# LiDAR Strip Adjustment

**Objective:**

Learn how to separate overlapping LiDAR strips (time stamped laser points) of airborne/mobile data, classify disturbing objects, and run global registration to adjust strips using VRMesh. The following instructions will guide you step-by-step through the process of LiDAR strip adjustment.

**Step 1: Separate LiDAR strips**

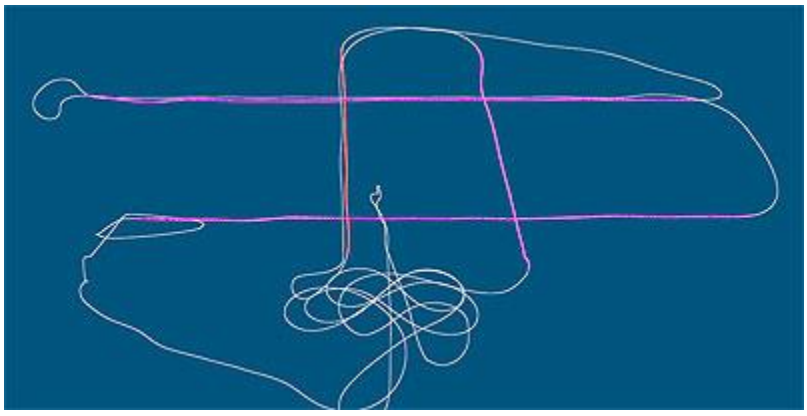
Click the **Separate LiDAR Strips** command  in the Registration menu. A working panel is shown in the Parameter Window, which guides you through the following steps:

1. **Import Trajectory**

   Click the [Import Trajectory] button to load a trajectory file. The supported file types are: SBET format (*.out) and ASCII format (*.txt).

2. **Split Trajectory**

   Press the [Pick Path] button and click two points on a trajectory to define a valid path. We picked four flight paths in this example.



   Note: The [Delete by Polygon] command allows you to draw a polygon to surround an area, and select [Apply] in the right-click menu to delete the inside parts of the selected trajectories. Hold [Ctrl] and select [Apply] to delete the outside parts of the trajectories.

3. **Separate Point Clouds (Strips)**

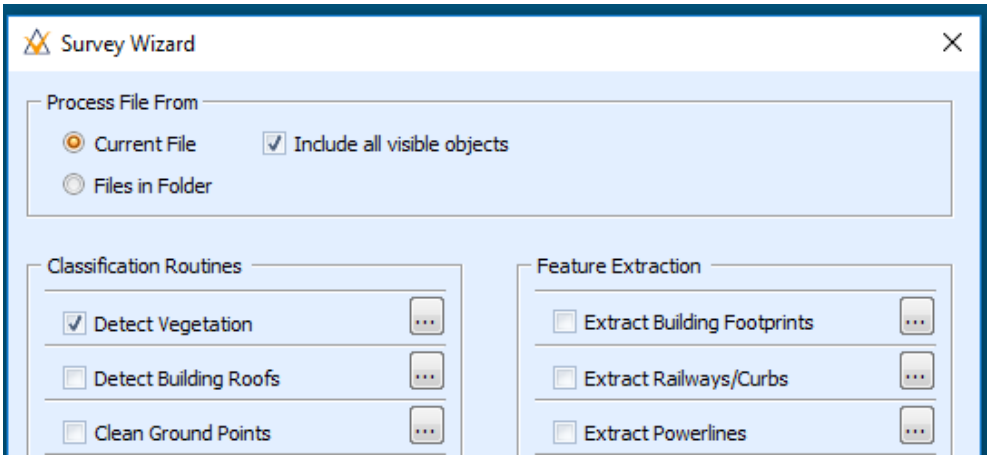
   Attach the original point cloud file (*.las/*laz) with correct time stamp, set an output folder to hold LAS files containing separated strips, and click the [Separate Point Clouds] button to separate strips based on the selected trajectories.

**Step 2: Index and attach the separated strips to project**

Click the **Index/Attach** command in the File menu, or click the icon  in the Quick Access Toolbar. The Index-Attach working panel appears in the Parameter Window. Press the [Index&Attach] button and select all the LAS files containing the separated strips to load into the current project.

**Step 3: Detect vegetation (Optional)**

You may classify each LiDAR strip to avoid some noisy objects on the surface such as vegetation to disturb the strip adjustment. The **Survey Wizard** in the Classification menu allows you to classify multiple files in a batch process.

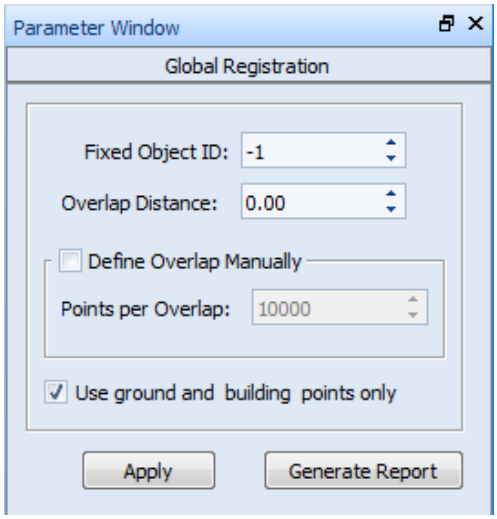



**Step 4: Registration**

Click the **Global Registration** command  in the Registration menu to perform the LiDAR strip adjustment. It fixes the misalignment between the laser scanner and the inertial measurement unit (IMU) and works well on unstructured point clouds. We set the *Fixed Object ID* = -1, *Overlap Distance* = *0*, and let the program automatically find the overlapping surfaces. Because vegetation has been

classified in this example, we select the [Use ground and building points only] option to let the program use ground and building points for registration.




Once the registration process is done, Press the [Generate Report] button to export the result to a PDF file. You can view the improvement of mean and stand deviation on each strip and the total improvement after adjustment. The registration report is shown below:

**Registration Report**

| Object | | Before Registration | | | After Registration | | | Improvement | |
|---|---|---|---|---|---|---|---|---|---|
| ID | Overlaps | Mean | Deviation | Variation% | Mean | Deviation | Variation% | Mean% | Deviation% |
| 0 | 1555 | 0.1284 | 0.1085 | 84.4993 | 0.0442 | 0.0352 | 79.6255 | 65.5527 | 67.5396 |
| 1 | 1098 | 0.1558 | 0.1095 | 70.3047 | 0.0521 | 0.0447 | 85.6822 | 66.5331 | 59.2130 |
| 2 | 1314 | 0.1215 | 0.1172 | 96.4697 | 0.0388 | 0.0305 | 78.6672 | 68.0597 | 73.9539 |
| 3 | 1003 | 0.1079 | 0.0987 | 91.5081 | 0.0430 | 0.0342 | 79.5155 | 60.1109 | 65.3386 |
| *Total Average:* | | *0.1284* | *0.1085* | | *0.0446* | *0.0362* | | *65.3001* | *66.6707* |

The following are the statistic formulas for generating a registration report:

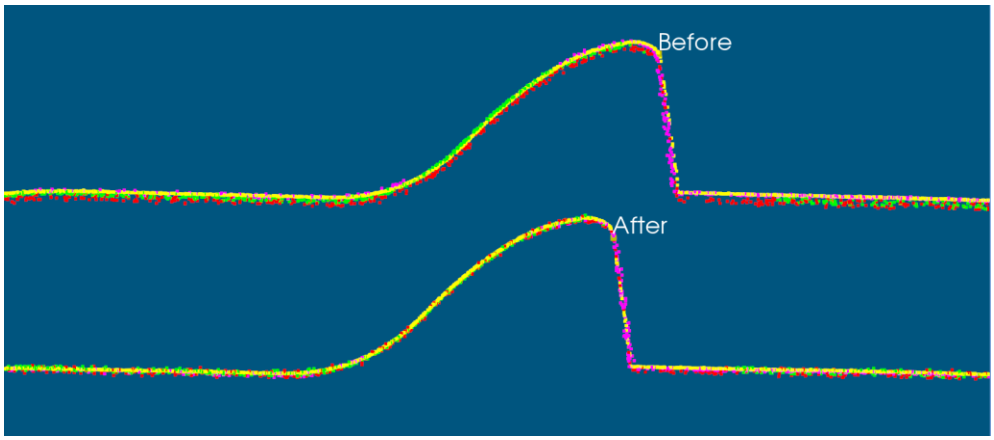
| | |
|---|---|
| Mean | $\bar{A} = \Sigma Ai \ / \ N$ |
| Deviation | $D = sqrt\ (\ \Sigma(Ai - \bar{A})^2 / N\ )$ |
| Variation | $V = D \ / \ \bar{A} * 100\%$ |
| Improvement | $I = (Old - New) \ / \ Old * 100\%$ |

The value of Mean is the average distance from one strip to other strips.

**Step 5: Compare section profiles before and after registration**

You can place a work plane to a desired location, and use the **Create Section** command  in the Mesh Editing menu to generate section profiles before and after registration at the same location for comparison. The result is shown below. The screenshot can be exported as a PDF file.




## End of Tutorial