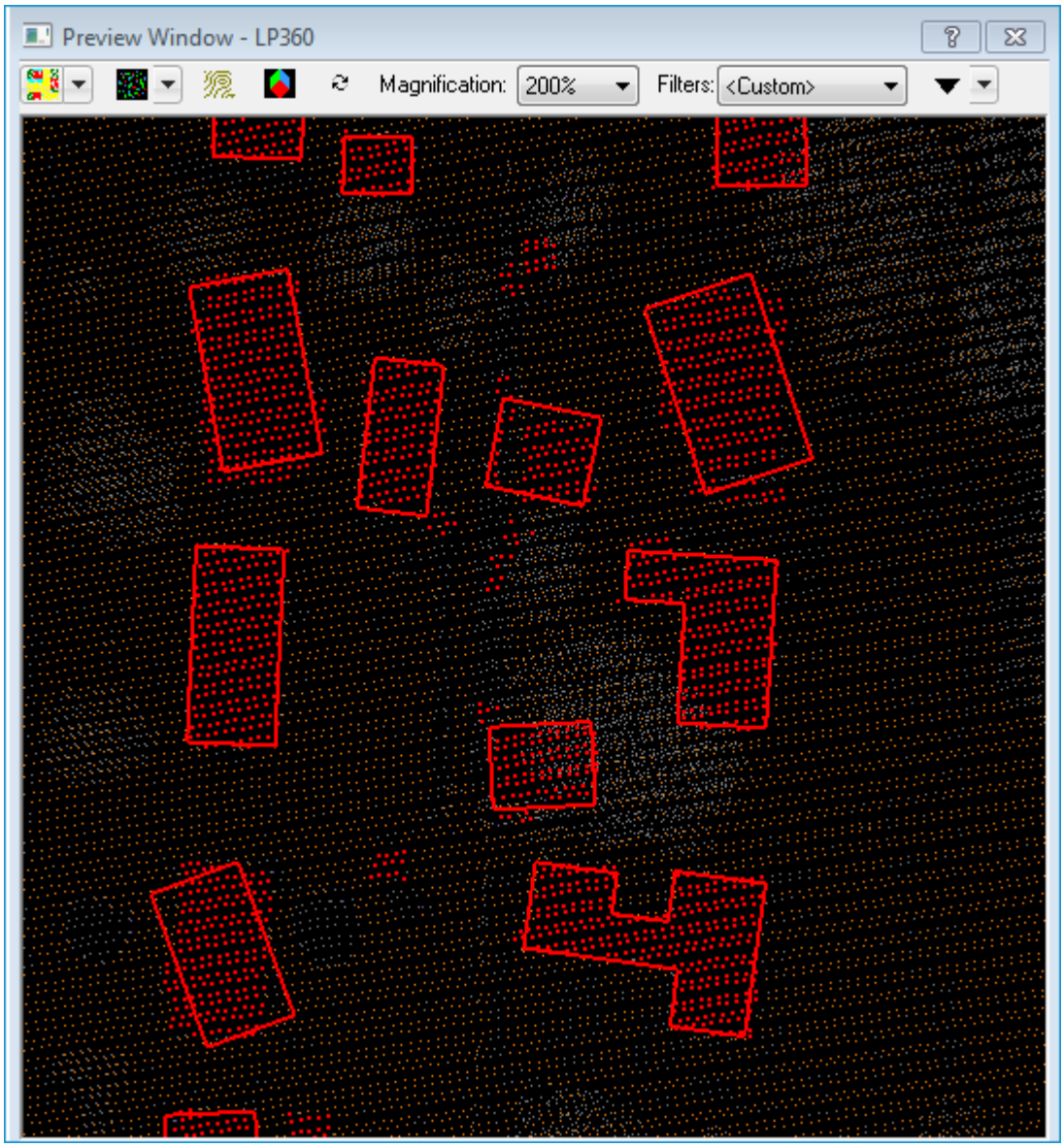

Figure 4: Preview Window showing preliminary tracing of buildings

Figure 5: Tracing around objects smaller than specified **Minimum Area** have been removed

When you select **Should Undo Minimum Area,** the objects that are removed as a result of being smaller than the **Minimum Area** can then be reclassified. Here, we reclassify them to **Unclassified**, thus removing all traces of incorrect classifications and footprints. (Figures 6 and 7)

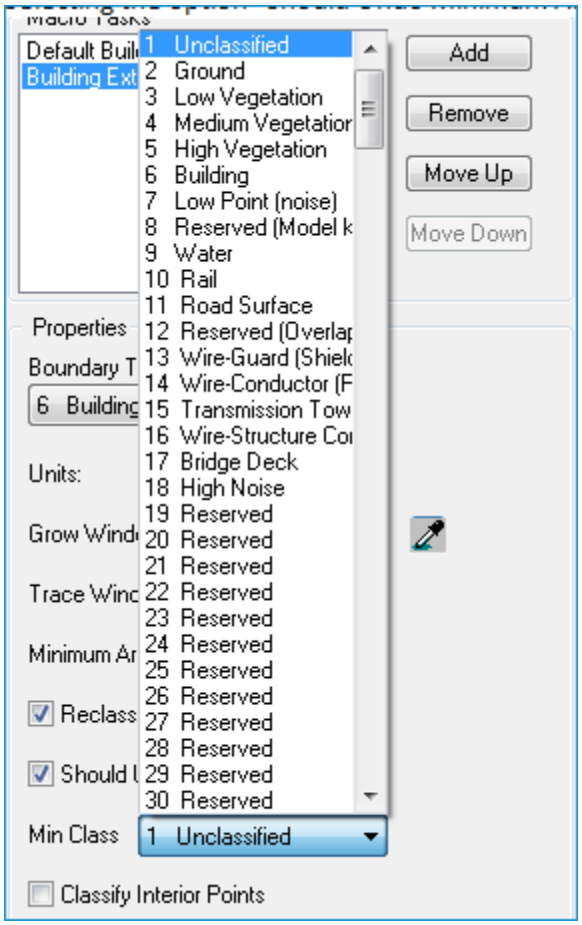

Figure 6: Classify objects that were incorrectly classified to **Unclassified**

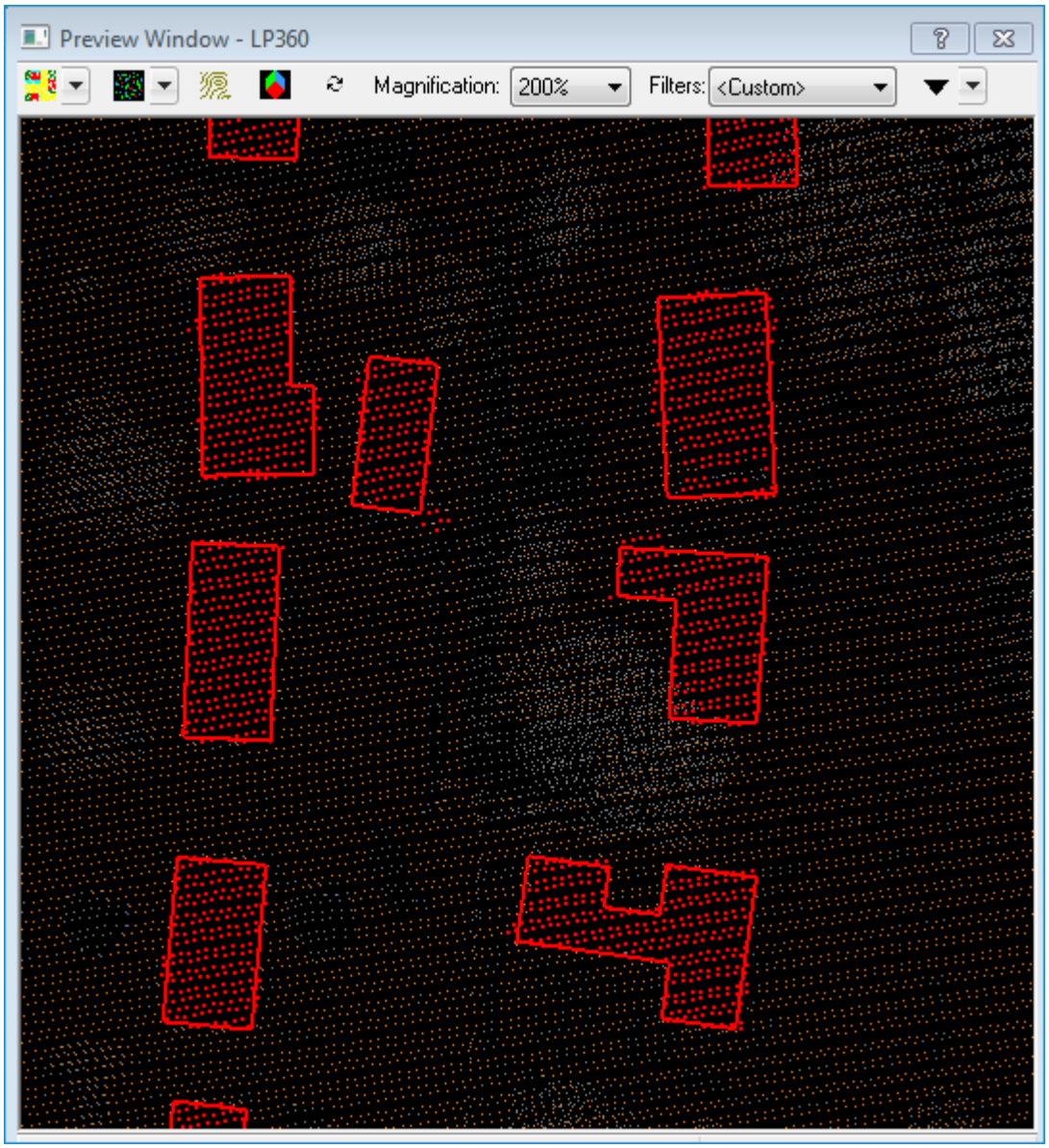

Figure 7: Incorrectly Classified Objects No Longer Displayed as Buildings

You may need to **Classify Interior Points** to ensure that all points inside the footprints are classified as buildings.

Next, you can choose to **Perform Squaring** (Figure 8) on the traced outlines to smooth any jagged edges or corners and to ensure that the outlines surround the correct points. Entering a **Squaring Angle** between 30 and 45 degrees will typically achieve the best results. The default value of 30 works in most cases. You will want to evaluate the results of changing the **Squaring Angle** carefully, as too large an angle may result in removing corner edges, and too small an angle may result in more and shorter edges and missing corners.

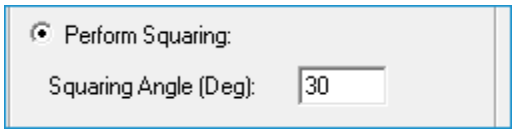

Figure 8: Perform Squaring Option

Figure 9 below shows a traced outline with too large a **Squaring Angle**, with some points outside of the boundaries that should be included. Figure 10 shows a corrected **Squaring Angle**, with the boundaries shifted to include the correct points.

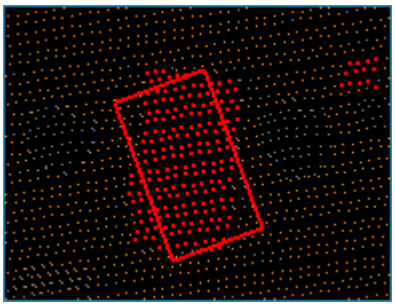
Figure 9: Too large **Squaring Angle**

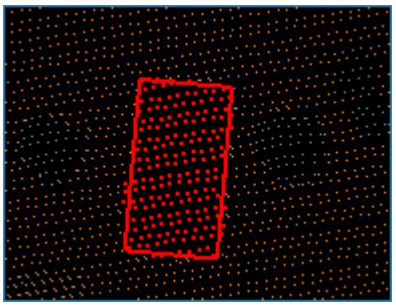
Figure 10: Correct **Squaring Angle**

The **Output Dataset** section is where you set the location and name of your output shapefile.

Last, use one of the **Execute Point Cloud Task** tools, such as **Execute by Envelope**  to define the area on which to perform building extraction, and then observe the footprints in the map and the created shapefiles listed in the TOC. (Figure 11) The shapefile listed with the filename you provided contains the extracted building footprints before the Squaring Angle is applied. The filename with the _sqr extension contains the footprints with the Squaring Angle applied.

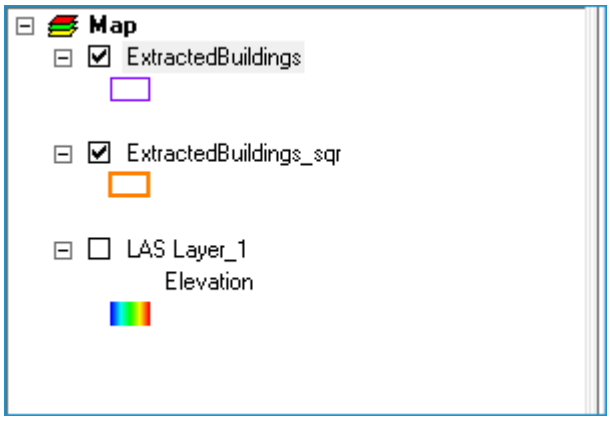

Figure 11: Resulting Shapefiles

> Note: For convenience, the **Default Building Filter/Extractor** macro combines both tasks of filtering and extracting buildings. It is delivered with LP360 and is found in the list of Point Cloud Tasks. (Figure 12)

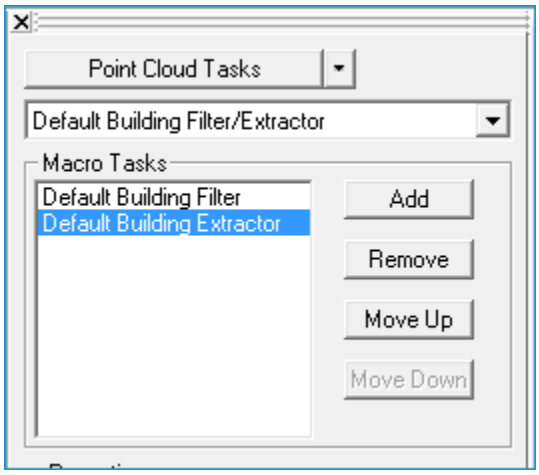

Figure 12: Point Cloud Tasks Menu