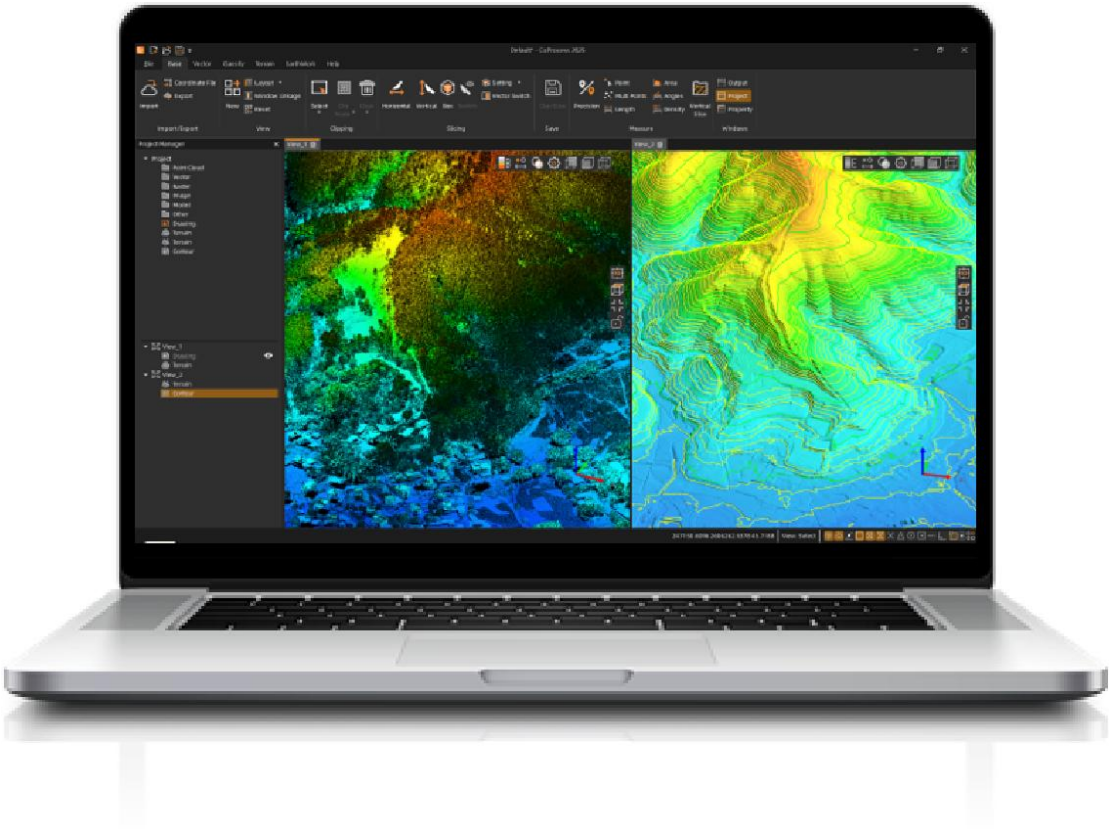
CoProcess Software

User Manual



M3D | May 2026

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Introduction



Figure:Software Installation Interface

1 Software Installation

1.1Software Installation

1.1.1 Installation Steps

① Double-click the software installation package to pop up the software ins tallation interface.

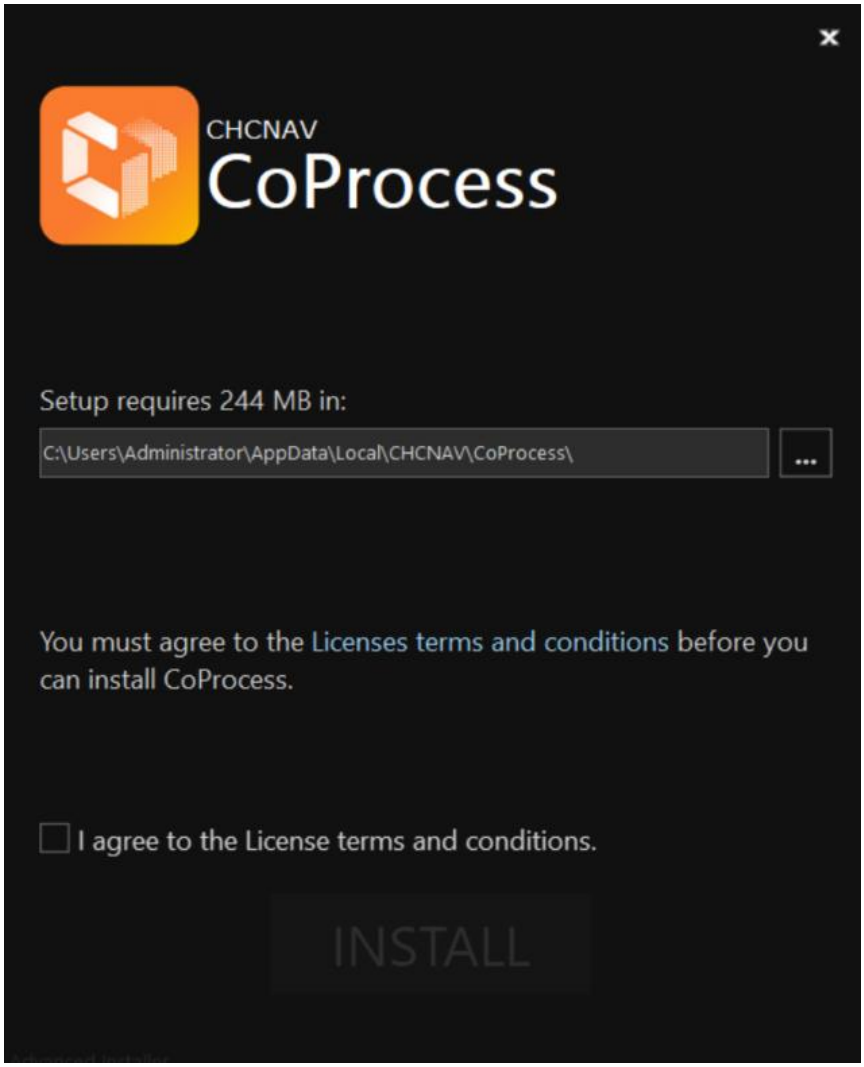


Figure:Installation Interface

② Set the installation path (usually keep the default), check "I agree to the license terms and conditions", and click "Install".

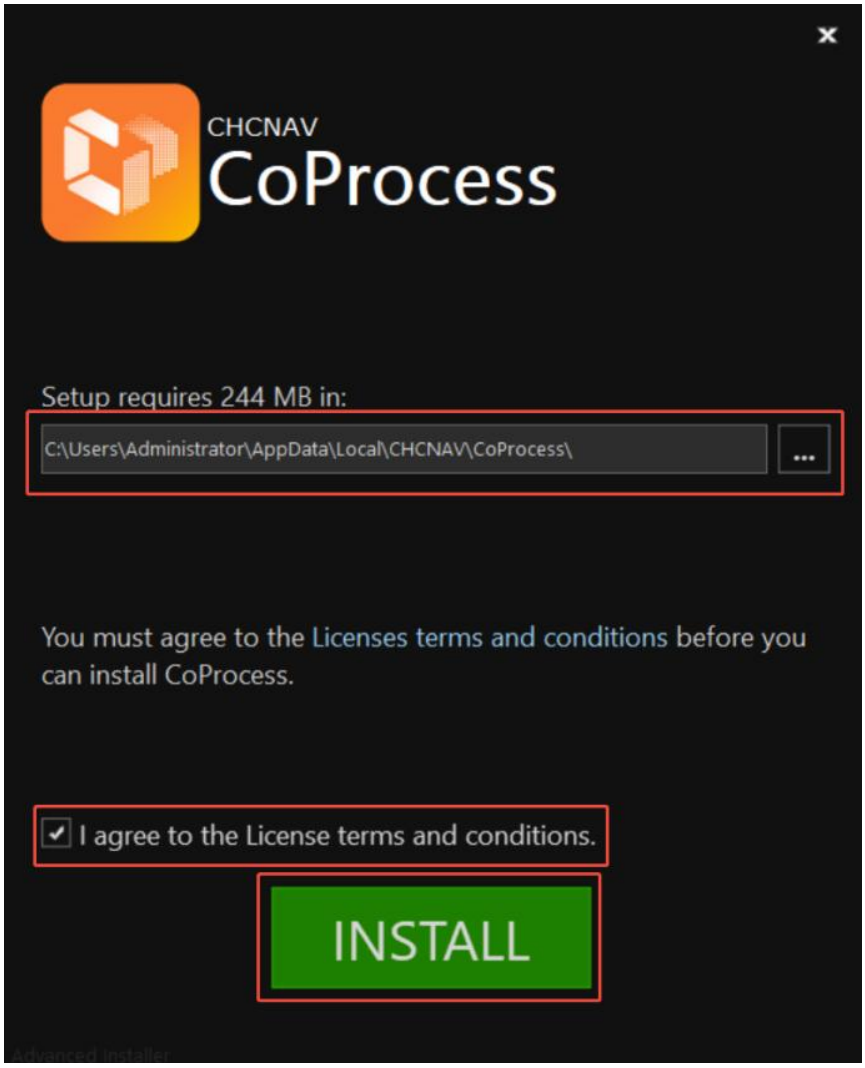


Figure:Set Installation Path



Figure:Waiting for Installation

③ After waiting for the program installation process to end, the License Manager installation interface will pop up.



Figure:License Manager Installation Interface

④ Set the installation path (usually keep the default), check the box "I agree to the license terms and conditions", then click "INSTALL" and wait for the program installation process to complete.

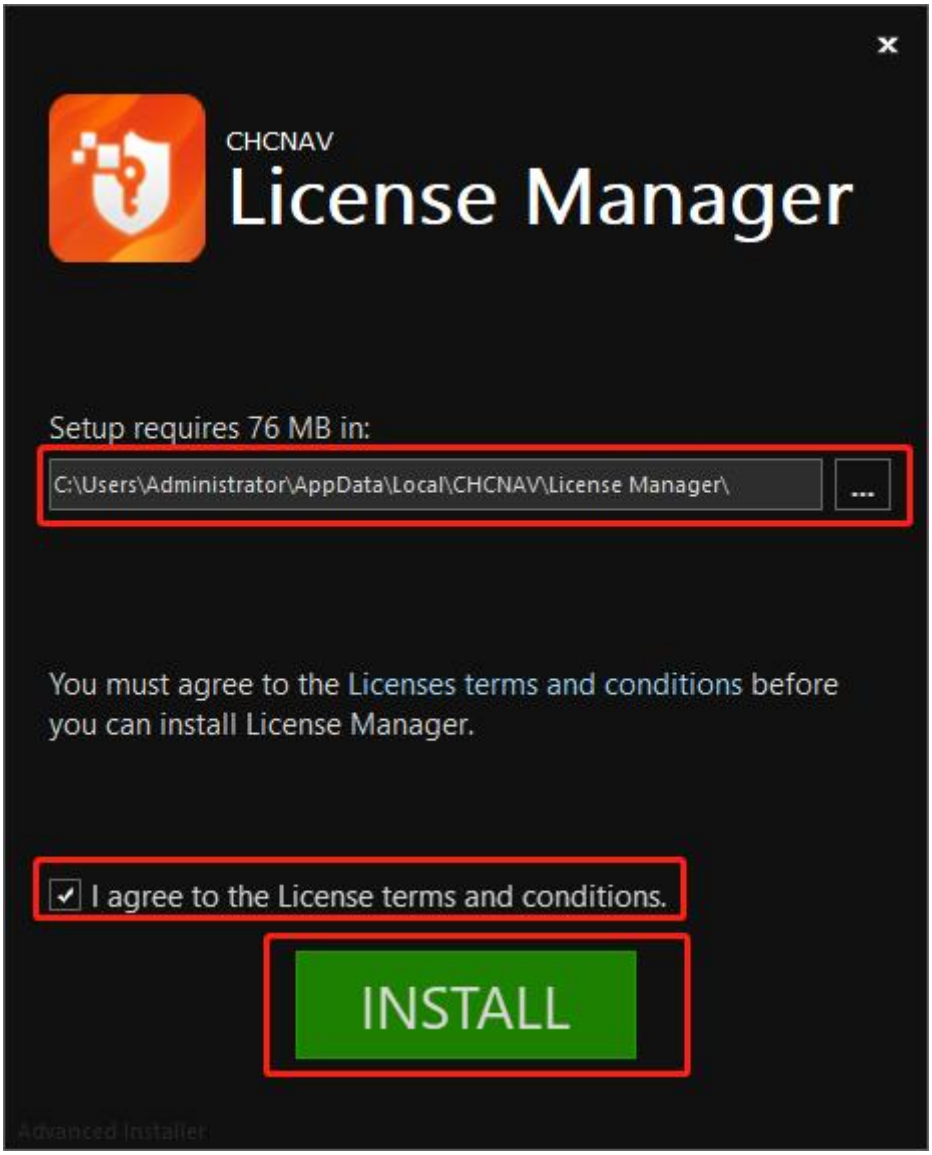


Figure:Set installation path

⑤ After the License Manager is installed, click the "Finish" button to close the License Manager installation interface.



Figure:License Manager Installation Completed

⑥ The CoProcess software installation is completed. Click the "Finish" button to close the software installation interface.

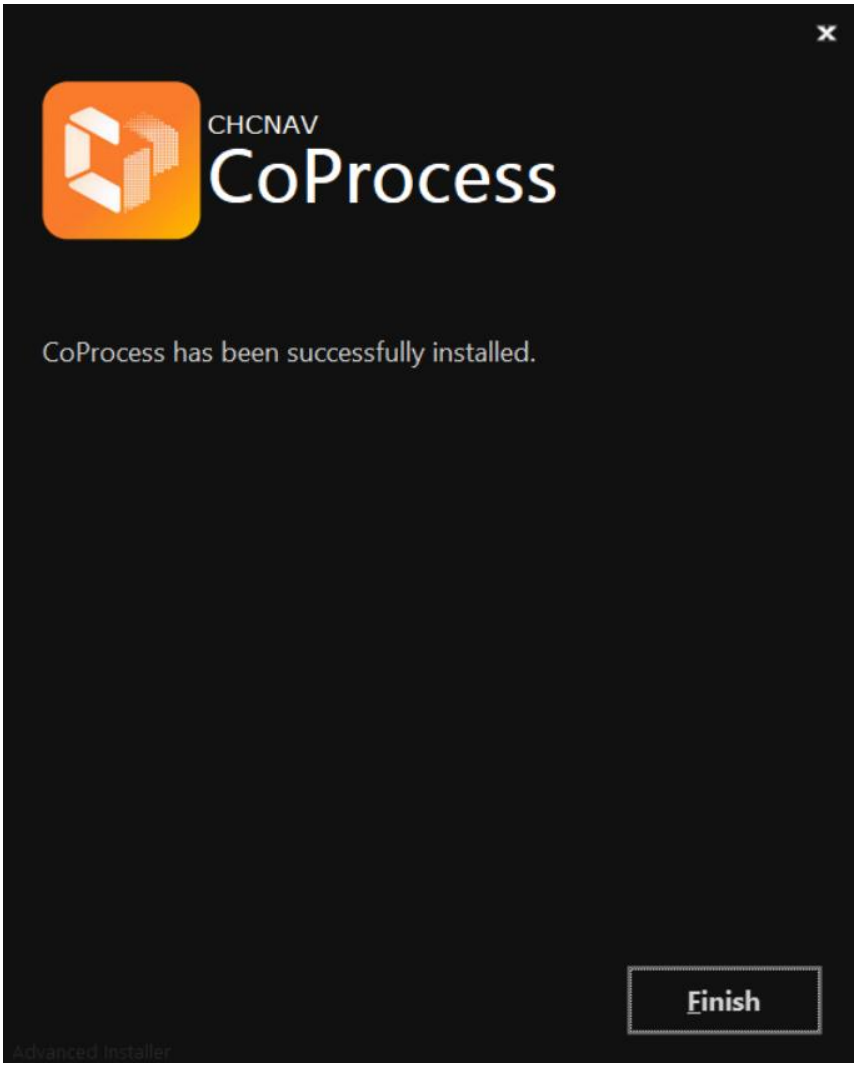


Figure:Software Installation Completed

Note:

When installing, it is recommended to close antivirus software to prevent the installation process from being interrupted by the antivirus software.

1.1.2 Installation Environment

Memory: Minimum 16GB, recommended 64GB and above.

Central Processor (CPU): Minimum Intel Core i7-7700, recommended Intel Core i9- 10900K and above.

Graphics processing unit (GPU): video memory is not less than 4GB, minimum NVIDIA GeForce 1050 Ti, recommended 3060 series or more, AMD graphics card is not supported.

Operating systems: win10 (64-bit), win11 (64-bit).

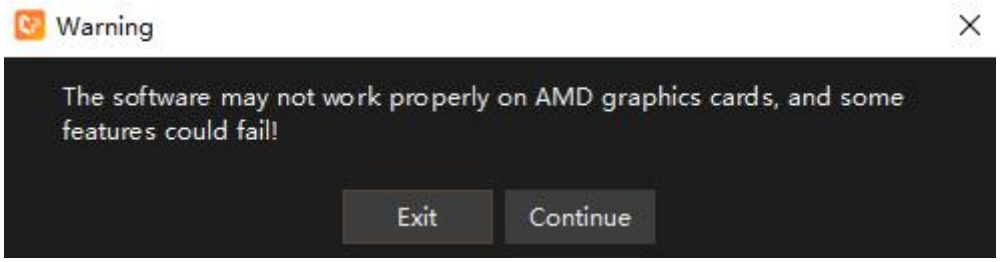


Figure: AMD GPU detection pop-up

1.1.3 Software Uninstallation

① Open the "Start" menu on your computer, find the "CoProcess 2025" folder, and click "Uninstall CoProcess 2025".



Figure: CoProcess in Start Menu

② In the pop-up dialog box, click "Yes" to complete the software uninstallation.

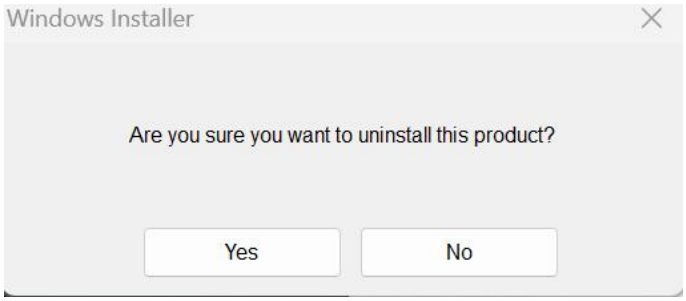


Figure: Uninstall Confirmation

2 Introduction to Software Functions

2.1Software Window

2.1.13D View Toolbar

Function Description:

The 3D view toolbar consists of horizontal and vertical groups, fixed in the upper-right area of the 3D view window.

From left to right, the functions on the horizontal toolbar are: Point Cloud Rendering, Point Size, Opacity Setting, Point Cloud Rendering Settings, Model Wireframe Rendering, Model Texture Rendering, Model Only Wireframe Rendering.

From top to bottom, the functions on the vertical toolbar are: View Angle, View Direction, Center Display, View Lock.

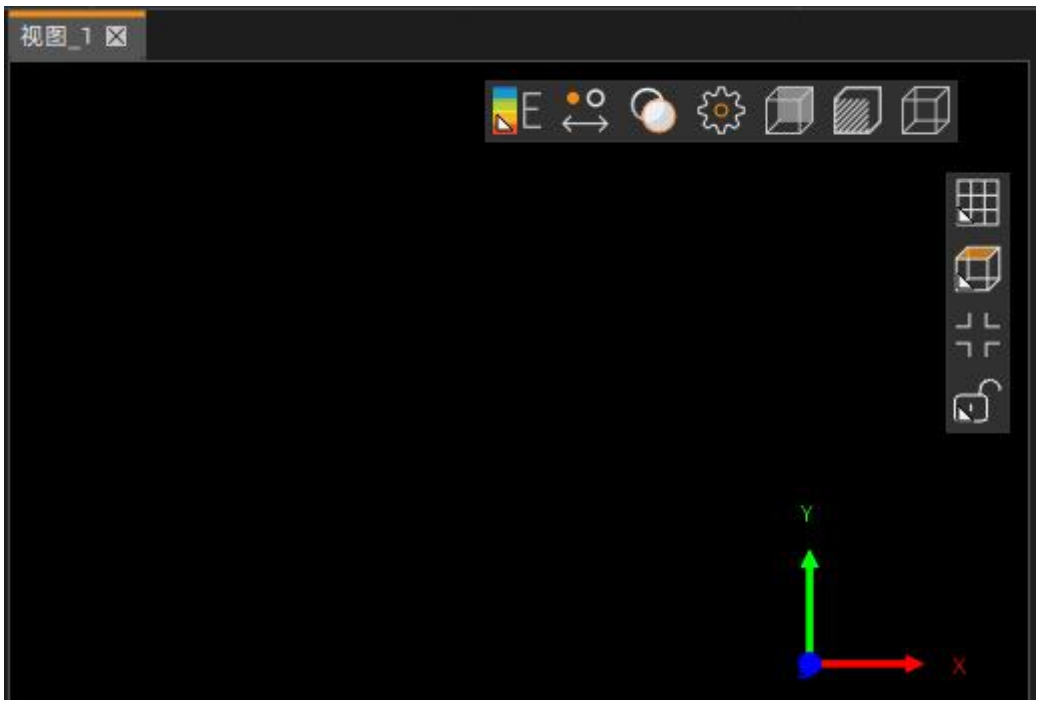


Figure: Toolbar in the 3D View

2.1.1.1 Point Cloud Rendering

This section mainly introduces point cloud rendering in the 3D view. Point cloud rendering allows users to render point clouds in different ways to ob tain needed information from various renderings, mainly including Elevation Rendering, Intensity Rendering, Class Rendering, RGB Rendering, Mixed Ren dering, and other rendering methods such as Return Number Rendering, R eturn Index Rendering, Time Rendering, Monochrome Rendering, Scan Angle Rendering, Scan Direction Rendering, Point Source ID Rendering, and User Data Rendering.

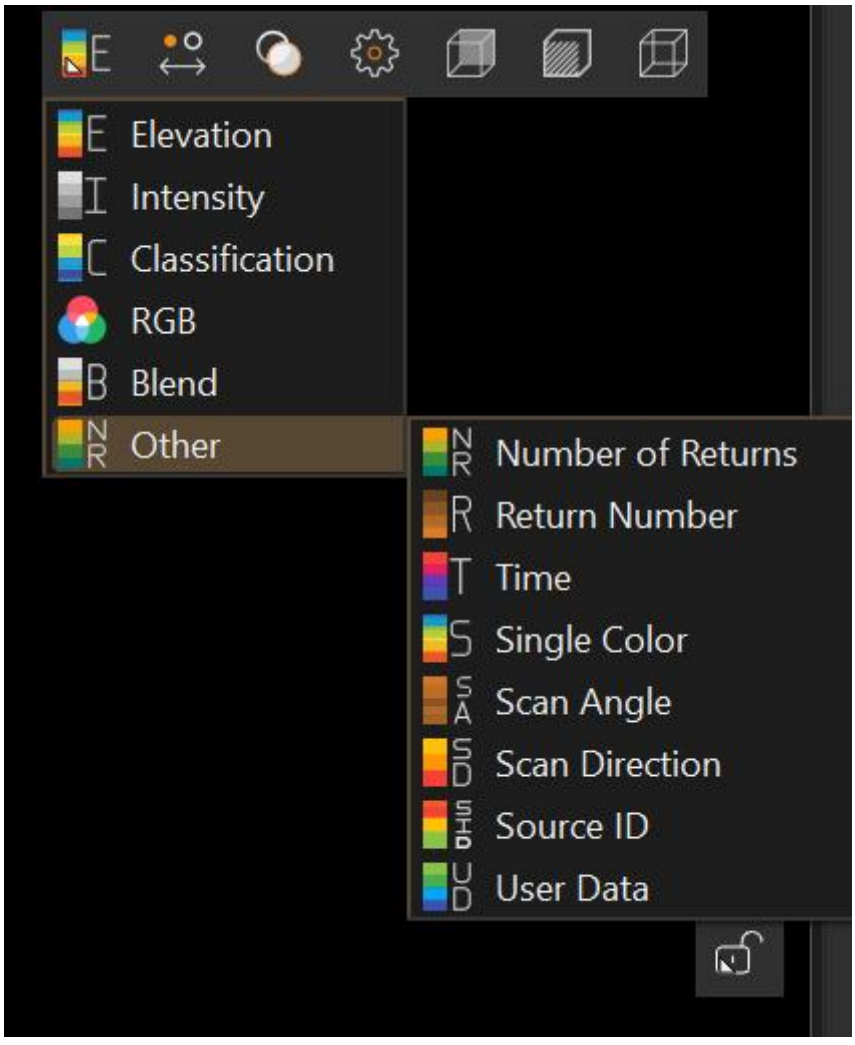


Figure: Point cloud rendering method

Note:

This function is only effective for point cloud data, and the default renderin g method is elevation rendering.

2.1.1.1.1 Elevation Rendering

Function description:

Map the point cloud data to a specified color range based on its elevation values, which facilitates the observation of elevation changes in the point cl oud data.

Operation steps:

① Click on the toolbar in the 3D view -> Point Cloud Rendering -> Color b y elevation

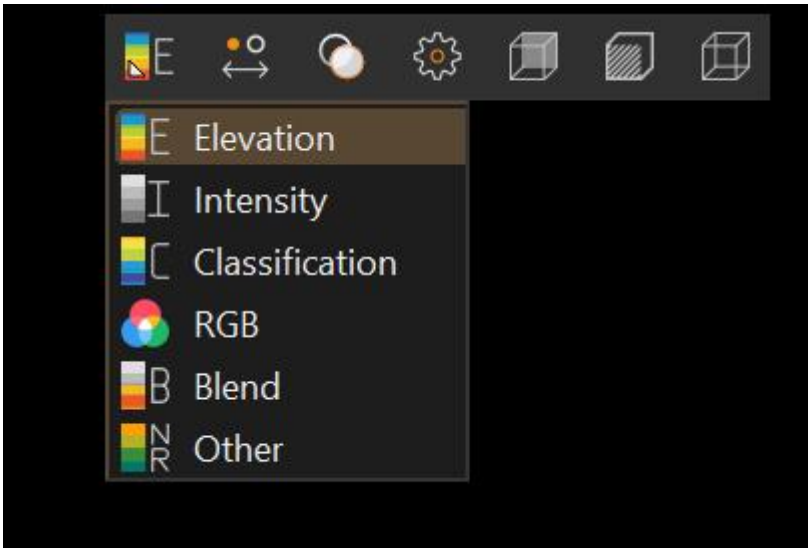


Figure: Elevation Rendering Mode

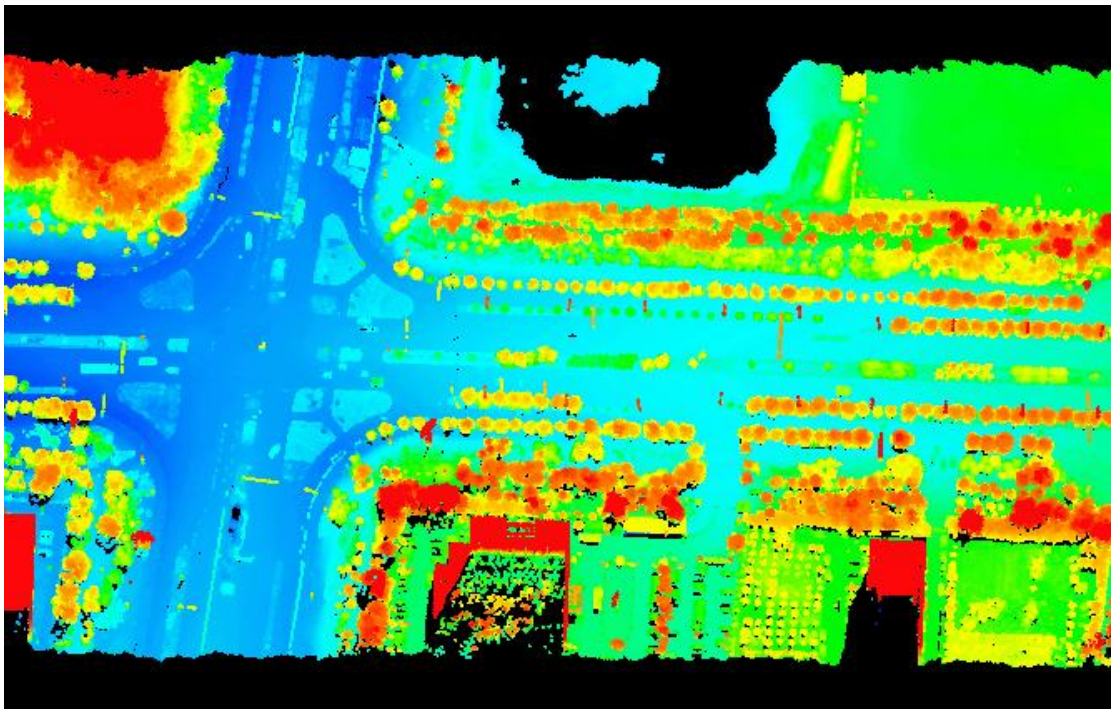


Figure: Elevation Rendering

② Click on the Rendering Settings. As shown in the figure below, you can select different color bars to modify the rendering effect. You can also mo dify the maximum and minimum values of the elevation range by adjusting the scroll bar, scrolling the mouse wheel, or entering numbers, and then y ou can modify the elevation rendering effect in real time. The "Reset" optio n is used to restore the default values.

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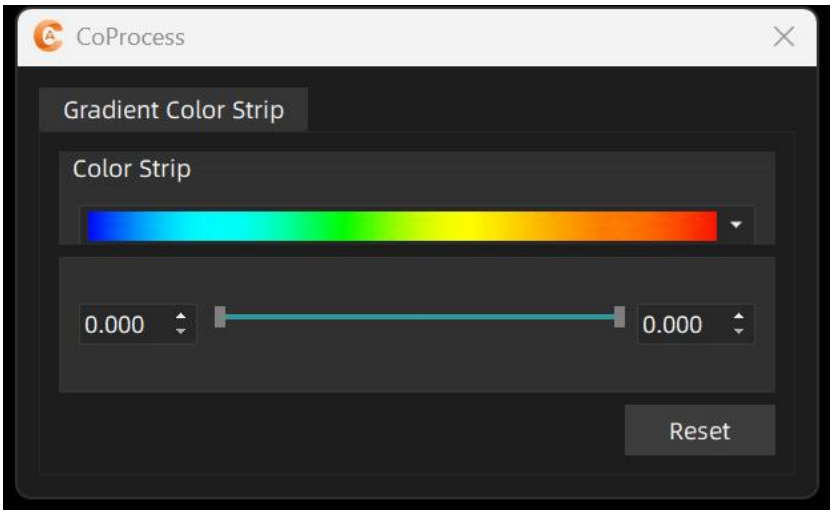


Figure: Elevation Rendering Settings

Note:

This function is only effective for point cloud data containing elevation information.

2.1.1.1.2 Intensity Rendering

Function description:

Map the intensity values of the point cloud data to a color range.

Operation steps:

① Click on the toolbar in the 3D view -> Point Cloud Rendering -> Color by intensity.

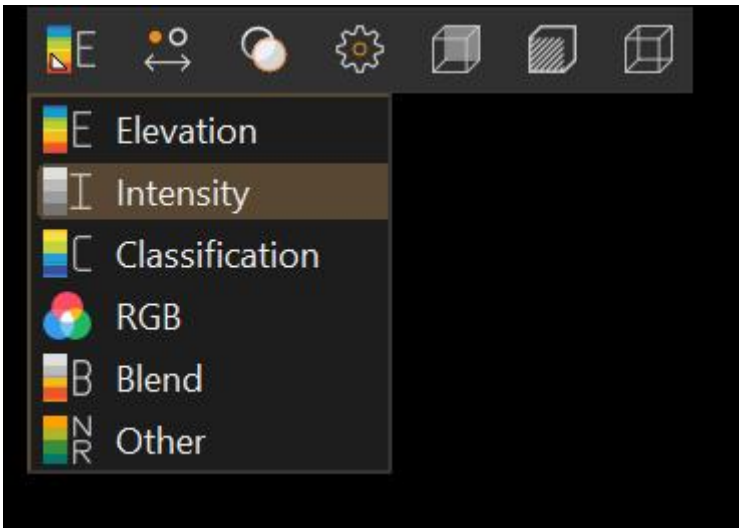


Figure: Intensity Rendering Mode



Figure: Intensity Rendering

② Click on the Rendering Settings. As shown in the figure below, you can select different color bars to modify the rendering effect. Move the scroll bar, scroll the mouse wheel, or enter numbers to modify the maximum and minimum values of the intensity range, and you can view the intensity rendering effect in real time. The "Reset" button is used to restore the default values.

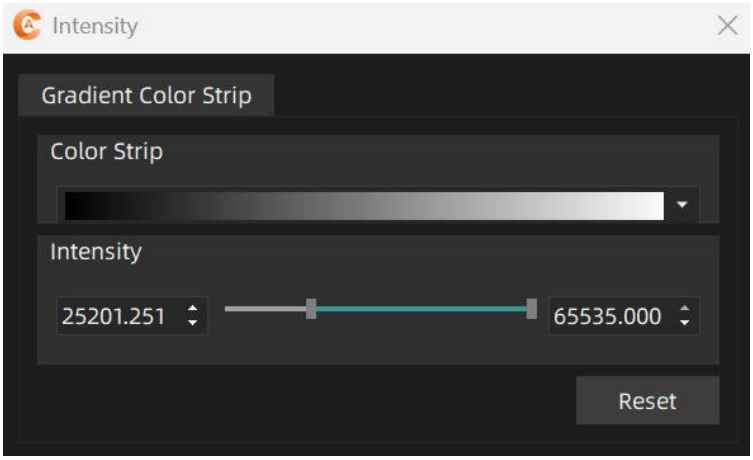


Figure: Intensity Rendering Settings

Note:

This function is only effective for point cloud data that contains intensity in

formation.

2.1.1.1.3 Class Rendering

Function Description:

According to the different class attributes of point cloud data, each class is mapped to a different color value, making it easy to visually distinguish points of different classes.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → Class to view the class rendering effect.

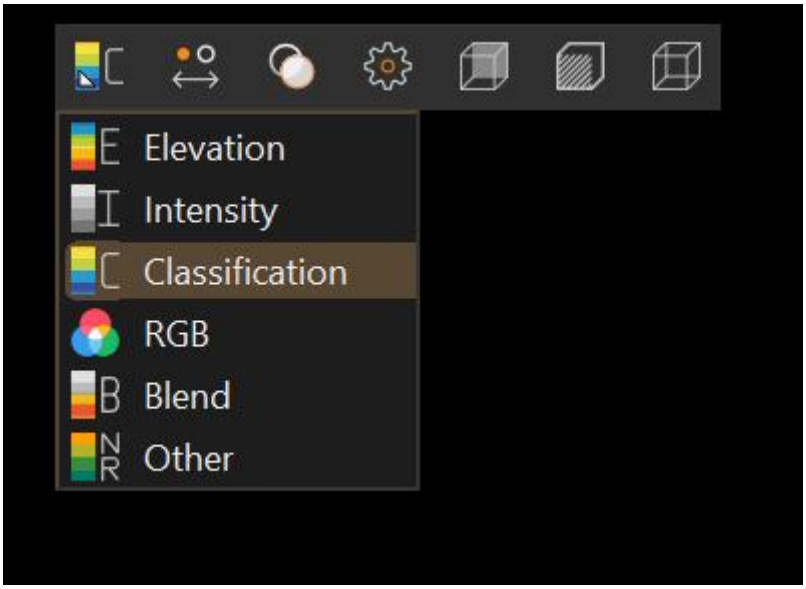


Figure: Classification Rendering Mode

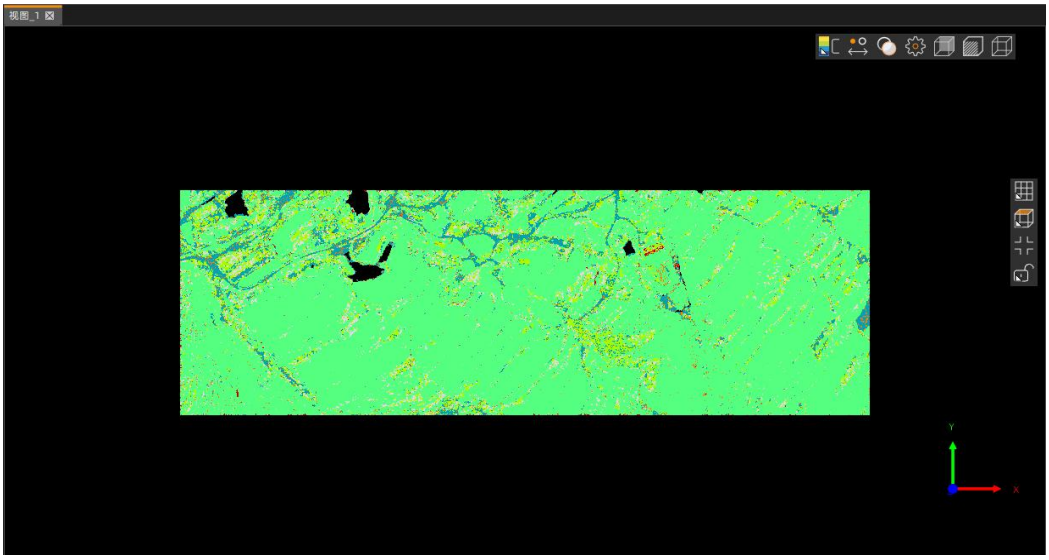


Figure: Classification Rendering

2. Click Rendering Settings. As shown below, by default all classes are rend ered. Uncheck the "Select All" checkbox to cancel rendering of all classes. Uncheck a specific class checkbox to cancel display of that class.

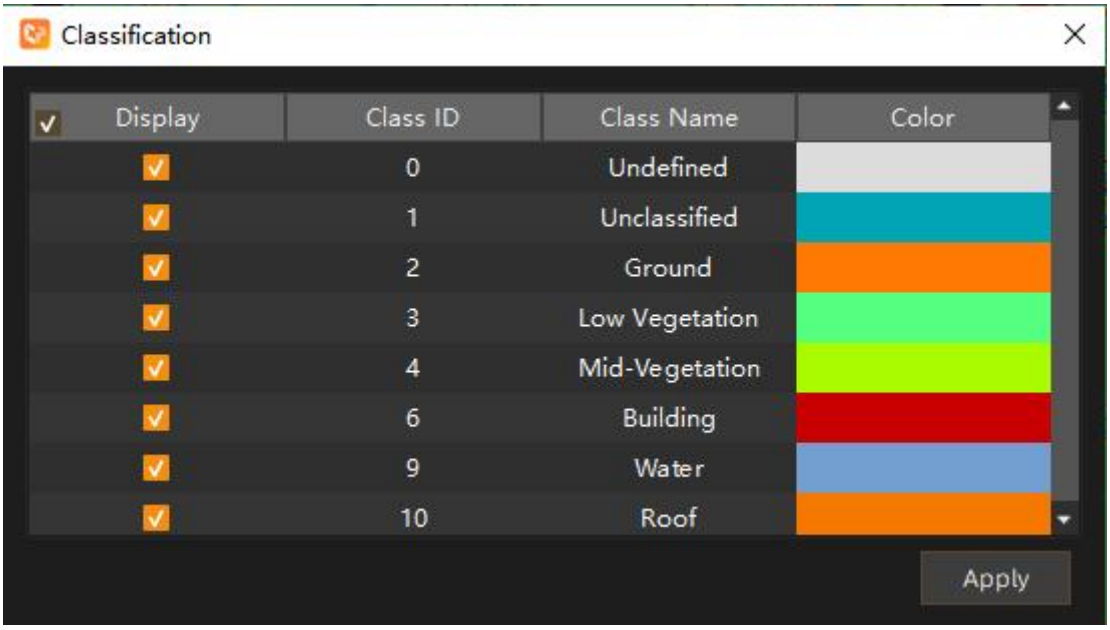


Figure: Classification Settings

3. Click the color box next to a class to open the color list. You can select a basic color or pick a color from the screen. Click OK to modify the class rendering color.

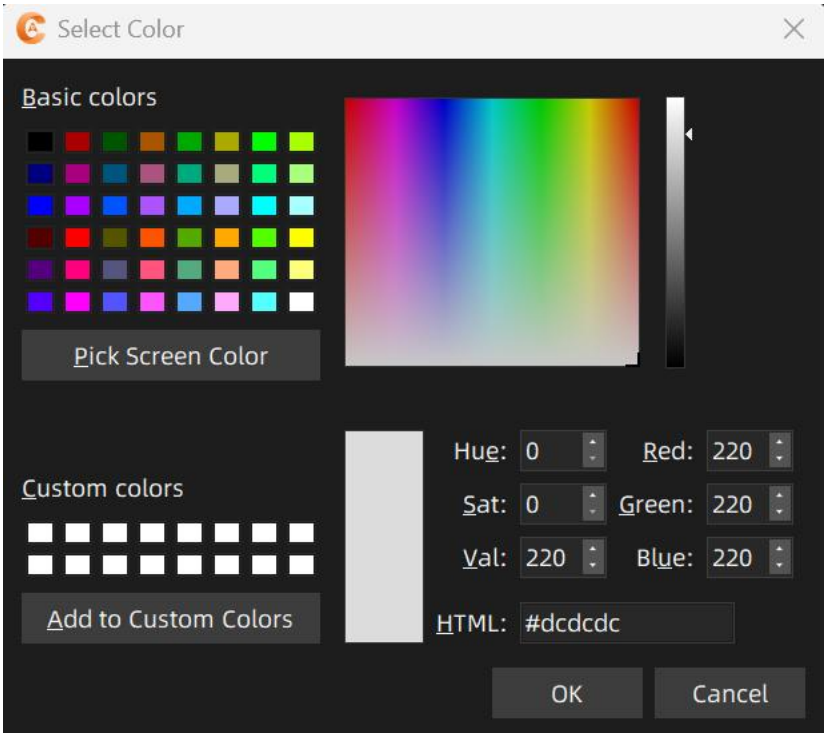


Figure: Classification Color Settings

Note:

This function is only effective for point cloud data that contains class information.

2.1.1.1.4 RGB Rendering

Function Description:

Uses the color attribute (RGB values) of point cloud data to display the point cloud.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → RGB.

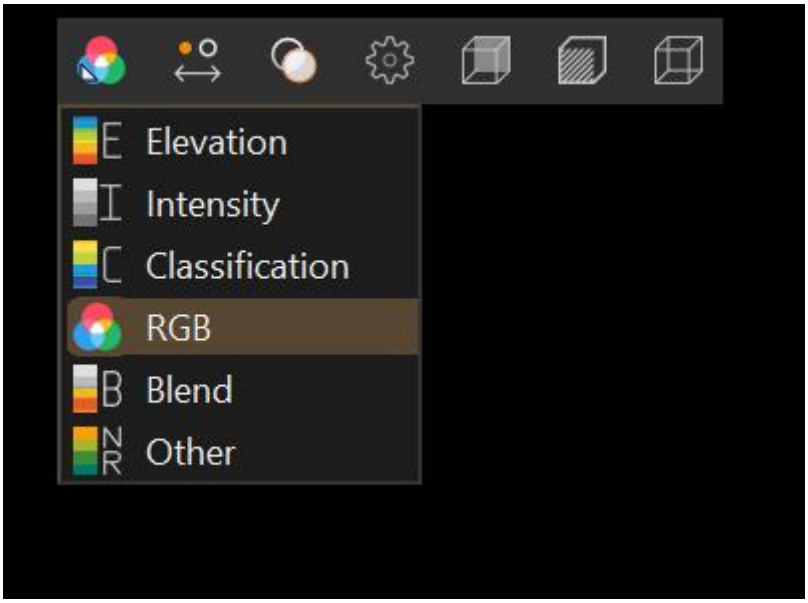


Figure: RGB Rendering Mode

2. The point cloud in the view is rendered according to its own RGB color values.



Figure: RGB Coloring Rendering

Note:

This function is only effective for point cloud data that contains RGB information.

2.1.1.1.5 Mixed Rendering

Function Description:

This function implements mixed rendering of point cloud data, mapping the elevation and intensity attributes of the point cloud data to a uniformly varying color range, displaying the combined effect of elevation and intensity, facilitating clear distinction of object boundaries.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → Mixed to view the mixed rendering effect of elevation and intensity.

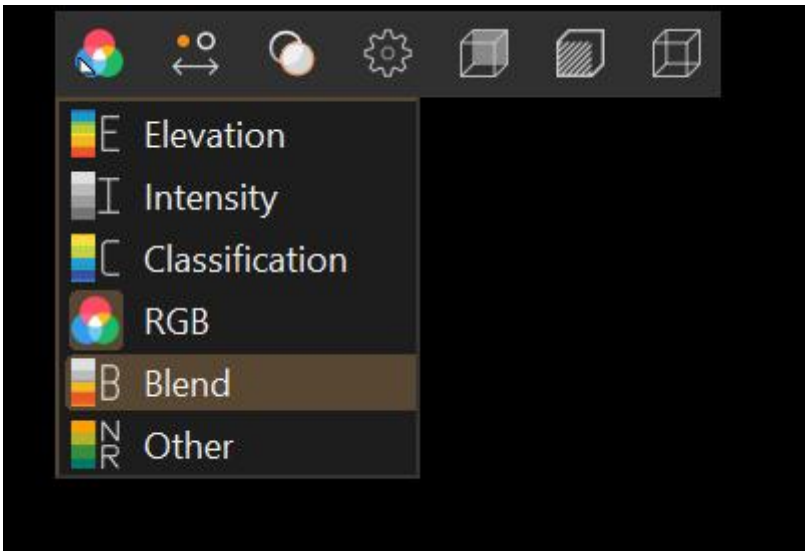


Figure: Blend Rendering Mode

2. After selecting a color ramp, the point cloud is displayed with mixed rendering.

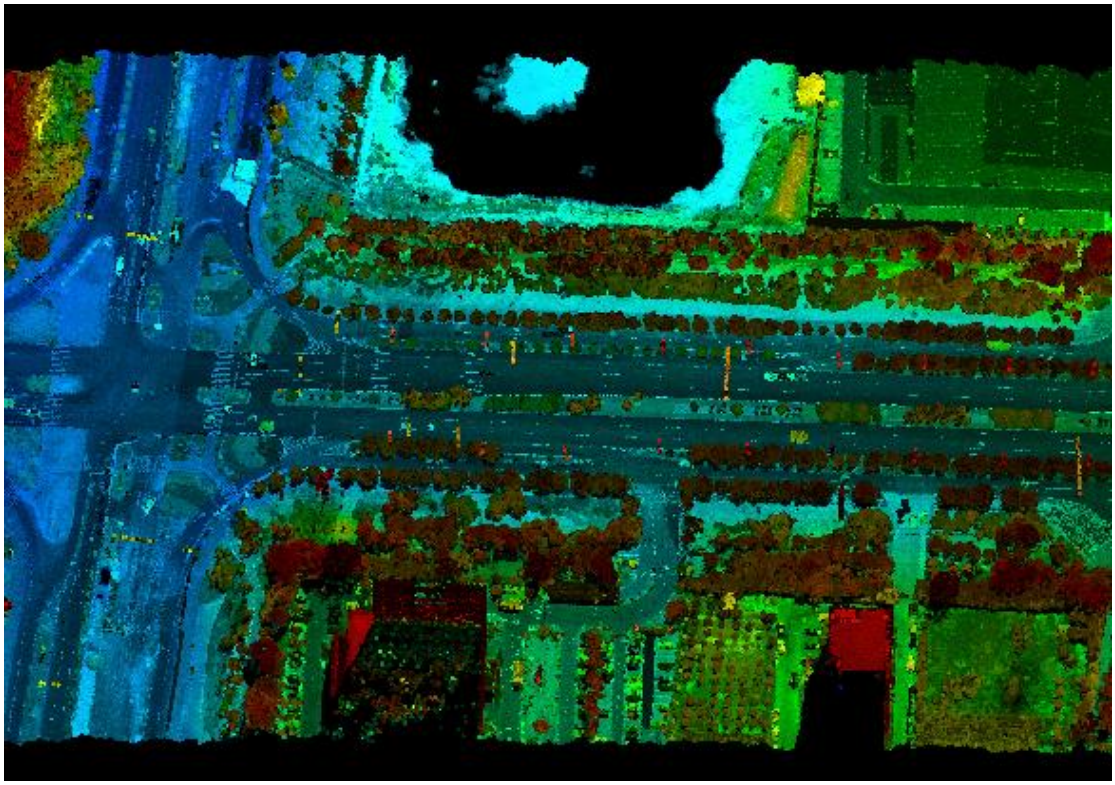


Figure: Blending Rendering

3. Click Rendering Settings. As shown below, drag the scroll bar, scroll the mouse wheel, or enter numbers to modify the maximum and minimum values of elevation and intensity to view the mixed rendering effect in real time. Reset restores the default values.

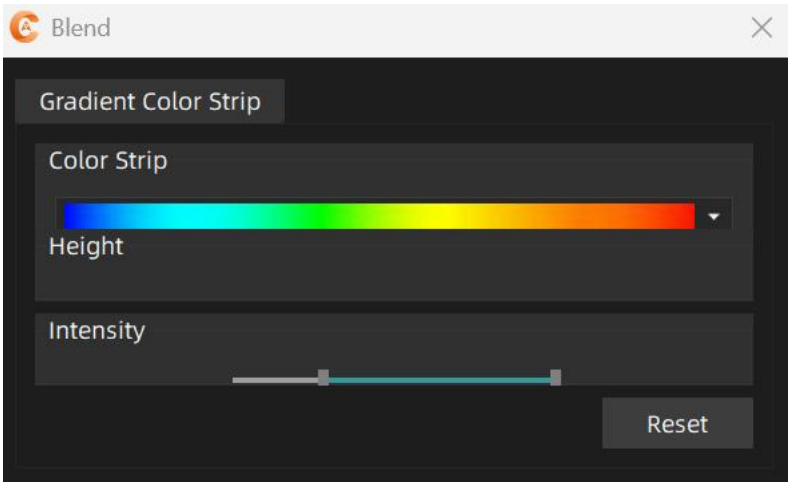


Figure: Blending Rendering Settings

2.1.1.1.6 Return Number Rendering

Function Description:

Renders point clouds with different color values according to the return number attribute value, facilitating intuitive distinction of point clouds with different return numbers.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → Others → Return Number to view the rendering result of the data according to different return numbers.

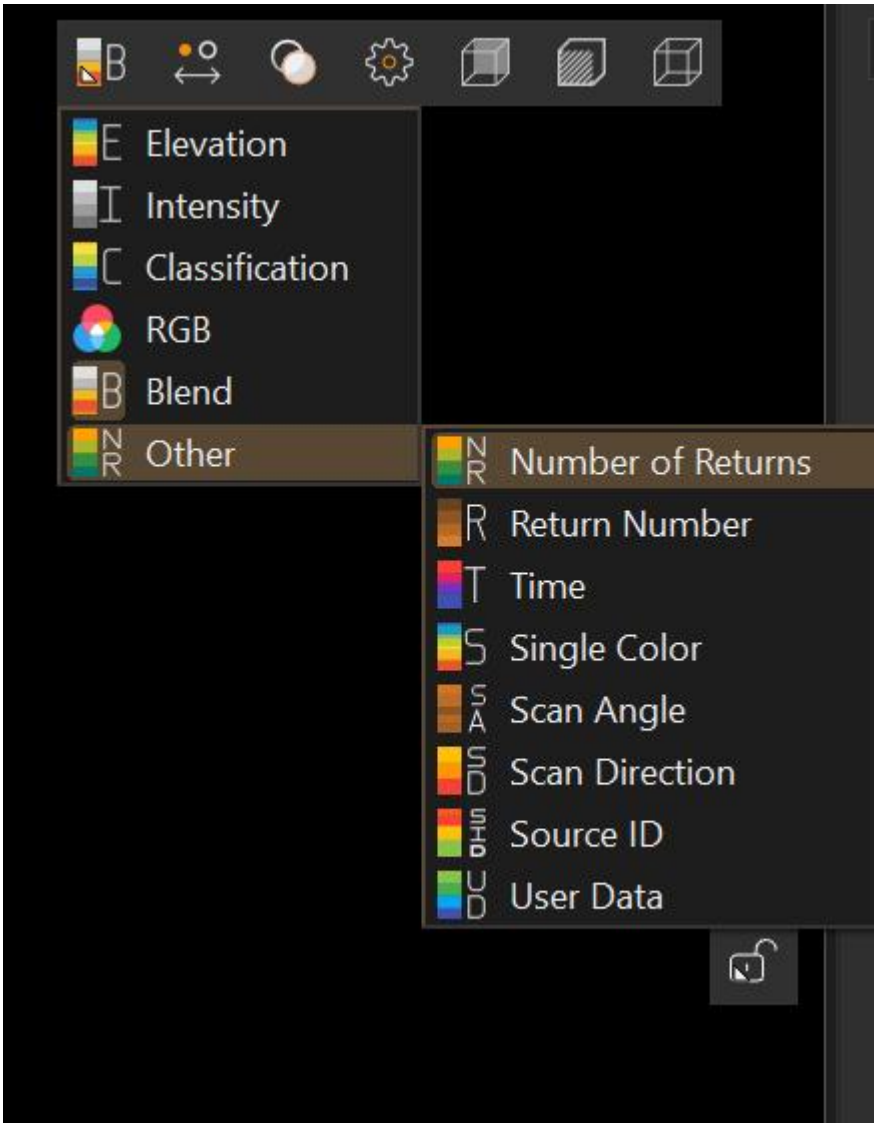


Figure: Echo Rendering Mode

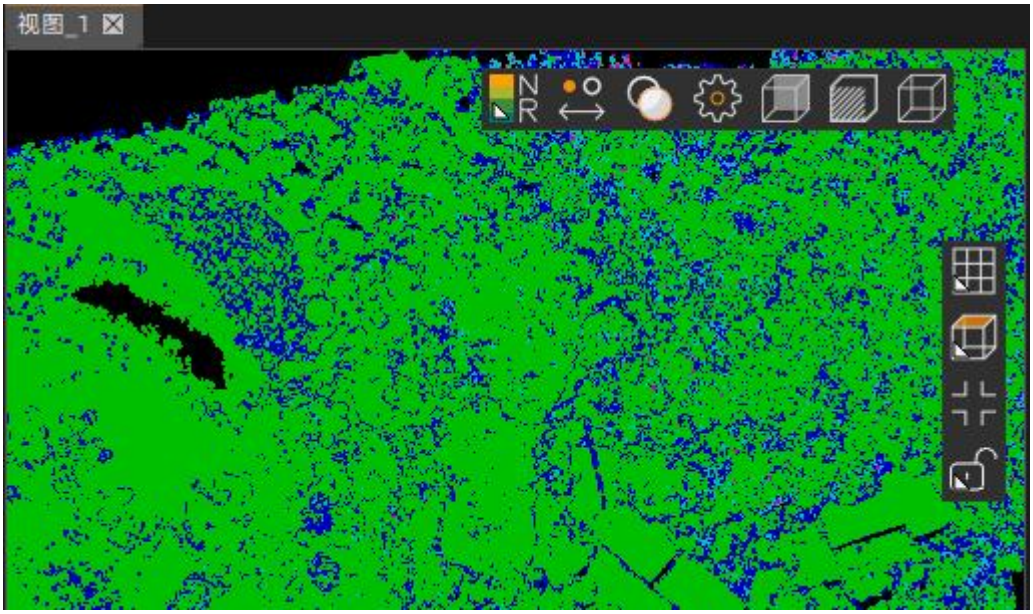


Figure: Echo Rendering

2. Click Rendering Settings. As shown below, by default all return numbers are rendered. Uncheck the "Select All" checkbox to cancel rendering of all return numbers. Uncheck a specific return number checkbox to cancel display of that return number.

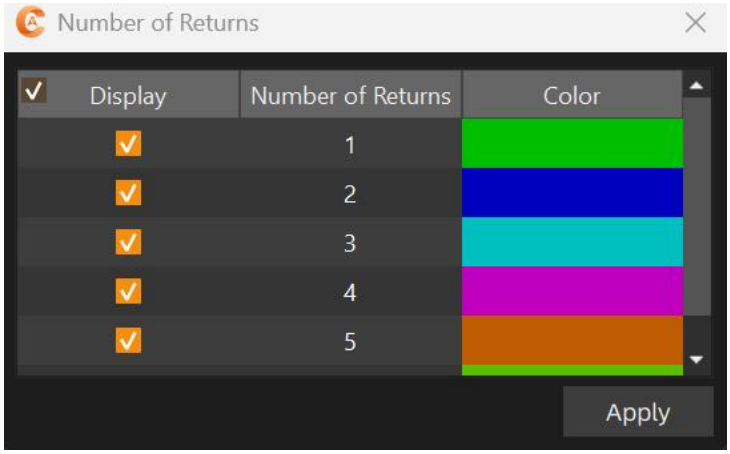


Figure: Echo Rendering Settings

3. Click the color box next to a return number to open the color list. You can select a basic color or pick a color from the screen. Click OK to modify the rendering color.

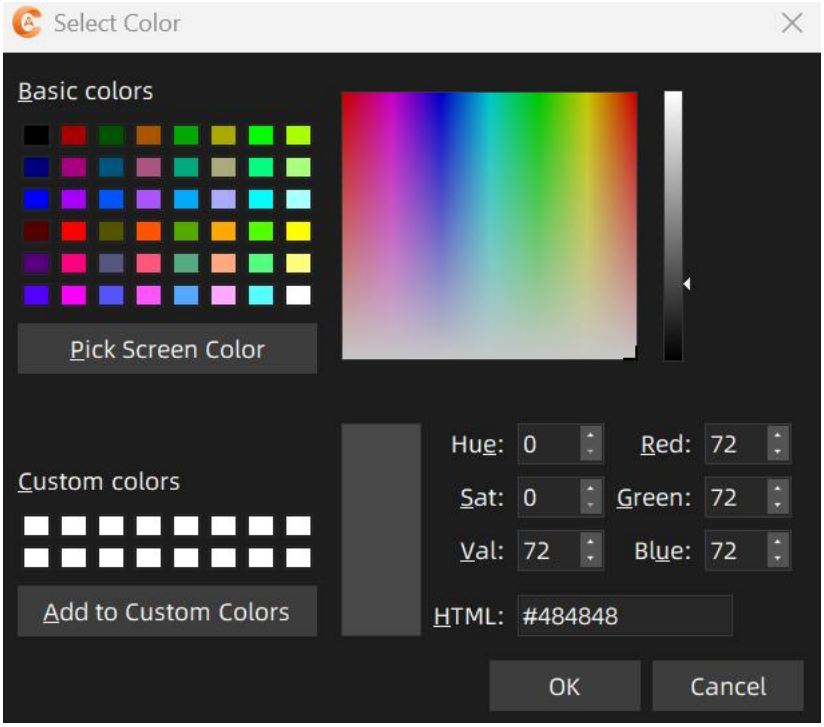


Figure: Echo Number Settings

Note:

This function is only effective for point cloud data that contains return number information.

2.1.1.1.7 Return Index Rendering

Function Description:

Renders point clouds with different color values according to the return index attribute, allowing quick viewing of rendering effects of different return indices.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → Others → Return Index to view the return index rendering of the point cloud.

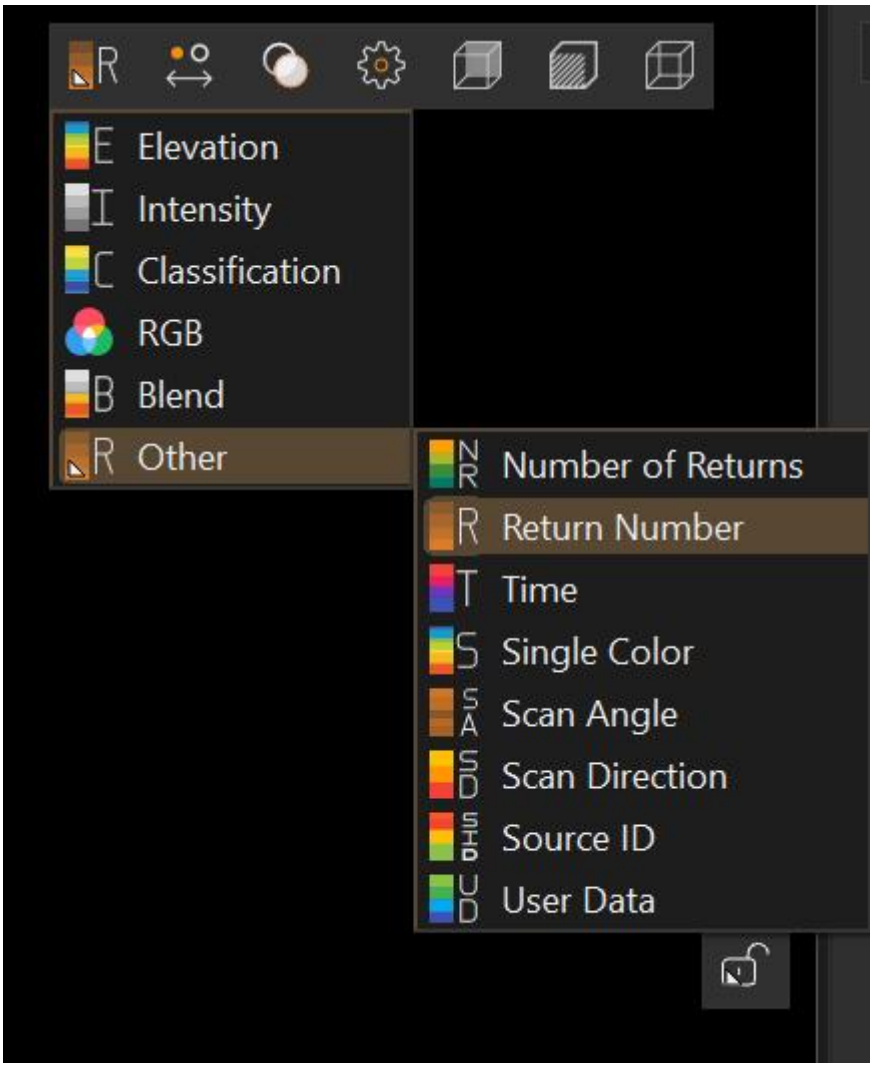


Figure: Echo Sequence Number Rendering Mode

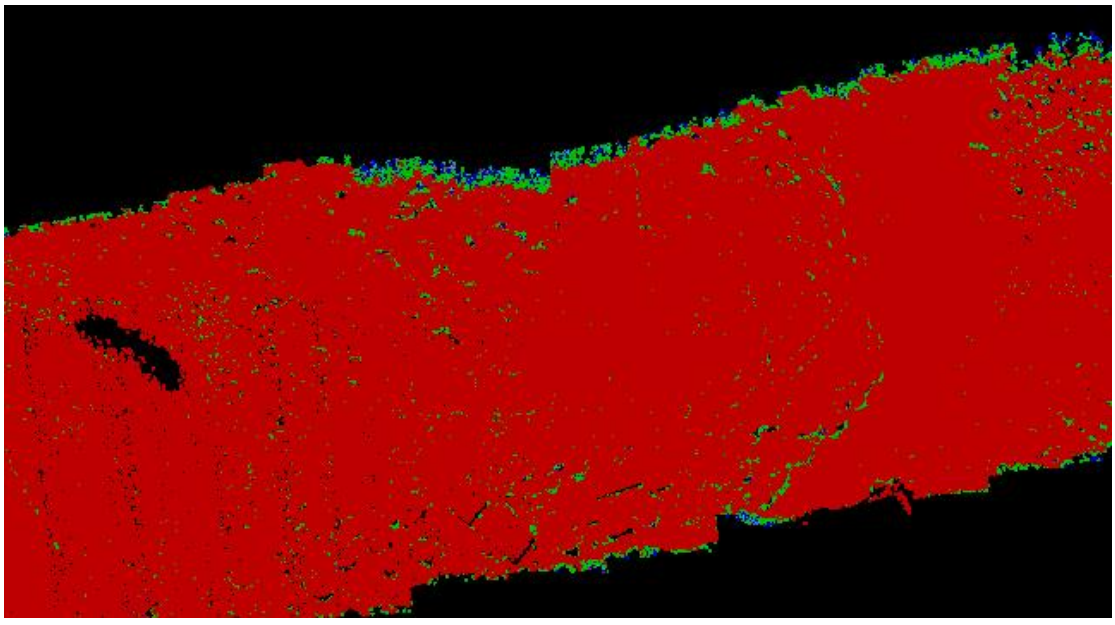


Figure: Echo Sequence Number Rendering

2. Click Rendering Settings. As shown below, by default all return indices are rendered. Uncheck the "Select All" checkbox to cancel rendering of all return indices. Uncheck a specific return index checkbox to cancel display of that return index.

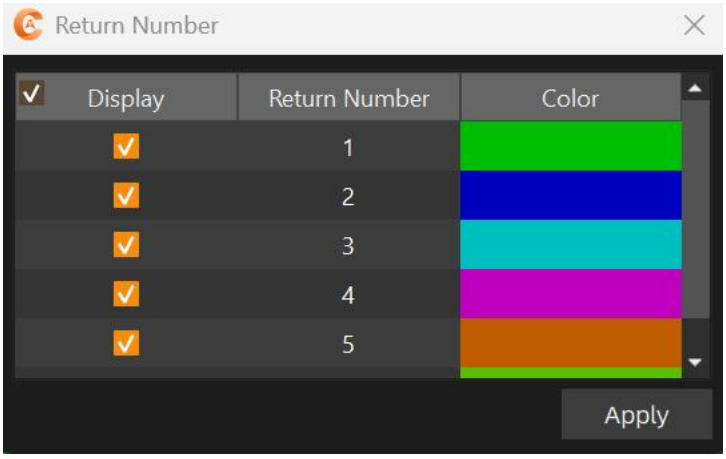


Figure: Echo Sequence Rendering Settings

3. Click the color box next to a return index to open the color list. You can select a basic color or pick a color from the screen. Click OK to modify the rendering color.

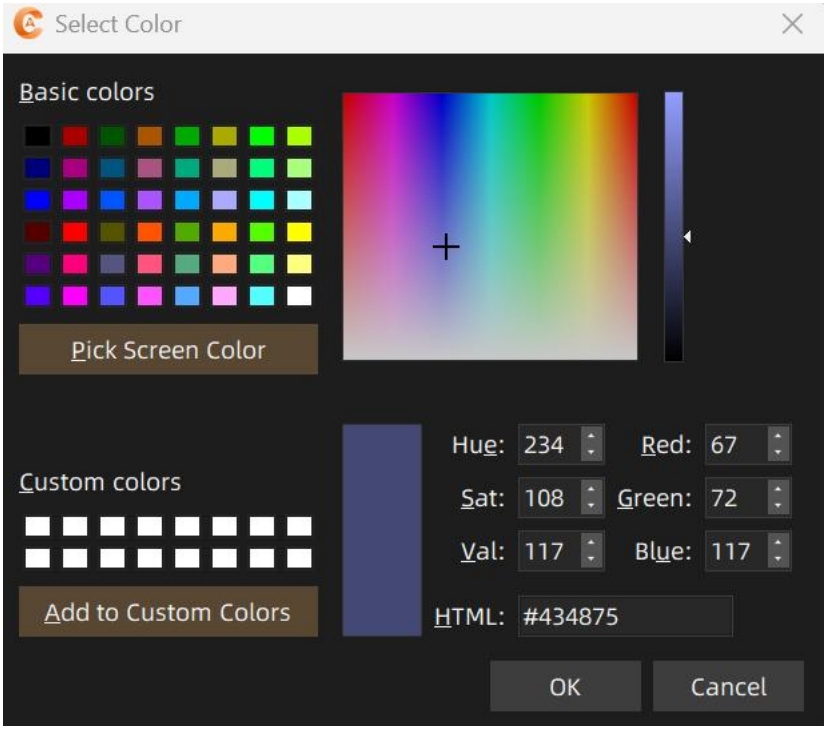


Figure: Set Echo Sequence Number Colors

Note:

This function is only effective for point cloud data that contains return index information.

2.1.1.1.8 Time Rendering

Function Description:

Renders point clouds with different color values according to the acquisition time.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → Others → Time to view the time rendering effect.

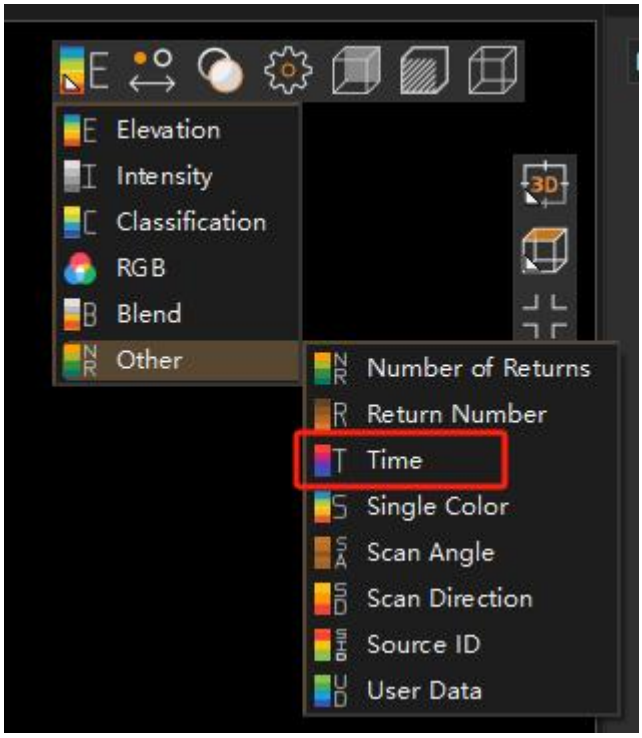


Figure: Time Rendering Function Entry

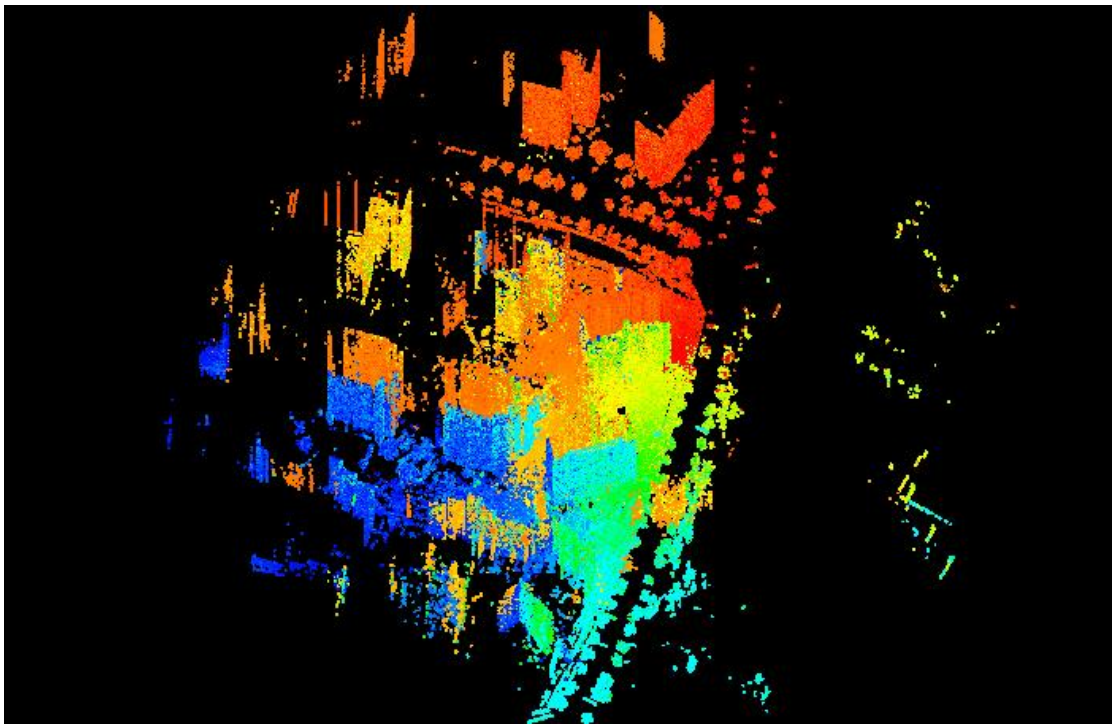


Figure: Time Rendering Effect

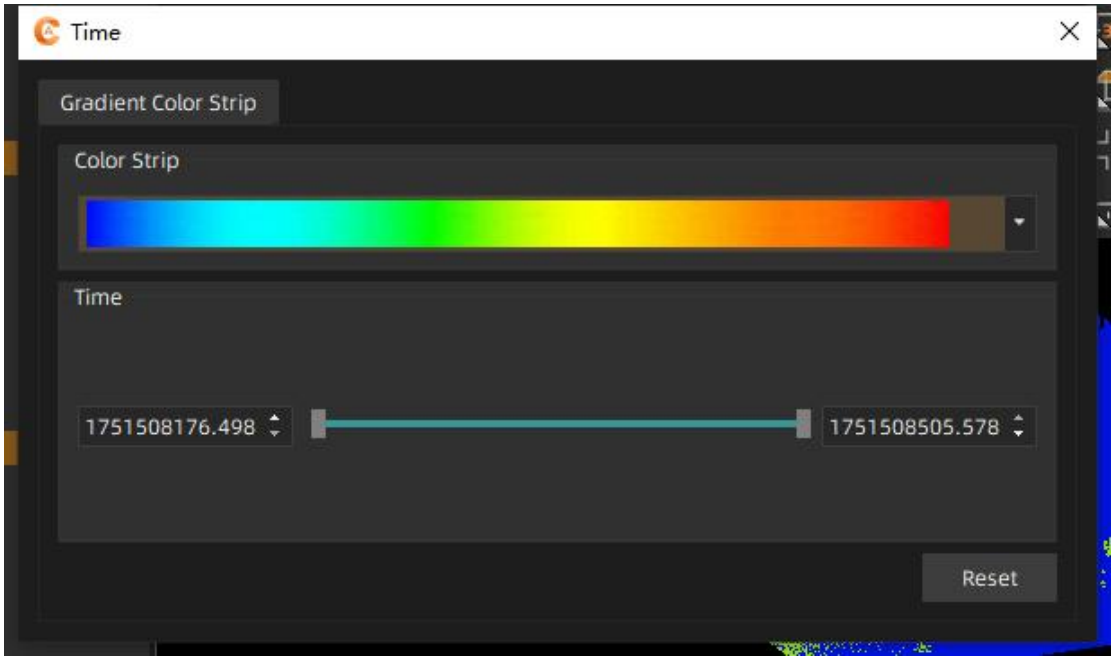


Figure: Time Rendering Settings

2.1.1.1.9 Monochrome Rendering

Function Description:

Maps point cloud data from different point cloud files to different color val

ues, facilitating intuitive distinction of different segments of point cloud dat a.

Operation Steps:

1.Click 3D view toolbar → Point Cloud Rendering → Others → Monochrome to view the monochrome rendering effect.

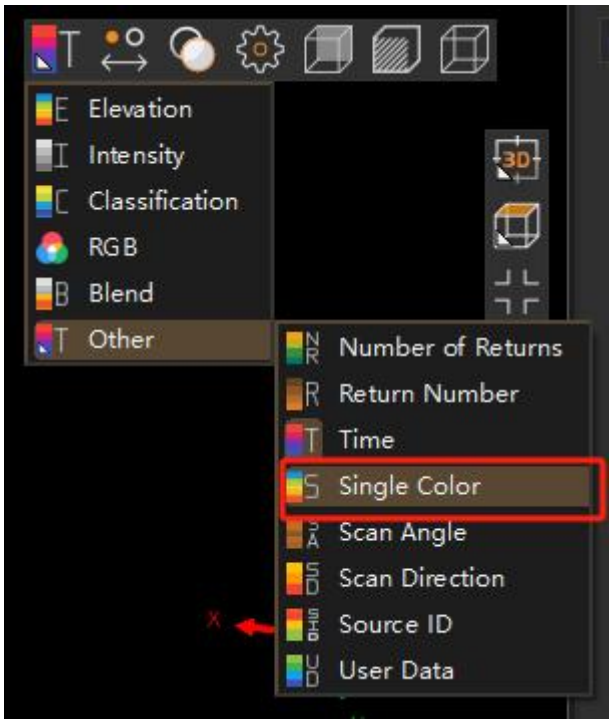


Figure: Single Color Rendering Function Entry

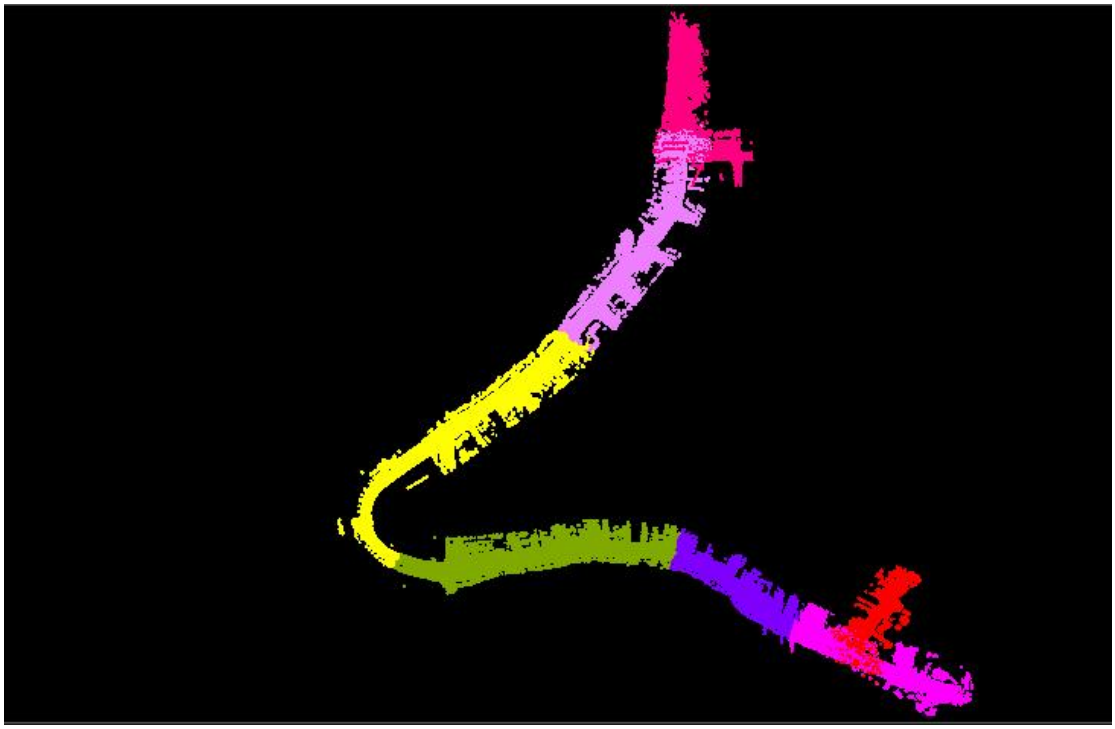


Figure: Single Color Rendering Effect

2.1.1.1.10 Scan Angle Rendering

Function Description:

Maps the scan angle attribute of point cloud data to uniformly varying color values according to different scan angle values.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → Others → Scan Angle to view the scan angle rendering effect.

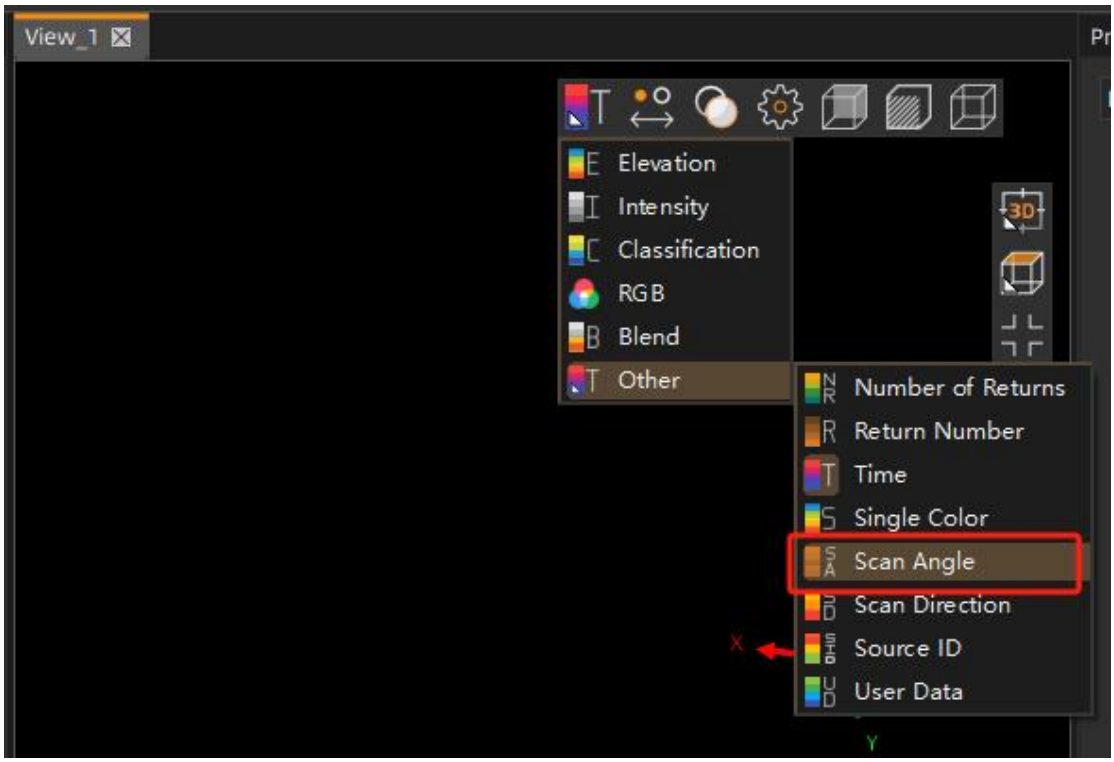


Figure: Scan Angle Rendering Function Entry

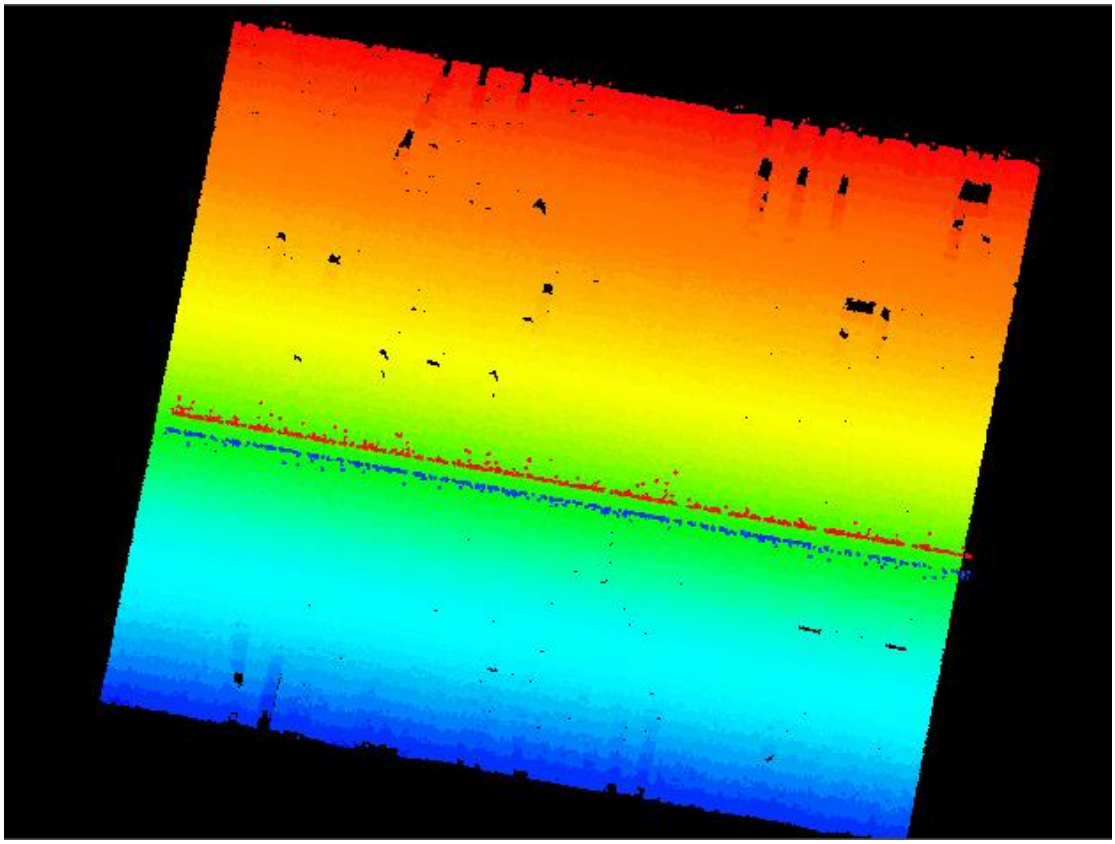


Figure: Scan Angle Rendering

2. You can select different color ramps as needed. Click Rendering Settings, drag the scroll bar or scroll the mouse wheel to modify the maximum and minimum values of the scan angle range to view the scan angle rendering effect in real time. Reset restores the default values.

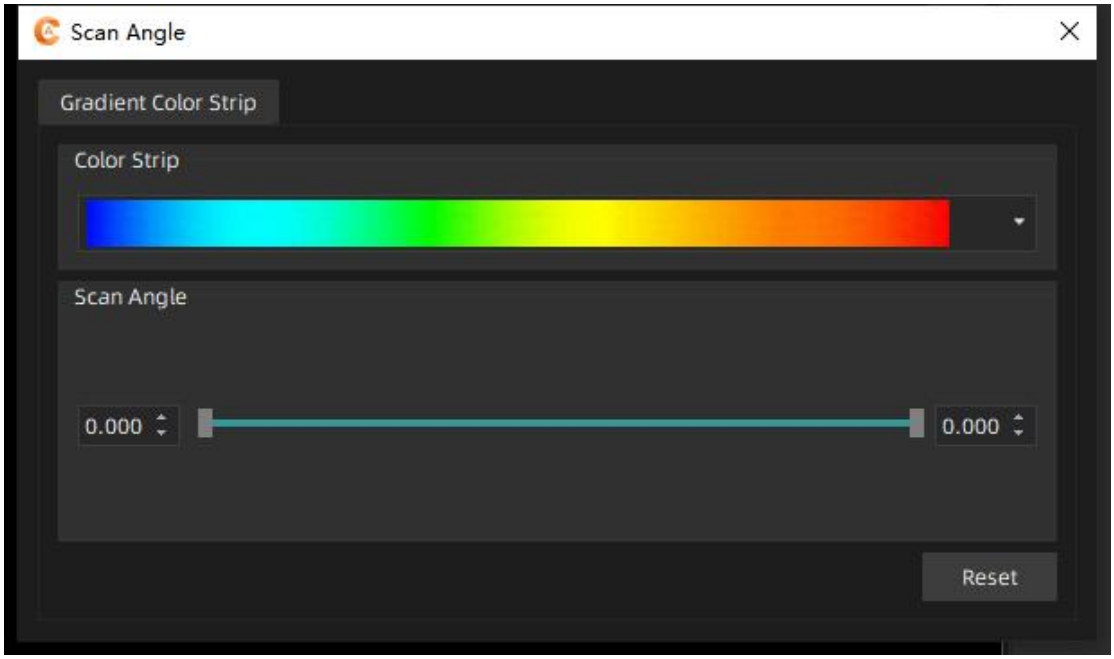


Figure: Scan Angle Rendering Settings

2.1.1.1.11 Scan Direction Rendering

Function Description:

Maps the scan direction values to uniformly varying color values according to different scan directions of point cloud data.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → Others → Scan Direction to view the scan direction rendering effect.

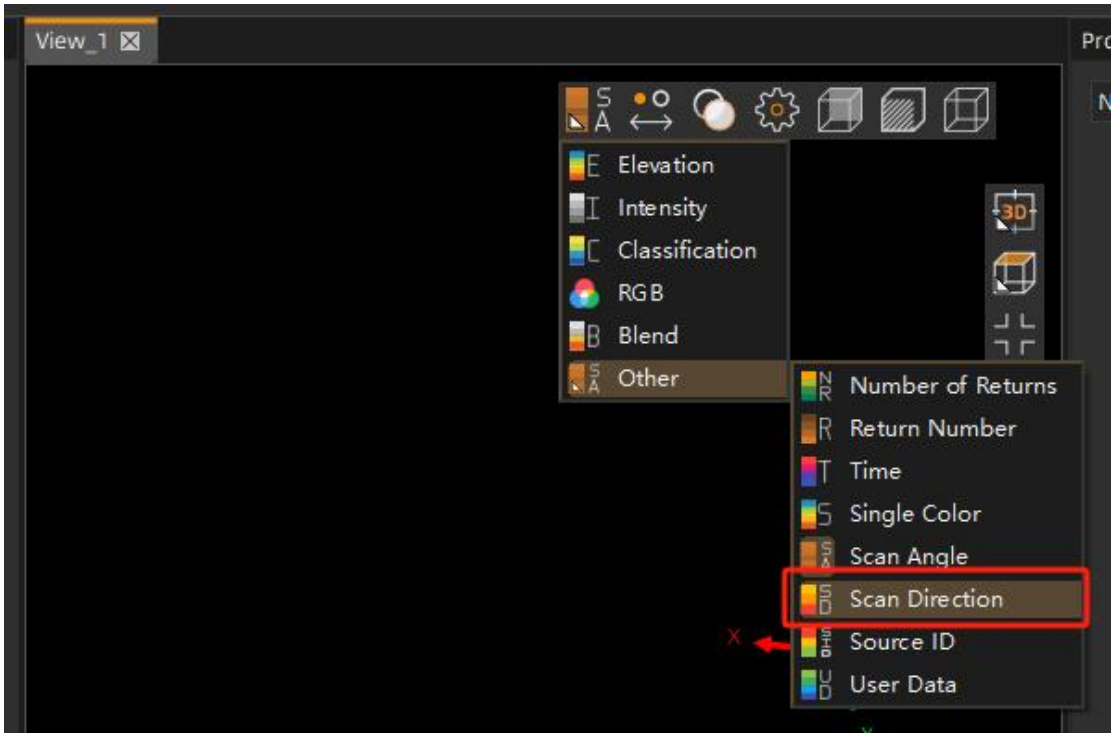


Figure: Scan Direction Rendering Function Entry

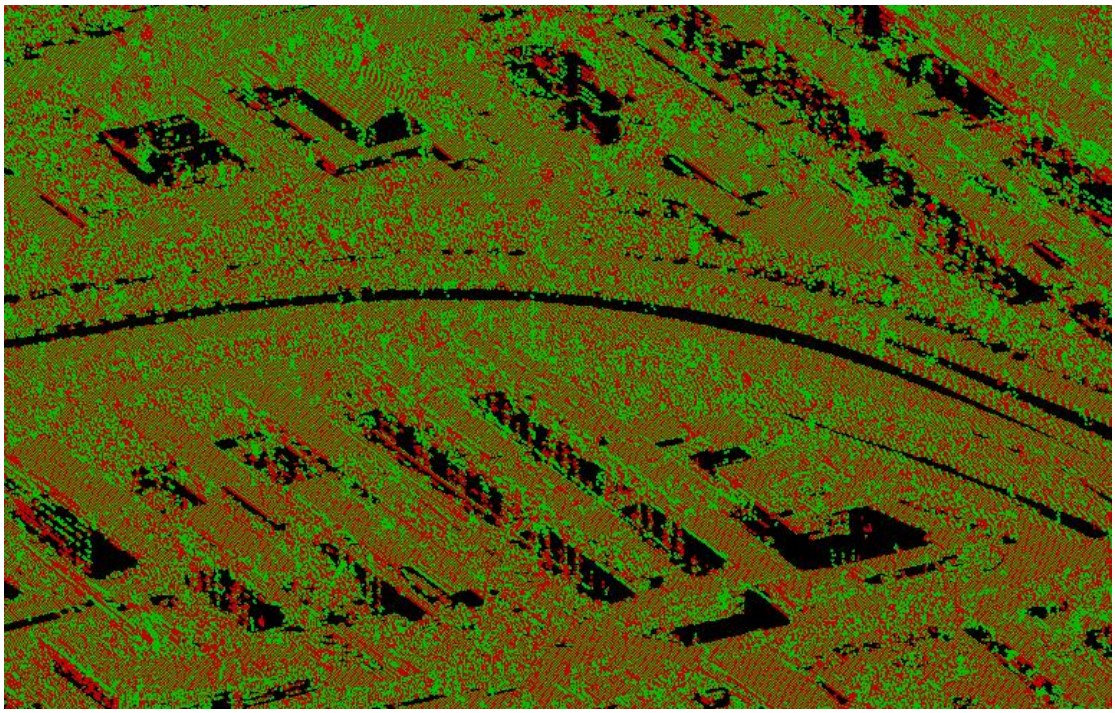


Figure: Scan Direction Rendering

2. You can select different color ramps as needed. Click Rendering Settings, drag the scroll bar or scroll the mouse wheel to modify the maximum and minimum values of the scan direction range to view the scan direction rendering effect in real time. Reset restores the default values.

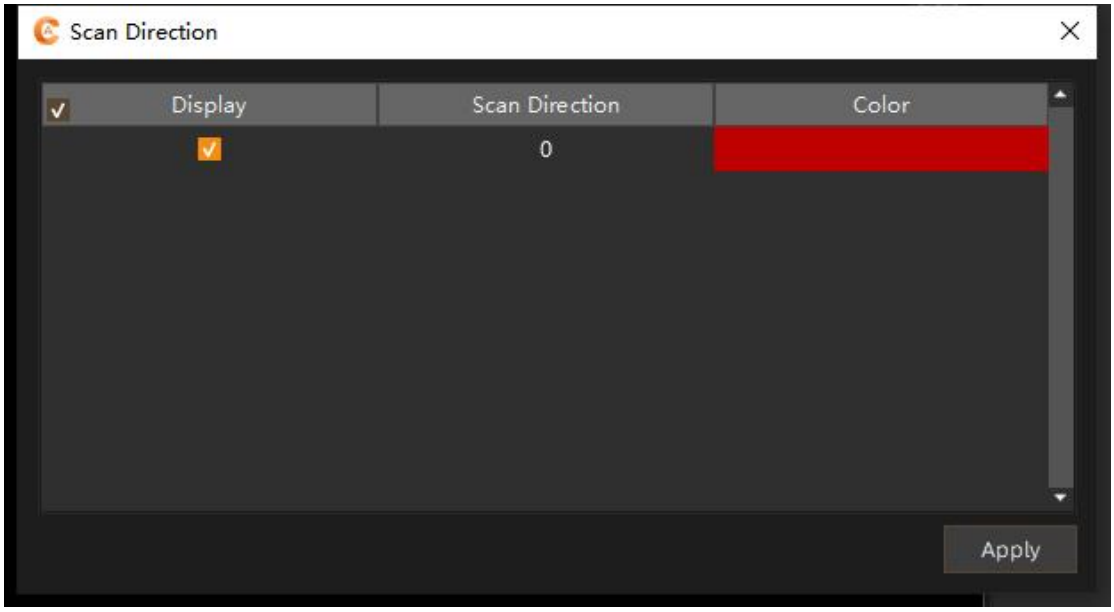


Figure: Scan Direction Rendering Settings

2.1.1.1.12 Point Source ID Rendering

Function Description:

Maps the point source ID attribute to uniformly varying color values according to different point source ID values of point cloud data.

Operation Steps:

1. Click 3D view toolbar → Point Cloud Rendering → Others → Point Source ID to view the point source ID rendering effect.

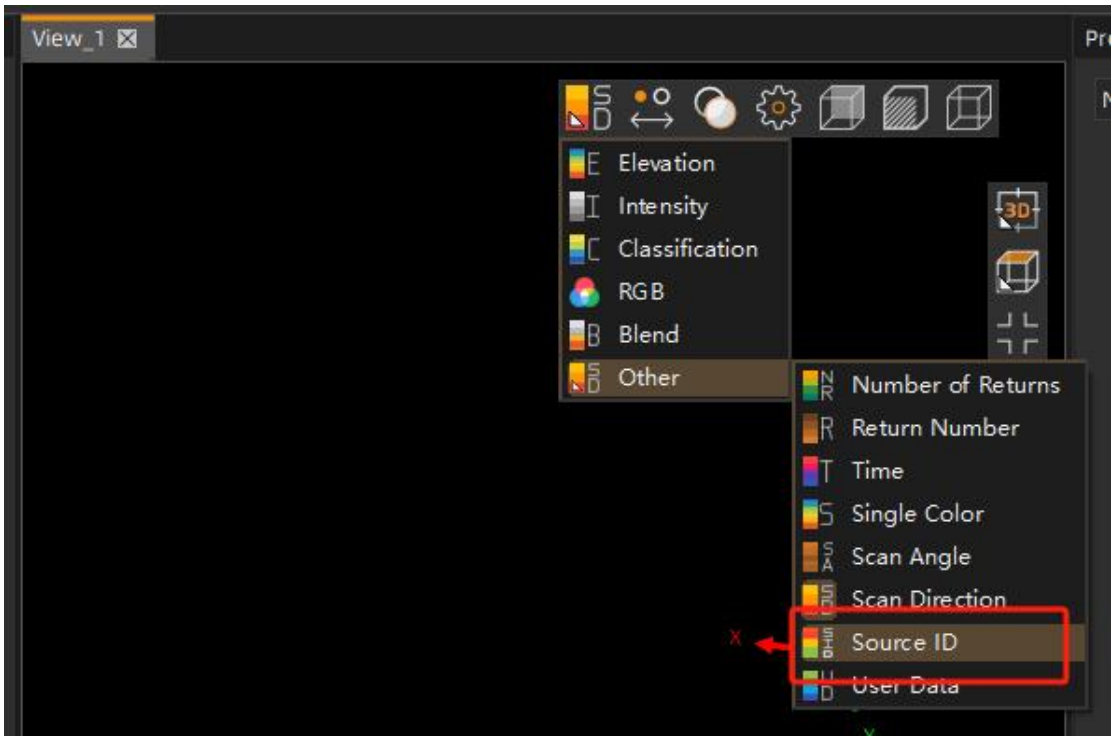


Figure: Source ID Rendering Function Entry

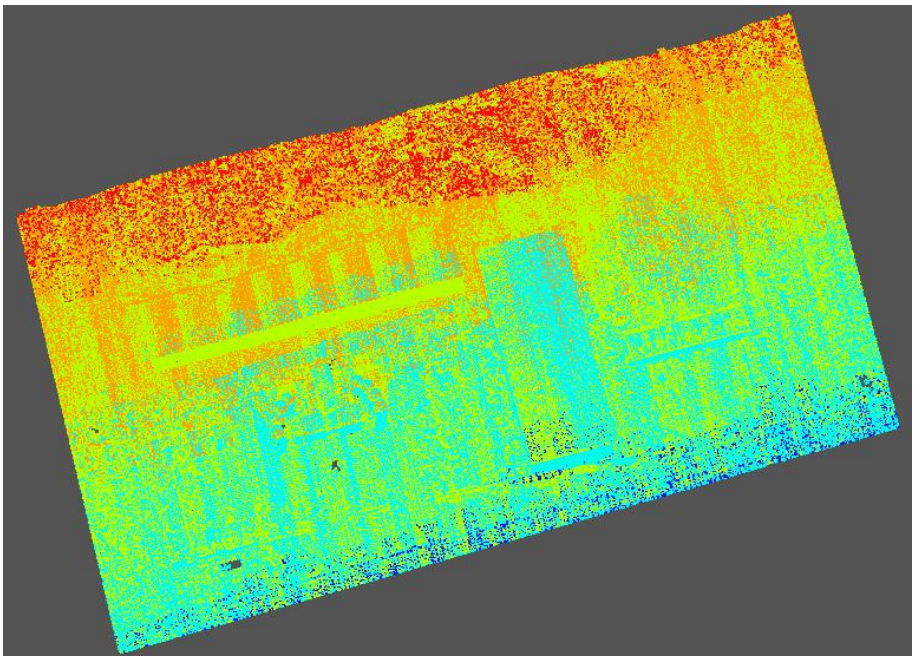


Figure: Source ID Rendering Effect

2. You can select different color ramps as needed. Click Rendering Settings, drag the scroll bar, scroll the mouse wheel, or enter numbers to modify the maximum and minimum values of the point source ID range to view the point source ID rendering effect in real time. Reset restores the default v

alues.



Figure: Source ID Rendering Effect

2.1.1.2 Point Size

Function Description:

Adjusts the size of point objects in the point cloud data in the view.

Operation Steps:

Click the 3D view toolbar → Set Point Size, scroll the mouse wheel (up to i ncrease, down to decrease), or directly enter a point size value. The adjust ment effect is displayed in real time in the view window.



Figure: Point Size Settings

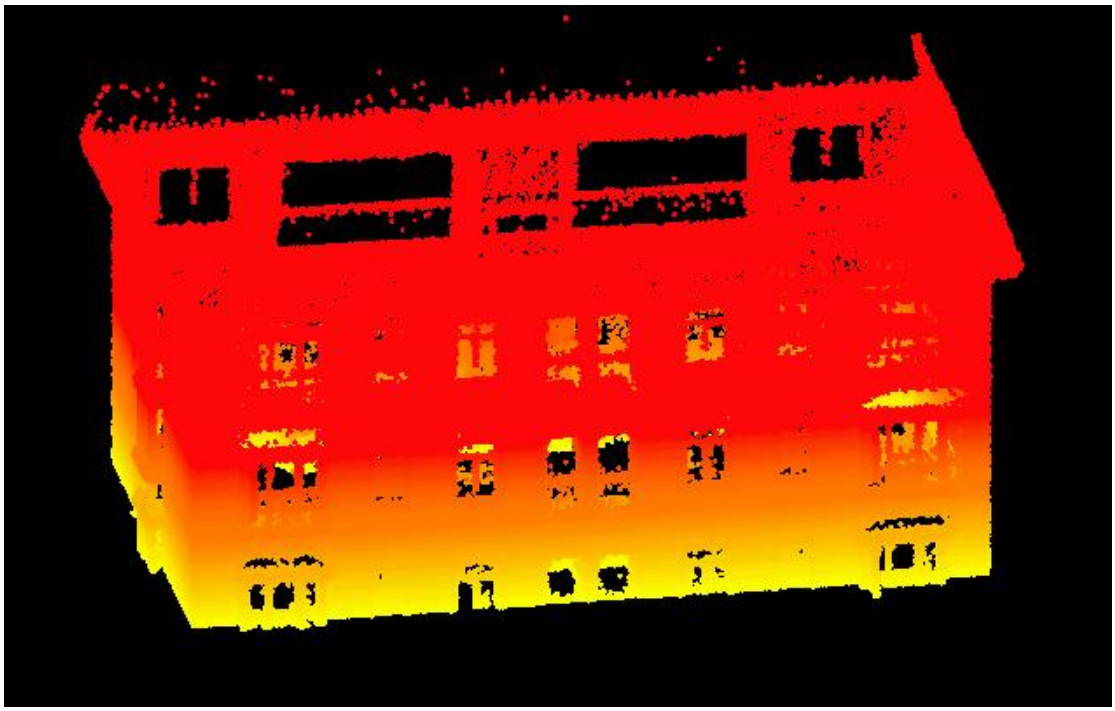


Figure: Point Size 3

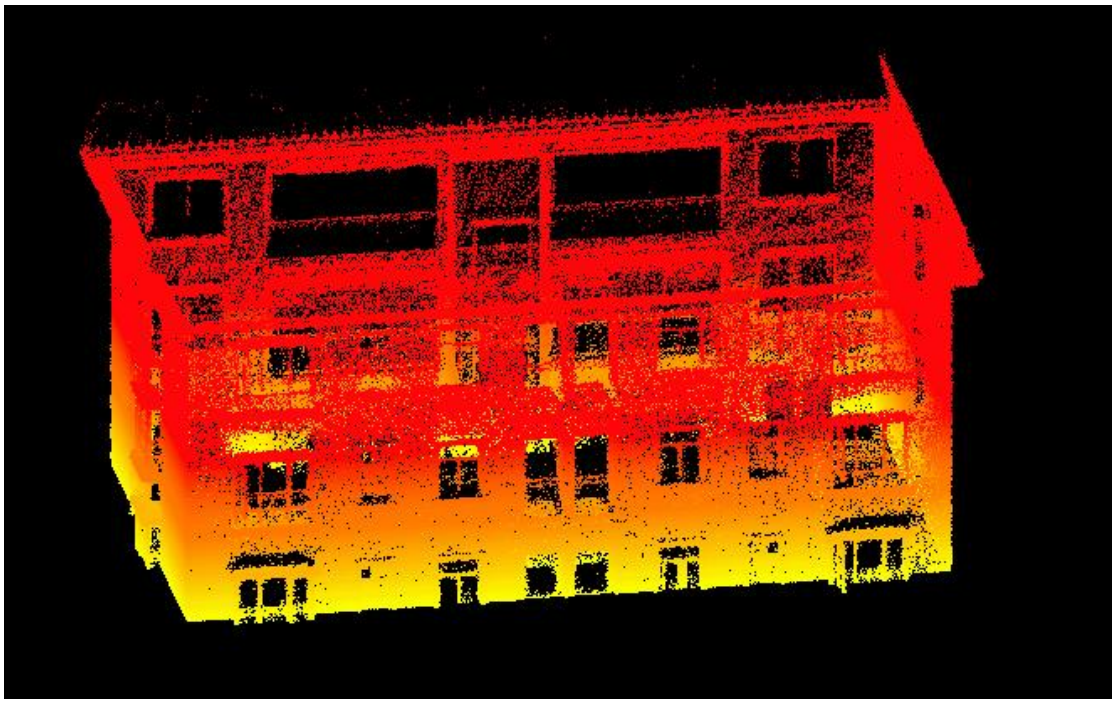


Figure: Point Size 1

Note:

The point size setting range is 1-10 and only takes effect on point objects in point cloud data.

2.1.1.3 Opacity Setting

Function Description:

Adjusts the opacity of point cloud data in the view.

Operation Steps:

Click the 3D view toolbar → Opacity Setting, scroll the mouse wheel (up to increase opacity, down to decrease), or directly enter an opacity value. The adjustment effect is displayed in real time in the view window.



Figure: Opacity Settings

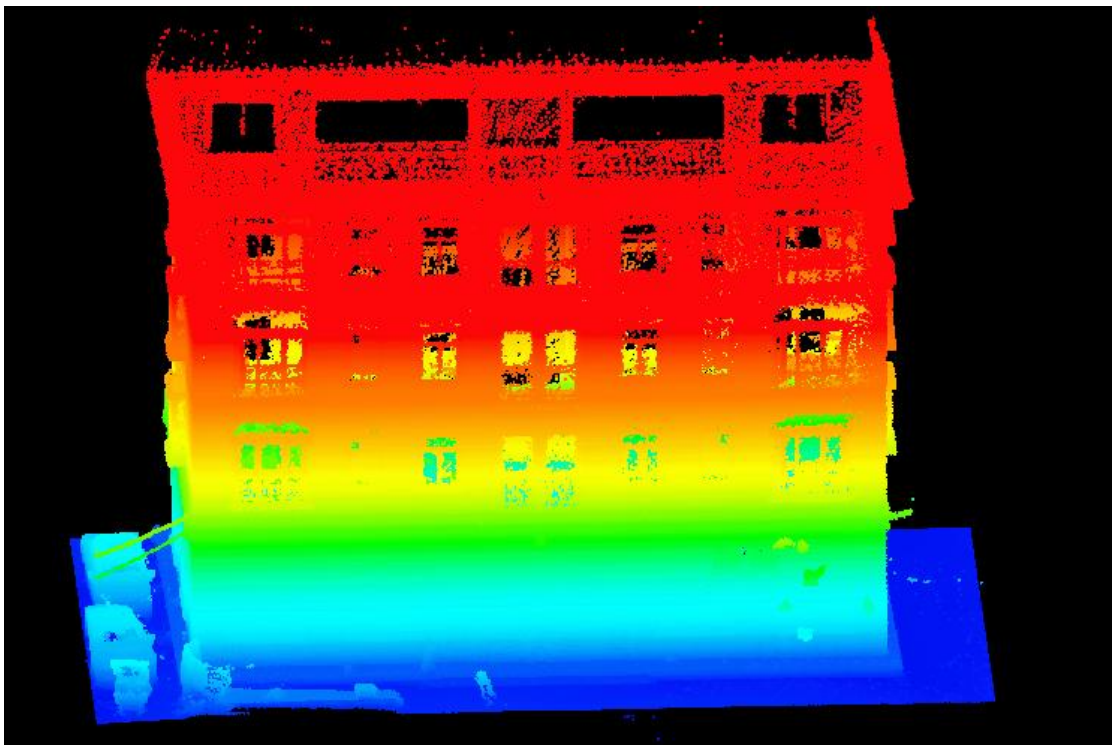


Figure:Opacity100%

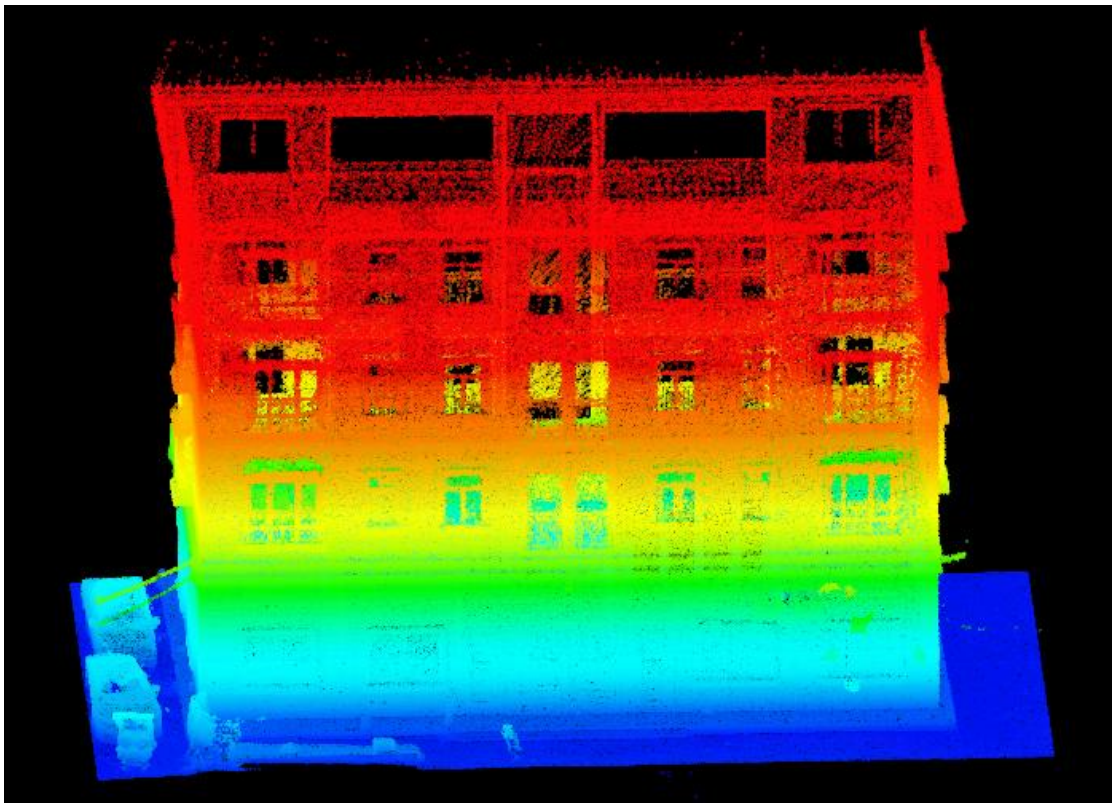


Figure:Opacity50%

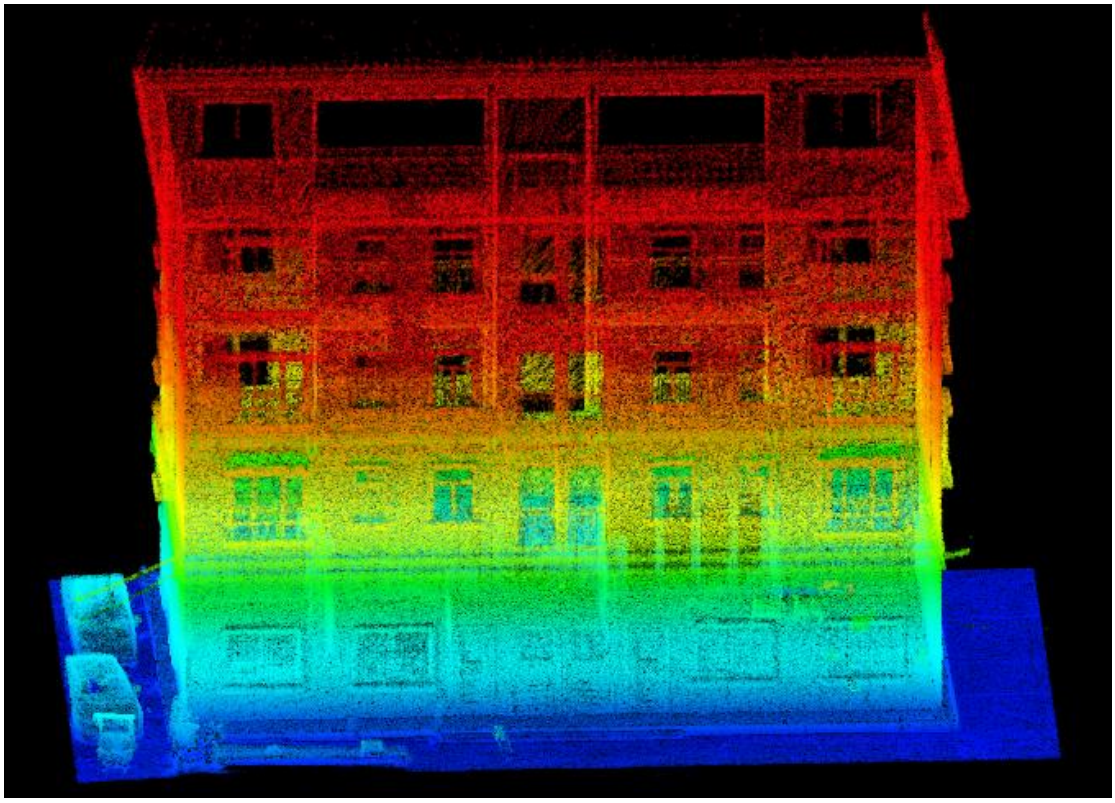


Figure: Opacity 20%

Note: The opacity setting range is 0-100, and it only takes effect for point cloud data.

2.1.1.4 Wireframe Rendering

Function Description:

Switch for displaying wireframes of OSGB model data in the view.

Operation Steps:

Click the 3D view toolbar → Wireframe to toggle wireframe display on/off. Default is off.

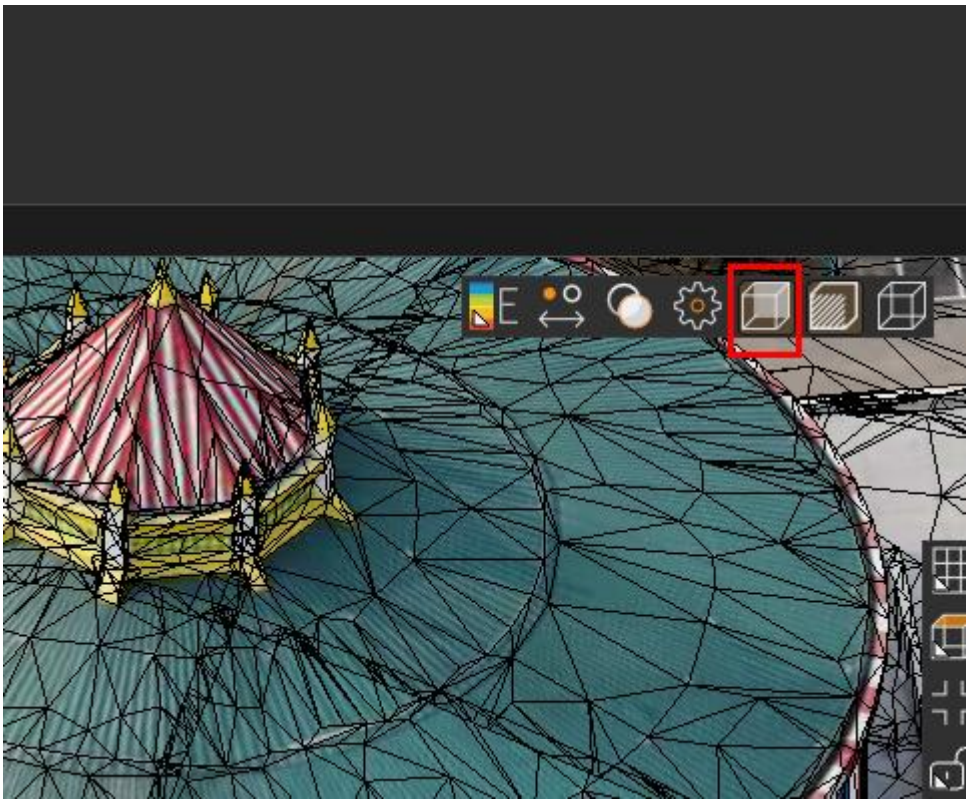


Figure: 3D View Wireframe Rendering

2.1.1.5 Texture Rendering

Function Description:

Switch for displaying textures of OSGB model data in the view.

Operation Steps:

Click the 3D view toolbar → Texture to toggle texture display on/off. Defaul t is on.



Figure: Enable Texture Rendering

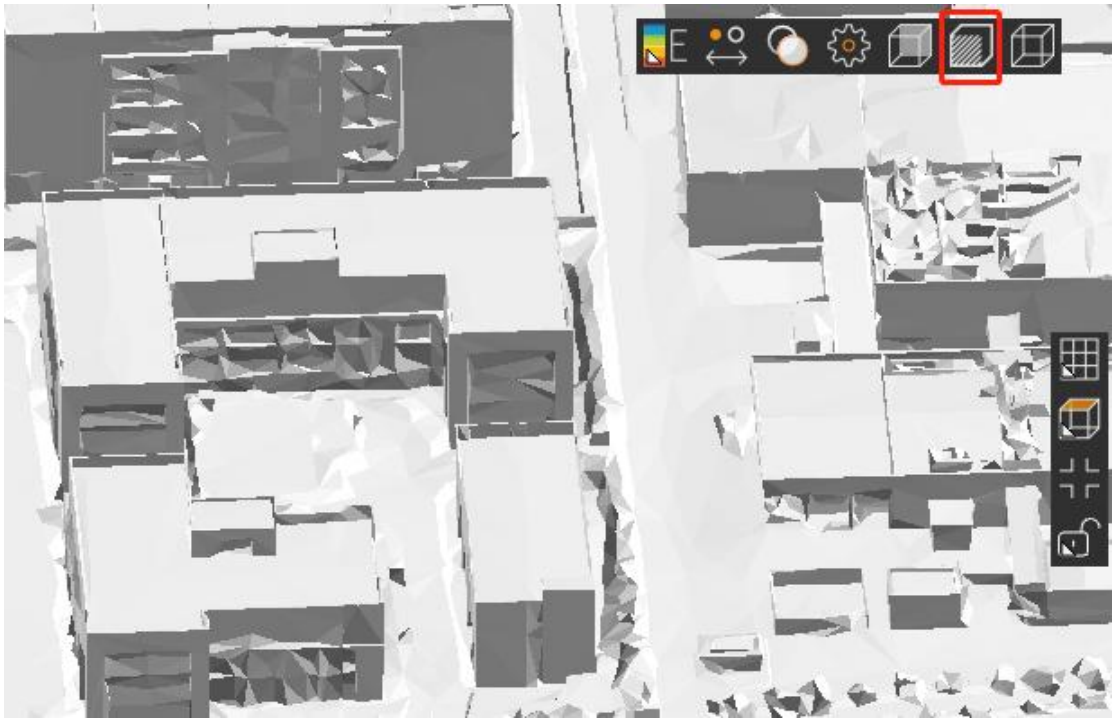


Figure: Disable Texture Rendering

2.1.1.6 Wireframe-Only Rendering

Function Description:

Switch for wireframe-only rendering mode of OSGB model in the view.

Operation Steps:

Click 3D View Toolbar -> Wireframe Only to switch the display and closing of the wireframe-only mode, which is closed by default. When the wirefram e-only mode is enabled, the model only displays the wireframe part.

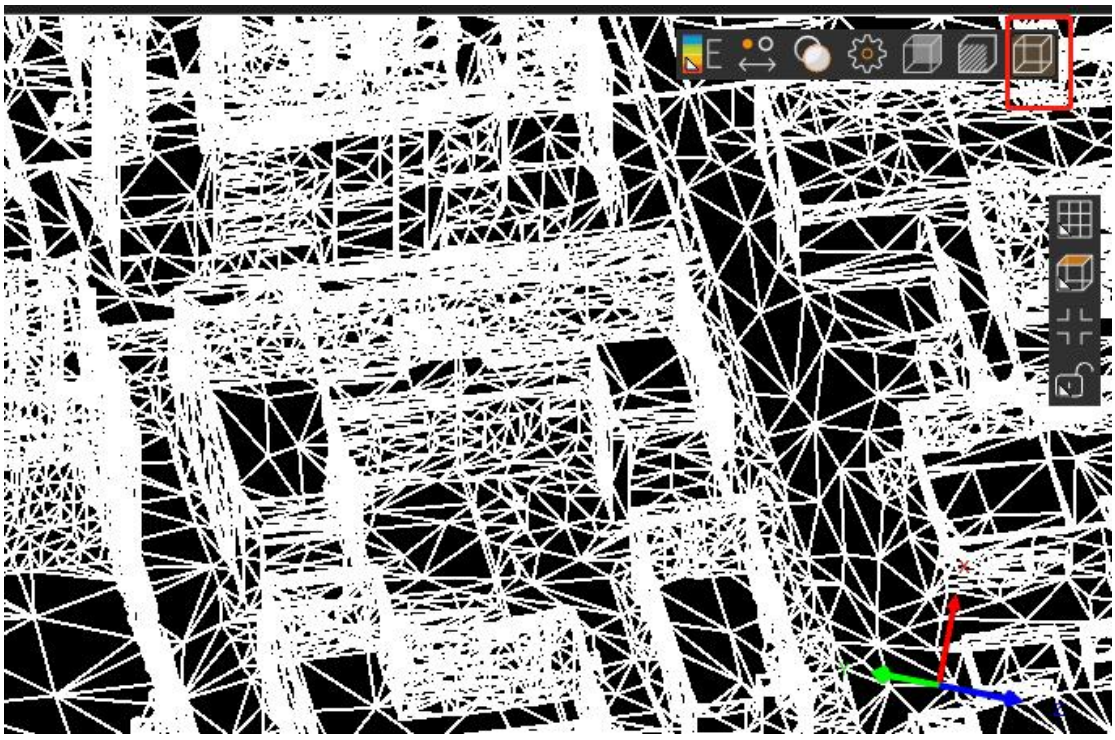


Figure: 3D View Wireframe-Only Rendering

Note: After enabling wireframe-only rendering, the wireframe and texture rendering buttons are grayed out. You can set wireframe and texture rendering only after exiting the wireframe-only rendering mode.

2.1.1.7 Real-Time Coordinate Axis

Function Description:

Real-time display of the direction of the 3D view, with the Z-axis as the vertical upward direction; the X-axis as the east direction, and the Y-axis as the north direction.

Operation Steps:

The real-time 3D coordinate axis are always displayed in the lower right corner of the 3D view.

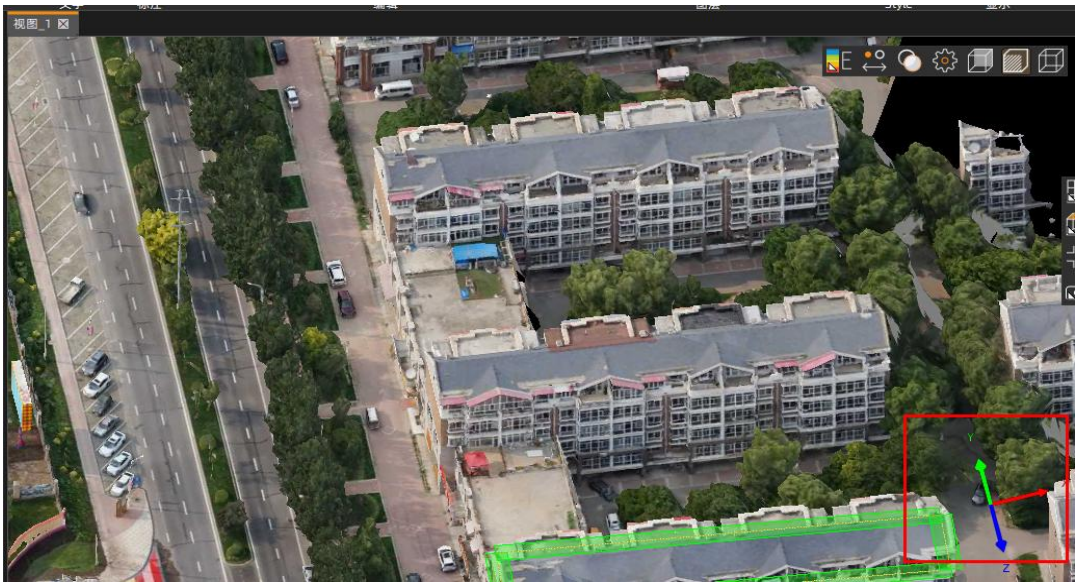


Figure: 3D Real-Time Coordinate Axis

2.1.1.8 View Angle

Defines the projection mode of data in the view, including Orthographic, Perspective, and 2D.

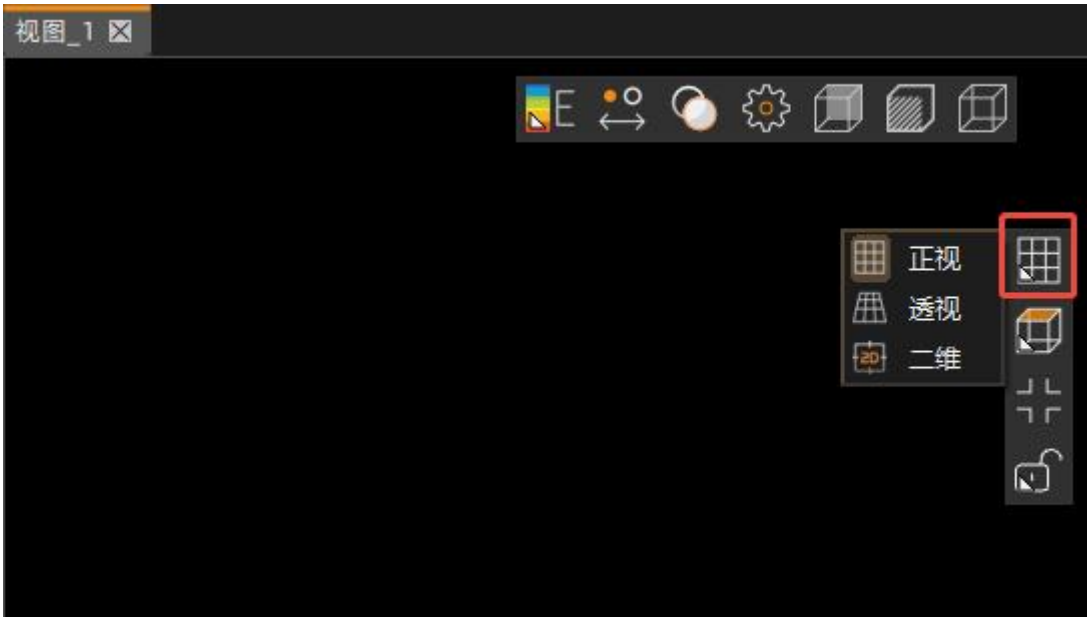


Figure: View Angle Function Entry

2.1.1.8.13 D View

In the 3D view angle, the projection mode of objects in the view is orthographic projection. Orthographic projection, also known as parallel projection, keeps the size of objects unchanged regardless of their distance from the camera.

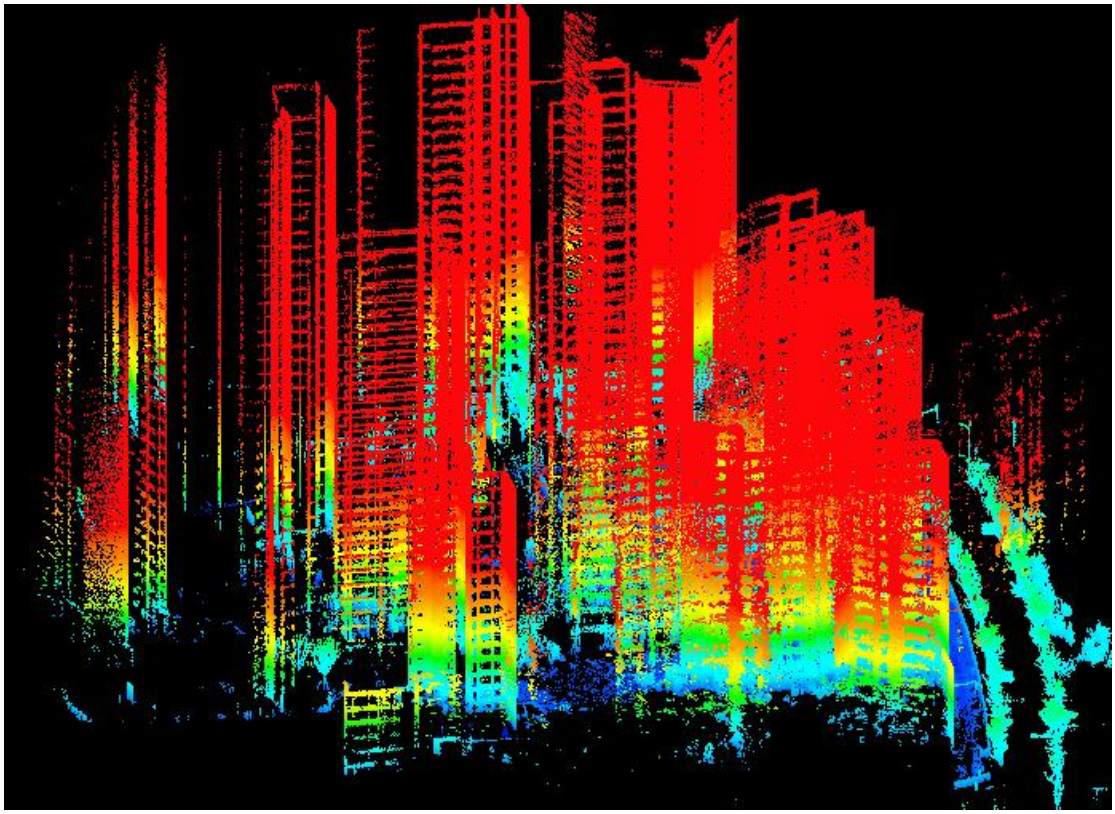


Figure: 3D View

2.1.1.8.14 2D View

3 D projection uses 2D projection to view objects, projecting the object onto the XY plane, displaying a top-down effect, and locking the Z-axis direction vertically upward.

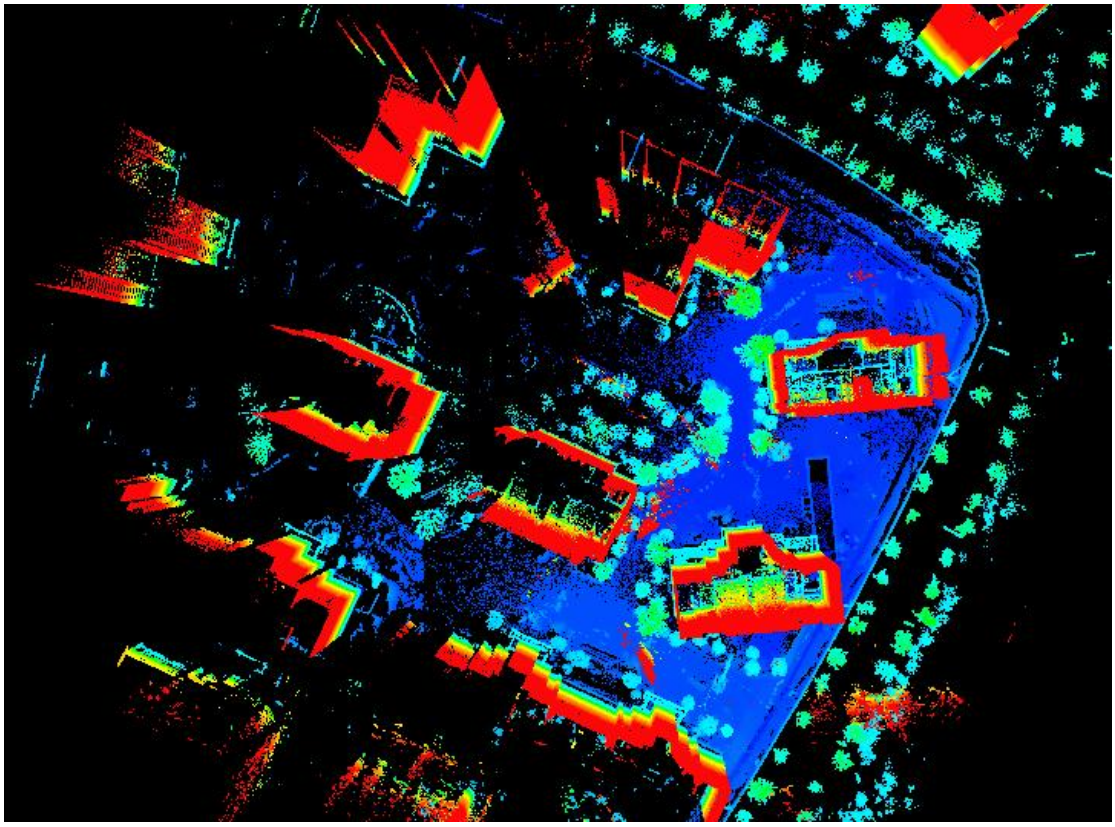


Figure: 2D Projection

2.1.1.9 View Direction

This section introduces view direction. Click to select a view direction; the data in the view can be presented in six different direction views: Front, Back, Left, Right, Top, and Bottom.

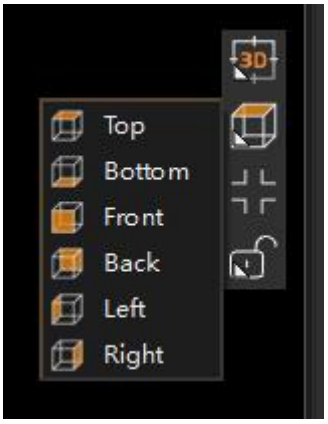


Figure: View Direction

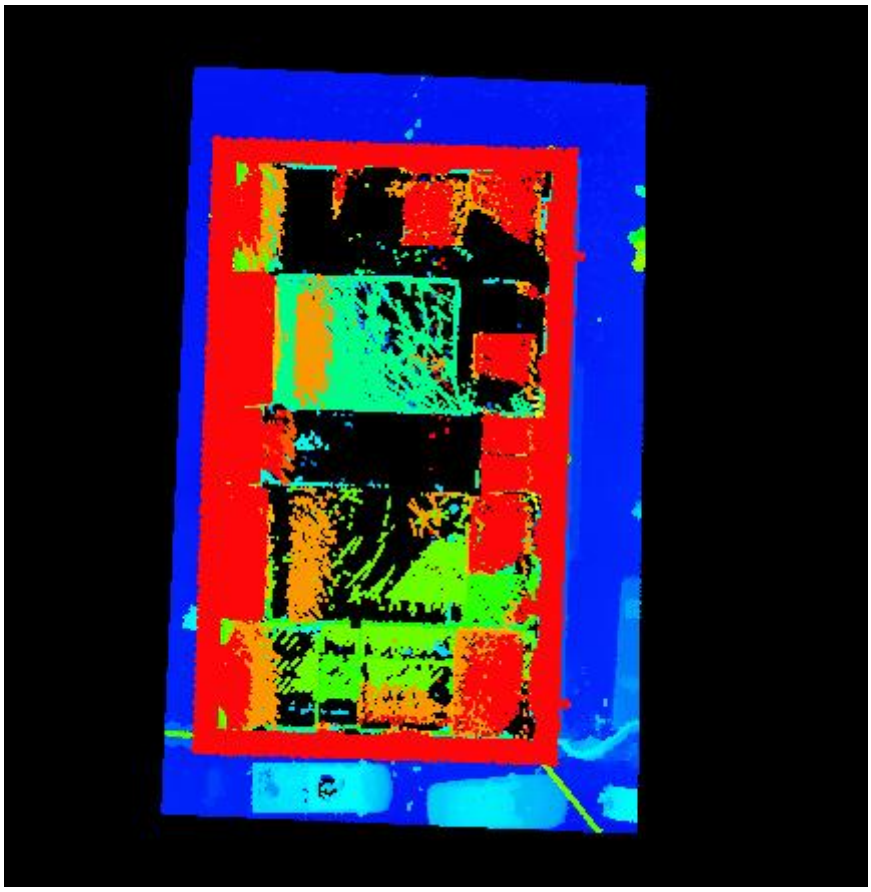


Figure: Top View

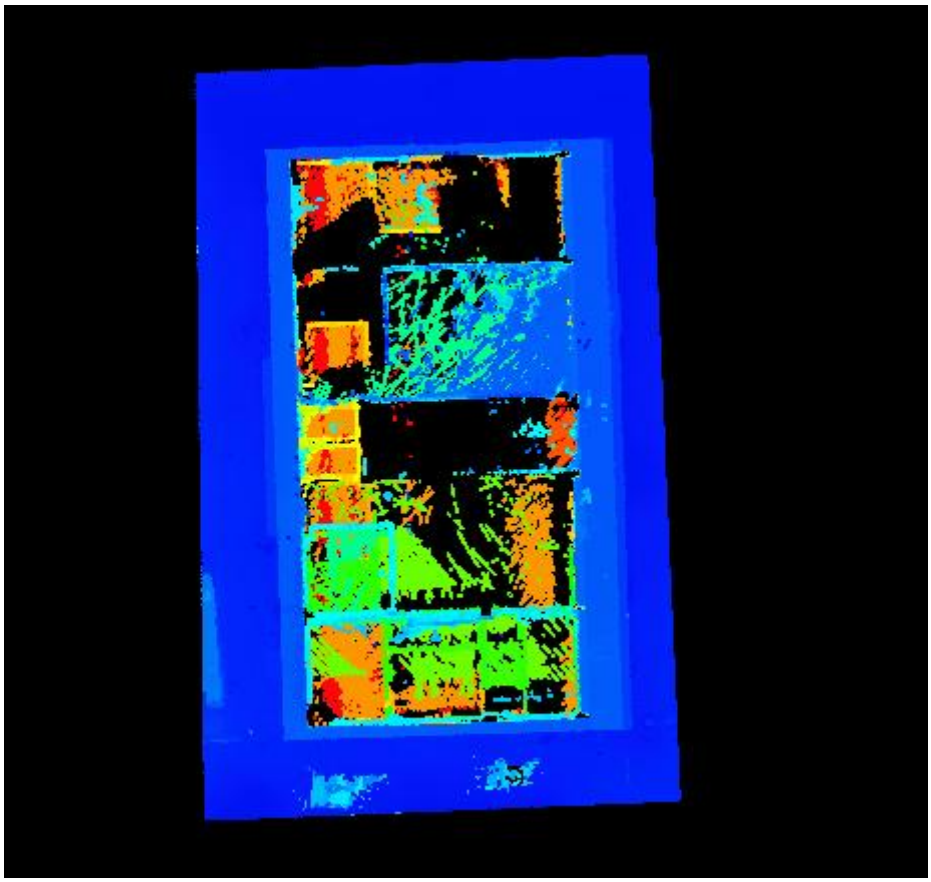


Figure: Bottom View

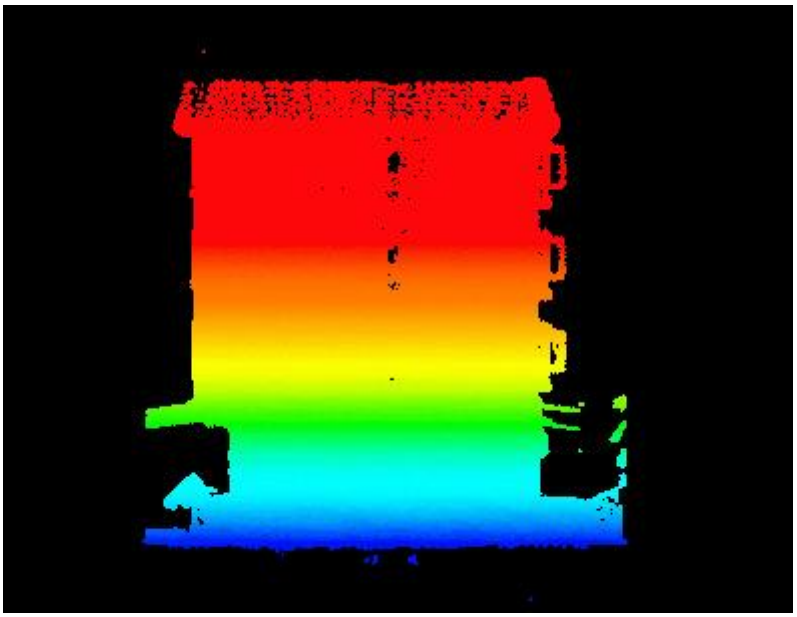


Figure: Front View

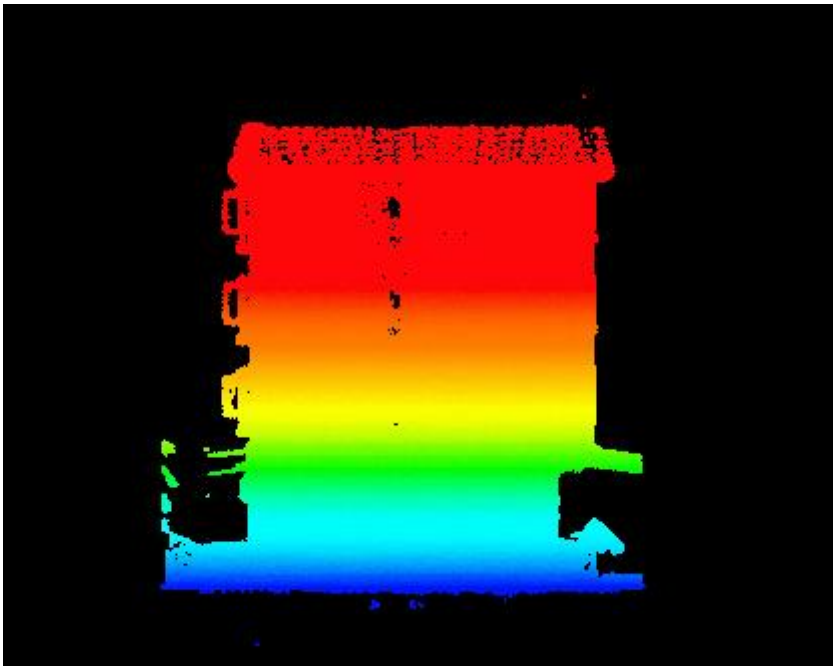


Figure: Back View

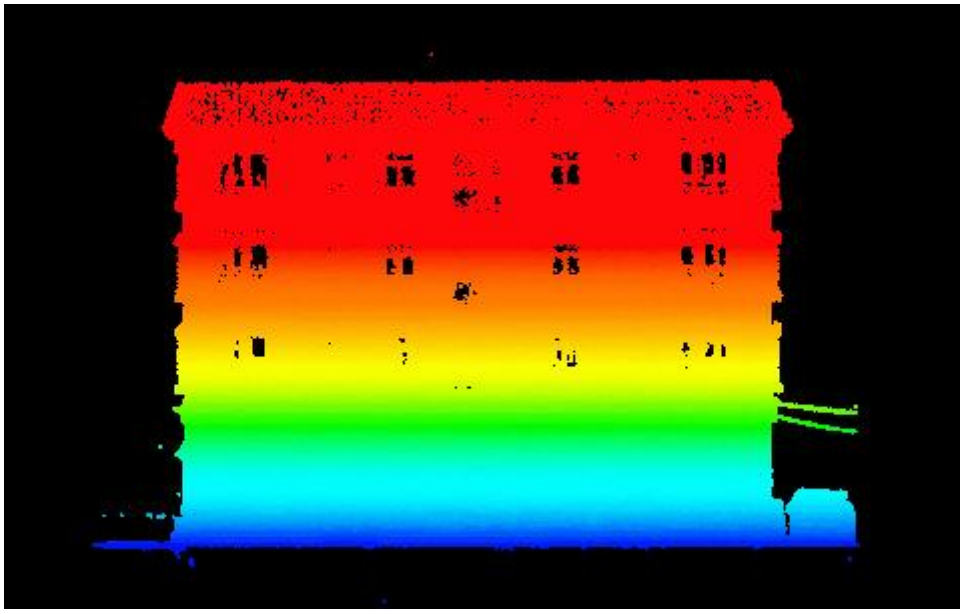


Figure: Left View

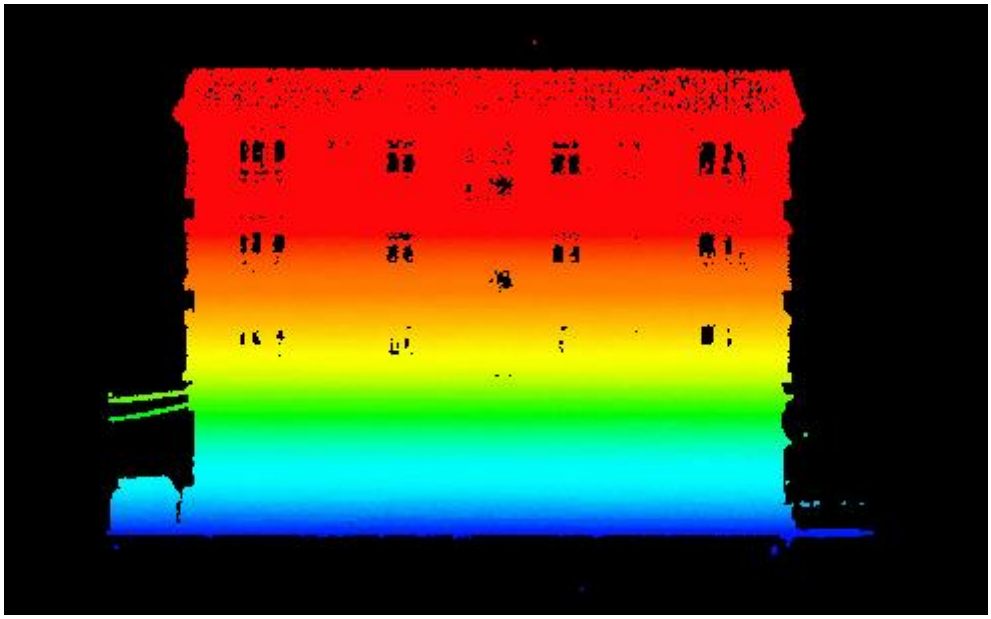


Figure: Right View

2.1.1.10 Center Display

Function Description:

Use the maximum zoom ratio to fully display the bounding box range of all data in the display state in the view.

Operation Steps:

① For data after executing zoom in, zoom out, or pan commands, click 3D View Toolbar -> Center Display;

② Vector, point cloud, DEM, image, and OSGB model data will be scaled according to the proportion of the view border and moved to the center of the view window for display.

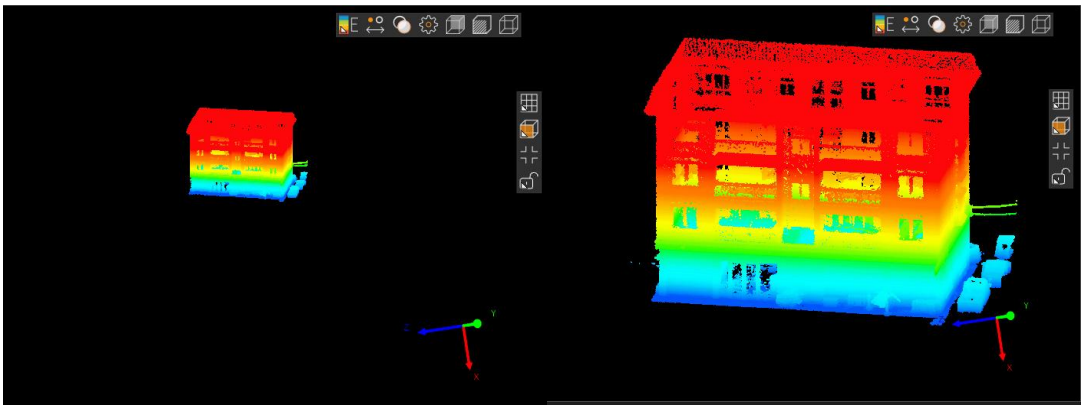


Figure: Comparison Before and After Centering

2.1.1.11 Pan

Pans data in the view. Right-click and drag to pan objects in the view.

2.1.1.12 Rotate

Rotates data in the view. Left-click and drag to rotate objects in the view.

2.1.1.13 Zoom In

Zooms in on data in the view. Scroll the mouse wheel upward to zoom in on data.

2.1.1.14 Zoom Out

Zooms out on data in the view. Scroll the mouse wheel downward to zoo m out on data.

2.1.1.15 View Lock

View lock can lock the pan, rotate, and zoom functions of the view.

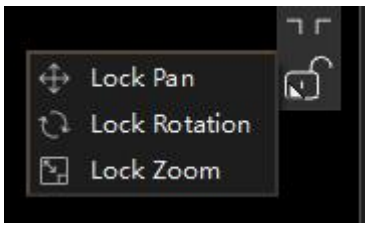


Figure: Lock View

2.1.1.15.1 Lock Pan

When the lock pan function is activated, data objects in the view cannot be panned.

2.1.1.15.2 Lock Rotate

When the lock rotate function is activated, data objects in the view cannot be rotated.

2.1.1.15.3 Lock Zoom

When the lock zoom function is activated, data objects in the view cannot be zoomed.

2.1.2 Elevation View Toolbar

Function Description:

The elevation view toolbar consists of horizontal and vertical groups, fixed in the upper-right area of the elevation view window. From left to right, the functions on the horizontal toolbar are: Elevation Switch, Elevation Parameter Settings, Vector Expansion, Elevation Export, Point Cloud Rendering, Point Size Setting, Opacity Setting, Point Cloud Rendering Settings, Model Wirefra

me Rendering, Model Texture Rendering, Model Only Wireframe Rendering. From top to bottom, the functions on the vertical toolbar are: Center Displ ay, View Lock.

Operation Steps:

Left-click the buttons in the toolbar to implement corresponding functions.

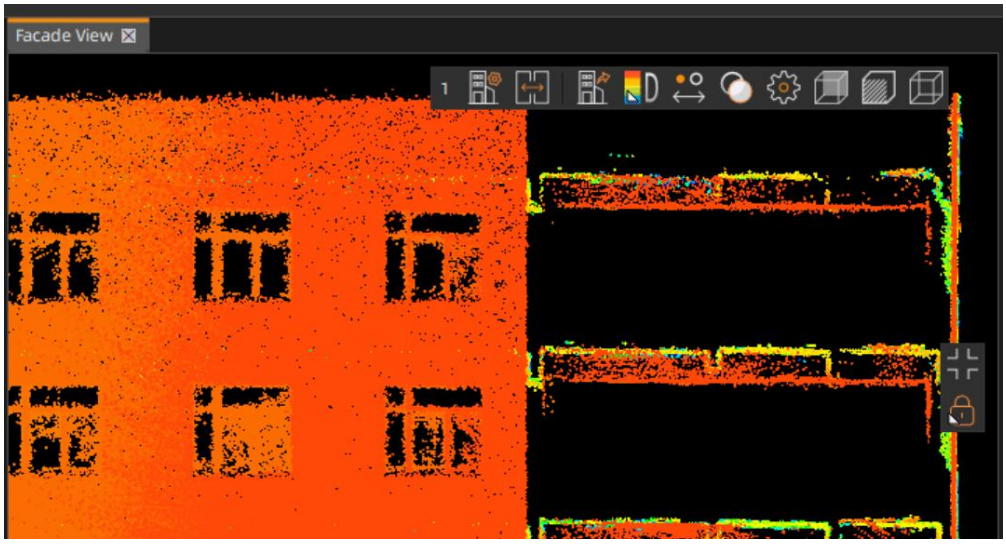


Figure Elevation View Toolbar

2.1.2.1 Elevation Switch

Function Description:

Switches the elevation view angle.

Operation Steps:

1. When the current elevation view is a four-view, click the first button on the horizontal toolbar of the elevation view, and in the dropdown, click "Fr ont, Left, Rear, Right" to switch the display of point cloud and vector data f or different elevation directions.



Figure: Elevation Switch - Four-View

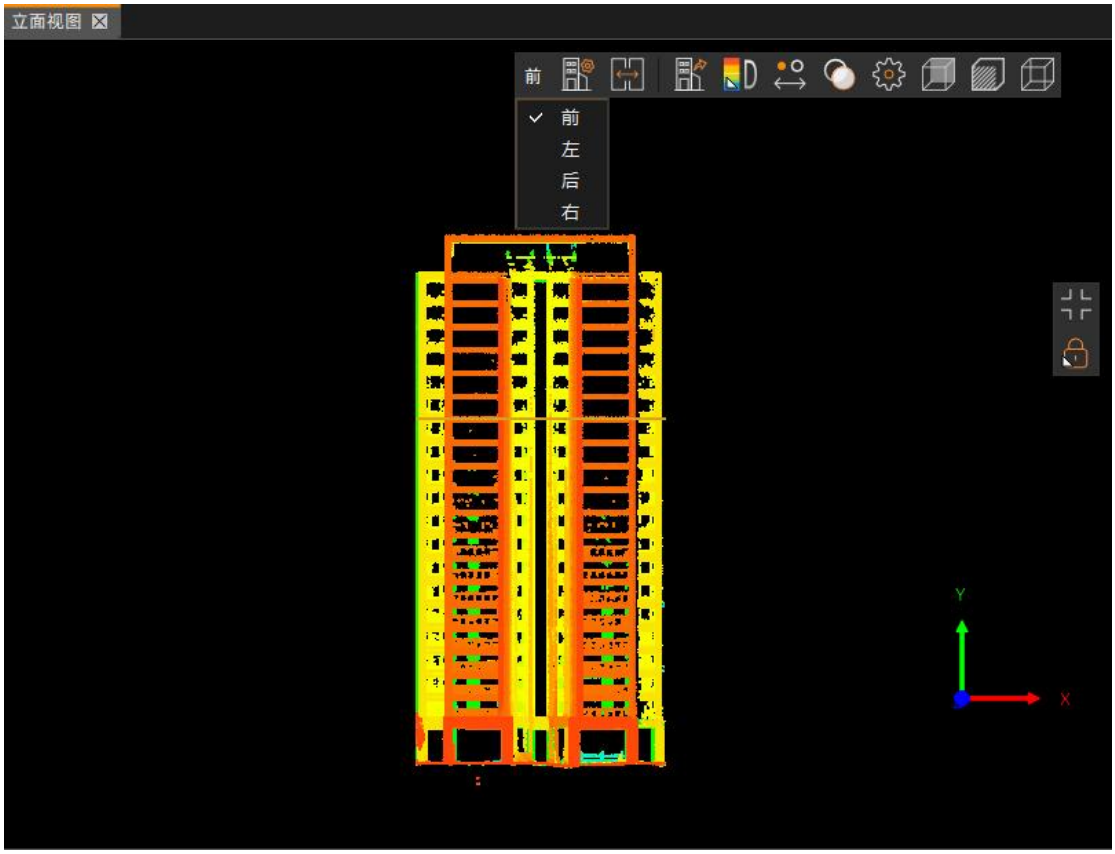


Figure: Elevation View - Four-View

2. When the current elevation view is a front view, click the first button on the horizontal toolbar of the elevation view, and in the dropdown, click different numbers to switch the display of point cloud and vector data for elevation views of different sides.



Figure:facade Switch - Front View

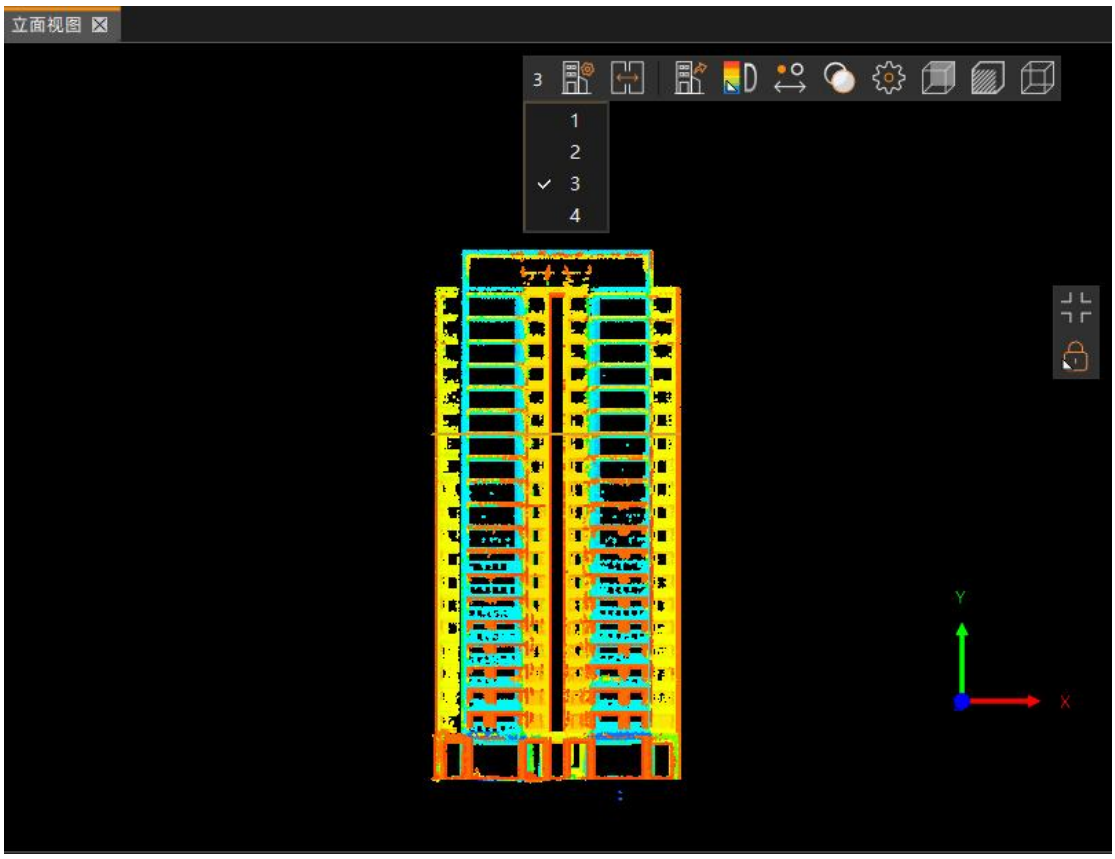


Figure: Elevation View - Front View

2.1.2.2 Elevation Parameter Settings

Function Description:

Sets the thickness and extension parameters of the current elevation.

Operation Steps:

1. Click the Elevation Parameter Settings button to open the Elevation Parameter Settings dialog box. You can modify parameter values by entering numbers, scrolling the mouse wheel, or clicking the up/down arrow buttons.



Figure: Facade Parameter Setting

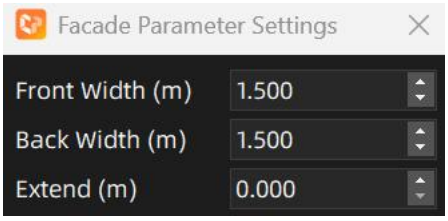


Figure: Facade Parameter Setting Dialog Box

Parameter Settings:

Foreground Thickness (m): The width of the elevation proxy line outward fr om the centerline in the 3D view top-down view (to the right for the front view elevation proxy line). Default value 1.5m, setting range [0.001,100]. Aft er modification, the data displayed in the elevation view is the range cover ed by the elevation proxy line in the 3D view top-down view.

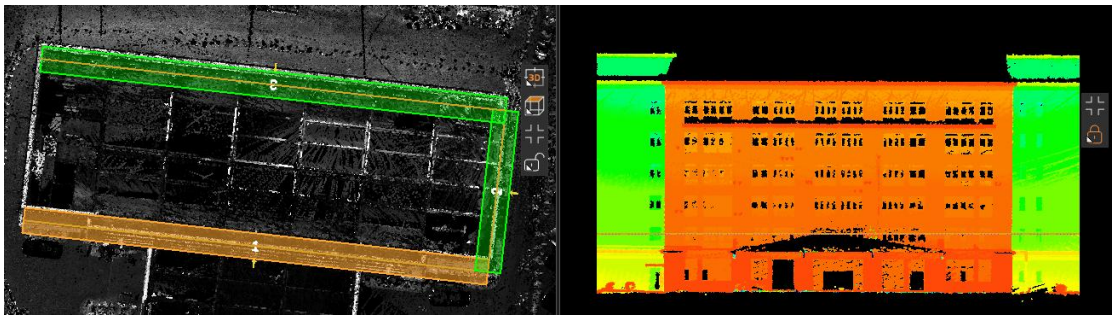


Figure: Front Width 1.5m

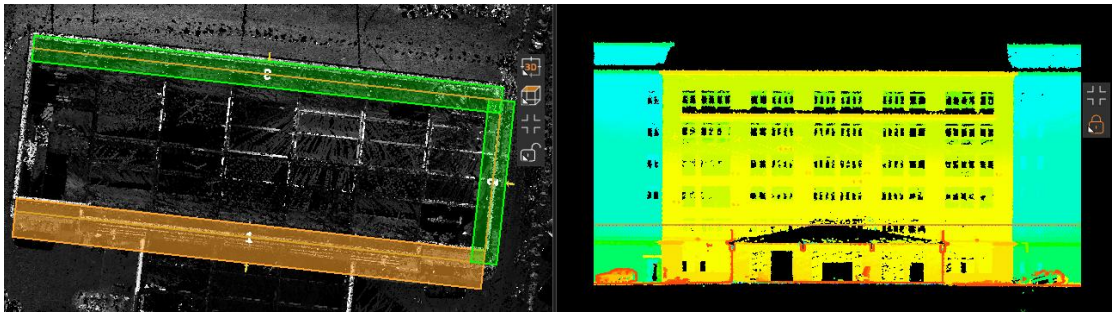


Figure: Front Width 3m

Background Thickness (m):The width of the elevation proxy line inward fr om the centerline in the 3D view top-down view (to the left for the front v iew elevation proxy line). Default value 1.5m, setting range [0.001,100]. Afte r modification, the data displayed in the elevation view is the range covere d by the elevation proxy line in the 3D view top-down view.

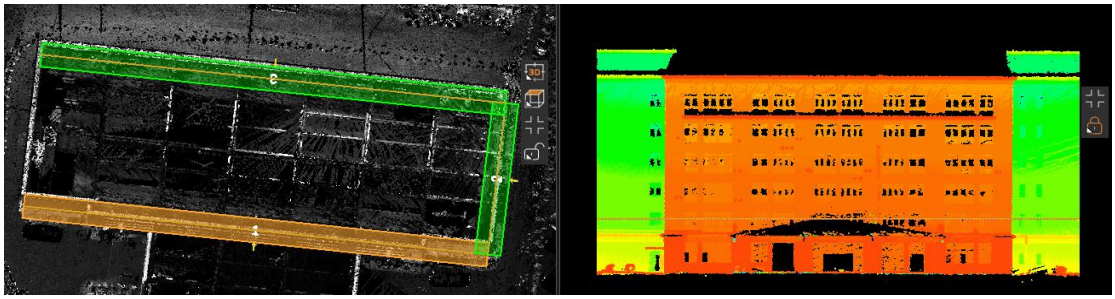


Figure: Back Width 1.5m

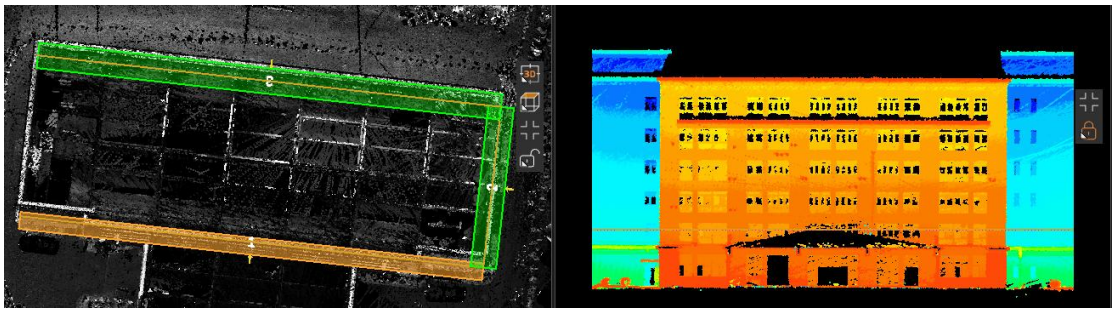


Figure: Back Width 0.5m

Extension (m): The width extended outward from the centerline at both ends of the elevation proxy line. Default value 0m, setting range [0,100]. After modification, the data displayed in the elevation view is the range covered by the elevation proxy line in the 3D view top-down view.

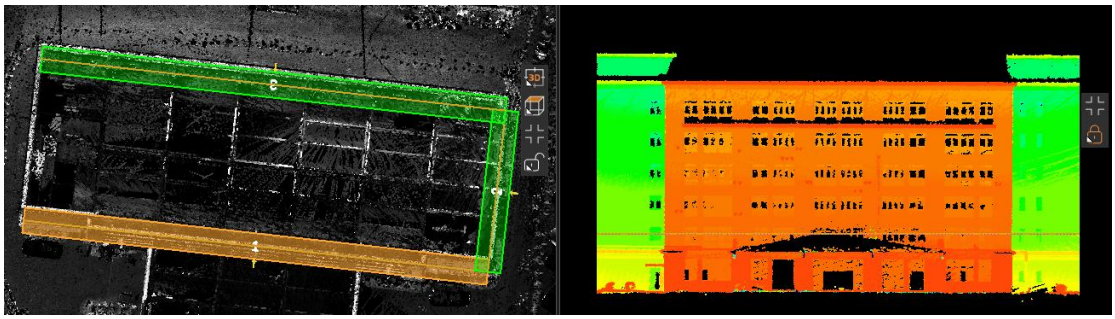


Figure: Expansion 0m

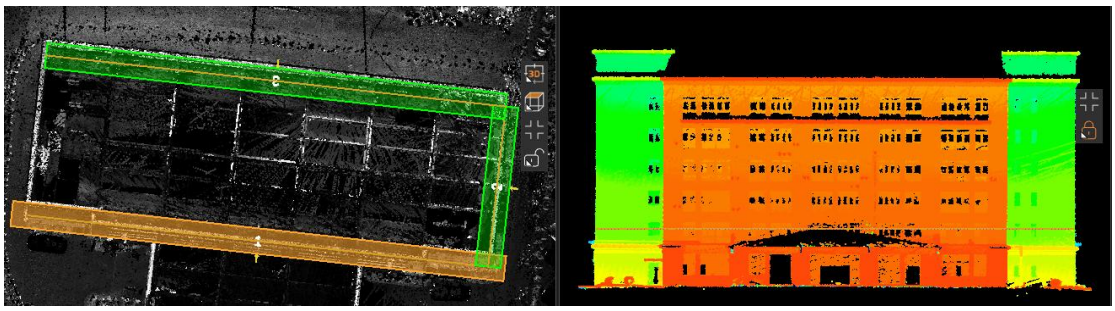


Figure: Expansion 2m

2.1.2.3 Vector Expansion

Function Description:

Expands and displays vector elements of adjacent elevations in the current elevation view.

Operation Steps:

Left-click the Vector Expansion button in the elevation view toolbar to toggle the open/closed state (highlighted for open, not highlighted for closed).



Figure: Vector Unfolding

The vertical height of the vector expansion is determined by the bounding box height of the total data in the software. The width of the vector expansion is determined by the length of the adjacent elevation proxy line. Vectors in the vector expansion can only be snapped, not edited.

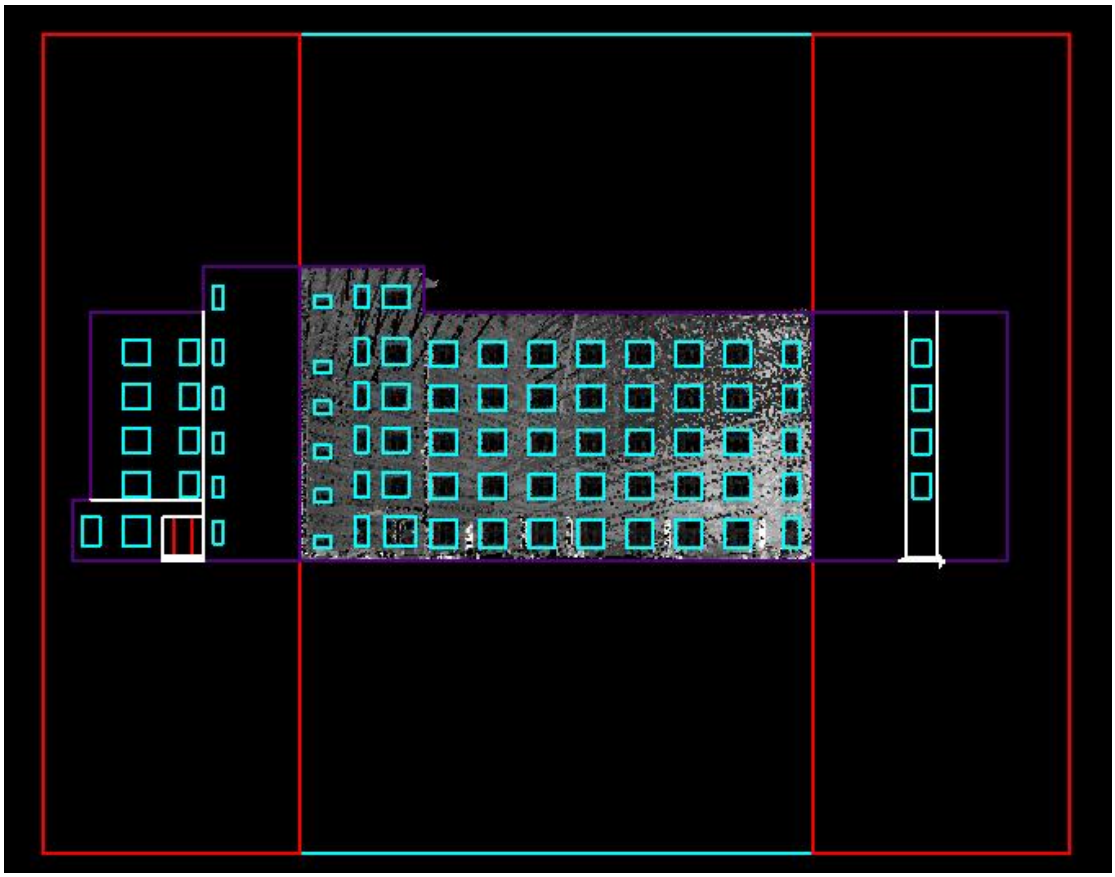


Figure: Vector Unfolding

2.1.2.4 Elevation Export

Function Description:

Facede export solves the problem that high-performance computers are required to support due to the large amount of data when drawing plane and facade based on point cloud data. It can export the point cloud in the created facade in the format of orthophoto or point cloud. When selecting orthophoto, the exported facade includes orthophoto, coordinate file with the same name, dxf and dwg files with the same name.

Operation Steps:

1. Left-click the Elevation Export button in the elevation view toolbar to open the Elevation Export dialog box.



Figure: Facade Export

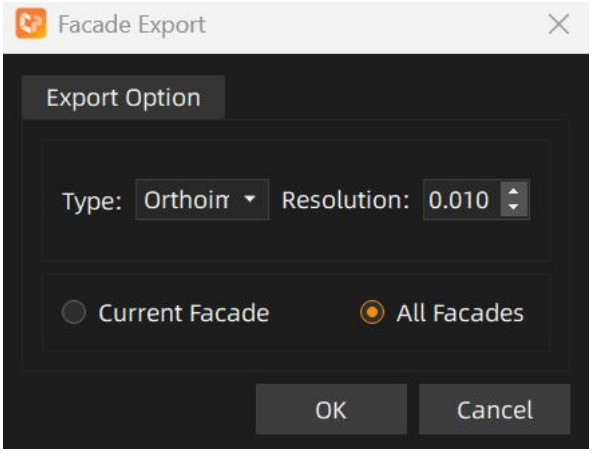


Figure: Facade Export Dialog Box

2. In the Elevation Export dialog box, you can select the object to export: Current Elevation or All Elevations. When Current Elevation is selected, you need to name the exported file and choose the export path. When All Elevations is selected, you only need to choose the export path.

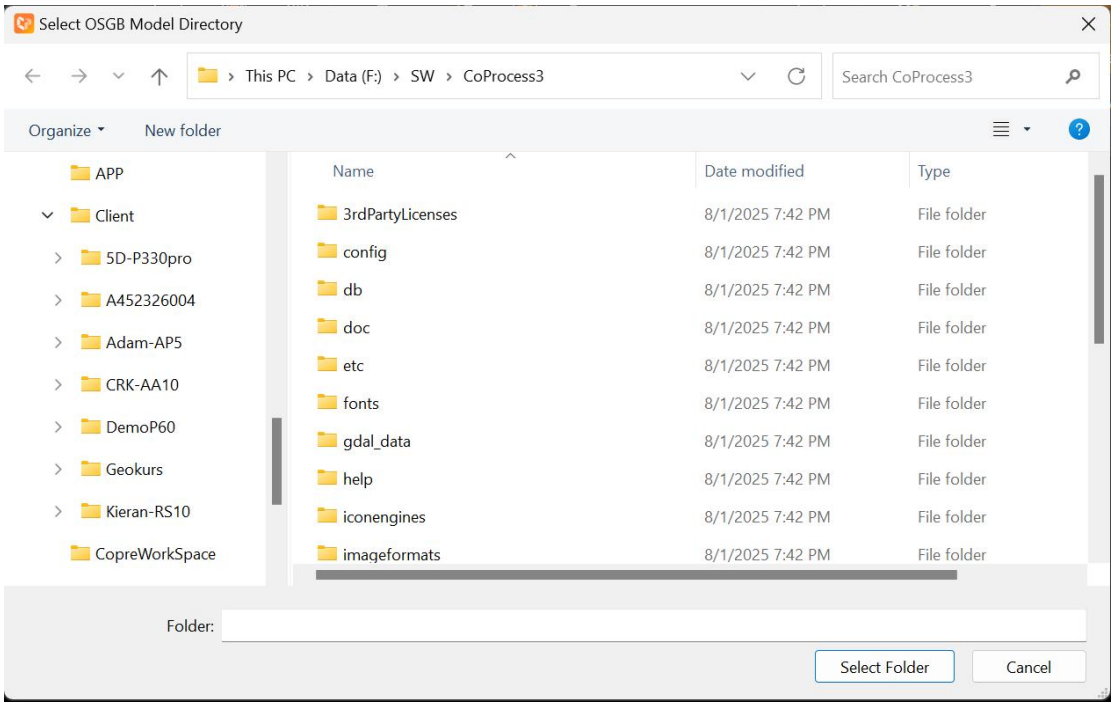


Figure: Current Facade Path Selection Dialog Box

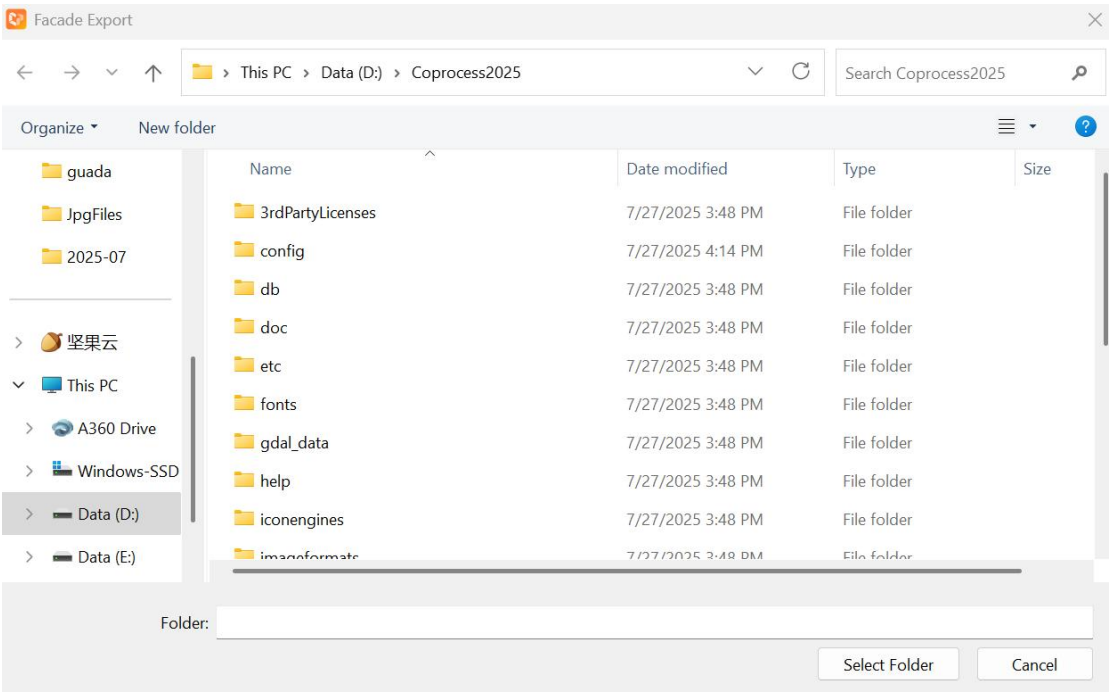


Figure: All Facades Path Selection Dialog Box

3. In the facade export interface, set the type of data to be exported, which is divided into orthophoto and point cloud; when exporting orthophoto, export the orthophoto consistent with the actual size of the point cloud according to the set resolution, the resolution range supports 0.001-1, and generate orthophoto, coordinate file, dxf and dwg files in the selected export path; when exporting point cloud, the supported point cloud types are hpc, las1.2, las1.3, las1.4,E57.

Parameter Settings:

Type:Sets the data format to export: Orthophoto or Point Cloud.

Resolution:Sets the resolution when exporting an orthophoto. The value represents the side length (in meters) of the area represented by one pixel in the orthophoto. Smaller values yield finer orthophotos but longer export times.

Format:Selects the format for exporting the point cloud: HPC, Las1.2, Las1.3, Las1.4, E57.

Current Elevation: Only the current elevation data is exported.

All Elevations: All elevations in the current proxy line are exported.

2.1.2.5 Point Cloud Rendering

This section mainly introduces point cloud rendering in the elevation view. Point cloud rendering allows users to render point clouds in different ways to obtain needed information from various renderings, mainly including Depth Rendering, Elevation Rendering, Intensity Rendering, Class Rendering, RGB Rendering, Mixed Rendering, and other rendering methods such as Return Number Rendering, Return Index Rendering, Time Rendering, Monochrome Rendering, Scan Angle Rendering, Scan Direction Rendering, Point Source ID Rendering, and User Data Rendering.

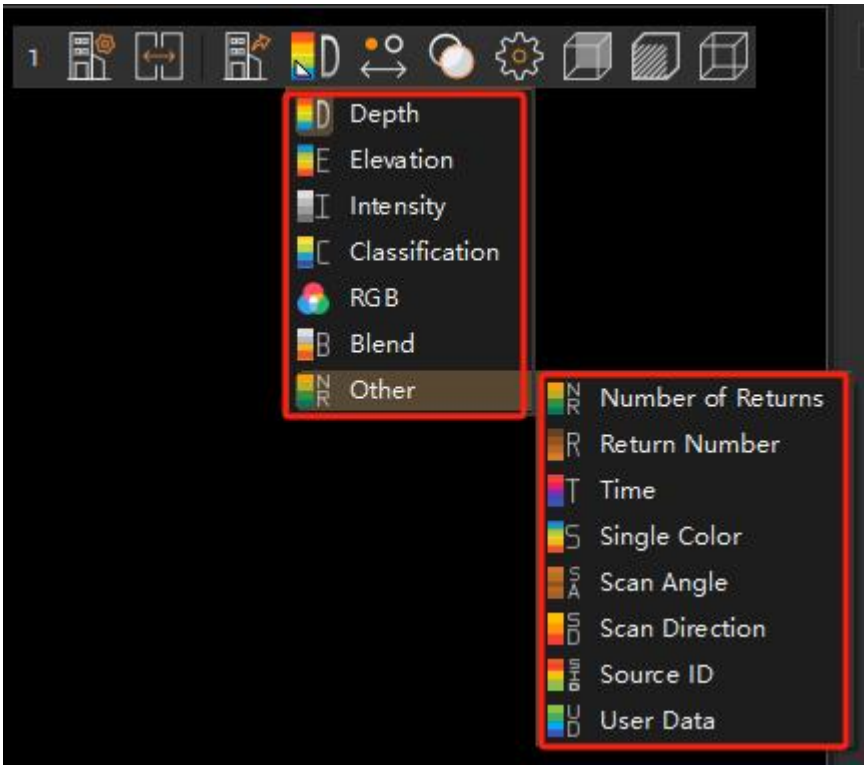


Figure: Point Cloud Rendering mode in the Facade View

Note: This function is only effective for point cloud data, and the default rendering is depth rendering.

2.1.2.5.1 Depth Rendering

Function Description:

Maps point cloud data of different depths to a specified color range according to the depth value.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → Depth to display the depth rendering effect of the data.

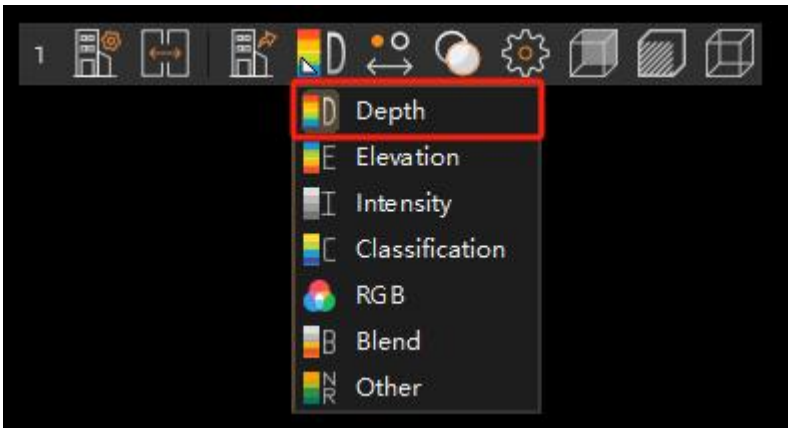


Figure: Depth Rendering Function Entry

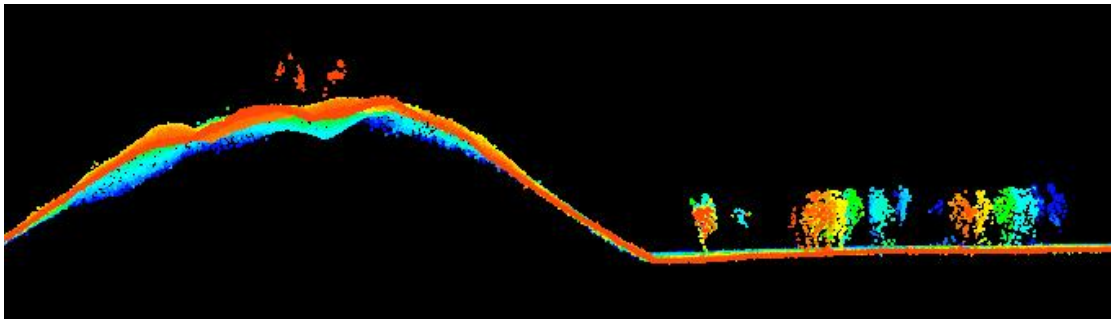


Figure: Depth Rendering

2. Click Rendering Settings. As shown below, you can choose different color ramps to modify the rendering effect. You can also change the maximum and minimum values of the depth range by dragging the scroll bar, scrolling the mouse wheel, or entering numbers to modify the depth rendering effect in real time. Click the Reset button to restore default values.



Figure: Depth Rendering Settings

2.1.2.5.2 Elevation Rendering

Function Description:

Map the point cloud data to a specified color interval according to its elevation value, facilitating the observation of elevation changes in the point cloud data.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → Elevation to display the elevation rendering effect of the data.

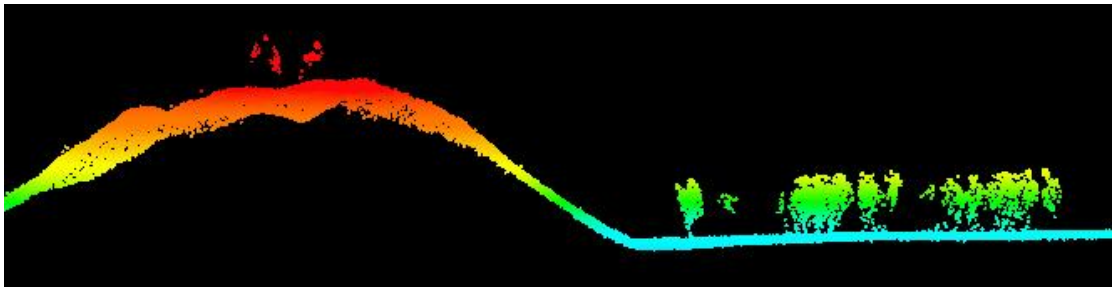


Figure: Elevation Rendering

2. Click Rendering Settings. As shown below, you can choose different color ramps to modify the rendering style. You can modify the maximum and minimum elevation values by dragging the scroll bar, scrolling the mouse wheel, or entering numbers to view the elevation rendering effect in real time. Click the Reset button to restore default values.



Figure: Elevation Rendering Settings

Note: This function is only effective for point cloud data containing elevation information.

2.1.2.5.3 Intensity Rendering

Function Description:

Maps the intensity values of point cloud data to a uniformly varying color range.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → Intensity to display the intensity rendering effect of the data.

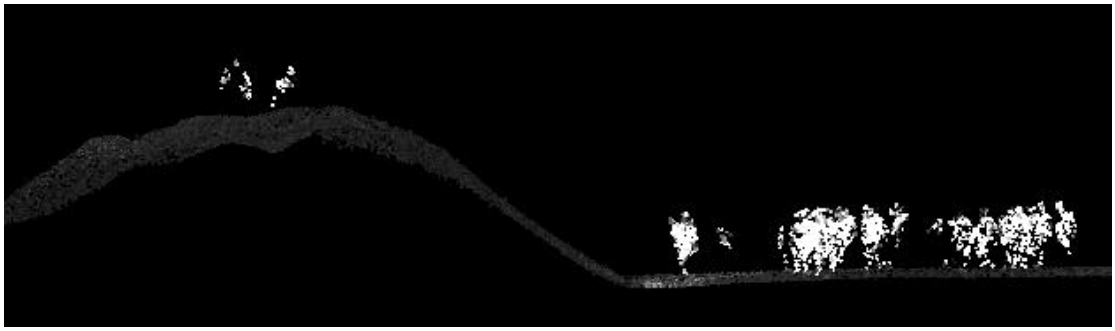


Figure: Intensity Rendering

2. Click Rendering Settings. As shown below, choose different color ramps to use different rendering styles. Drag the scroll bar, scroll the mouse wheel to modify intensity values, or enter numbers to modify the maximum and minimum intensity values to view the intensity rendering effect in real time. Click the Reset button to restore default values.



Figure: Intensity Rendering Settings

Note: This function is only effective for point cloud data containing intensity information.

2.1.2.5.4 Class Rendering

Function Description:

According to the different class attributes of point cloud data, each class is

mapped to a different color value, making it easy to visually distinguish points of different classes.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → Class to view the class rendering effect.

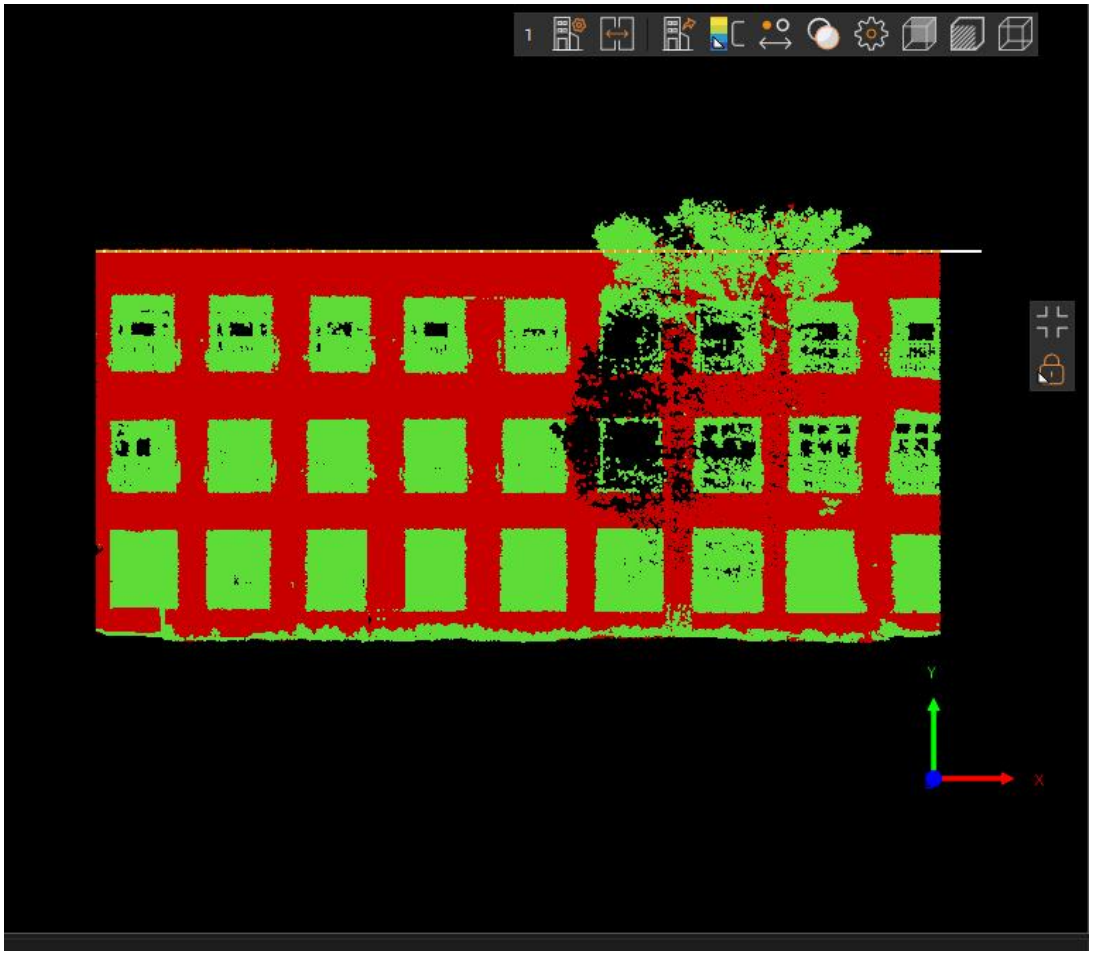


Figure: Classification Rendering

2. Click Rendering Settings. As shown below, by default all classes are rendered. Uncheck the "Select All" checkbox to cancel rendering of all classes. Uncheck a specific class checkbox to cancel display of that class.

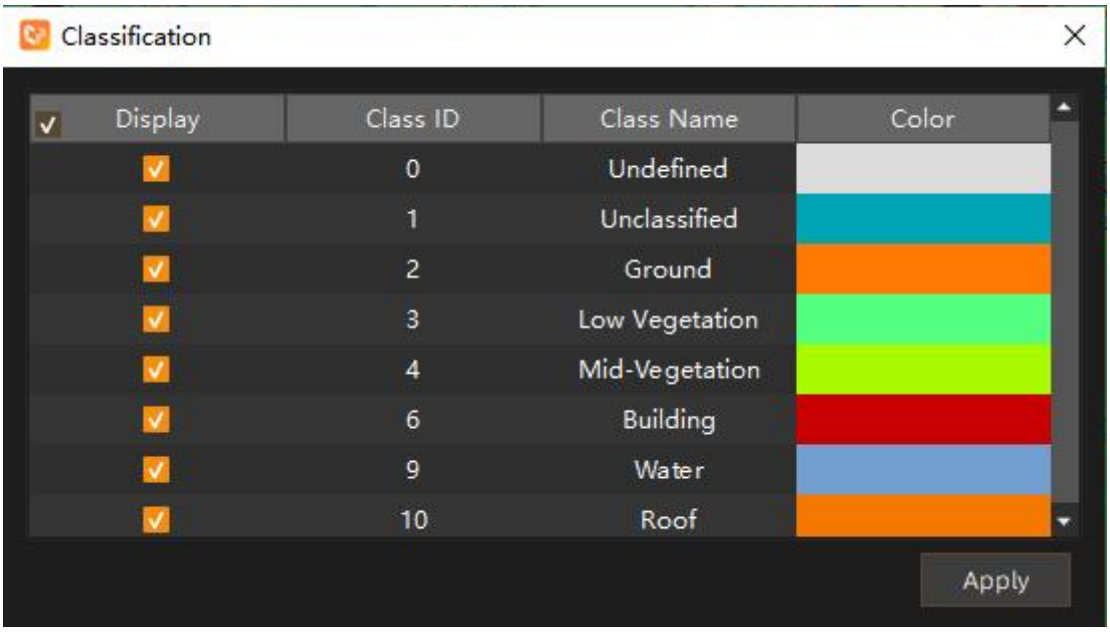


Figure: Classification Settings

3. Click the color on the right side of a category to load the color list. You can select basic colors and also support obtaining screen colors. Pick a col or in the color mapping table on the right and click OK to modify the clas sification rendering color.

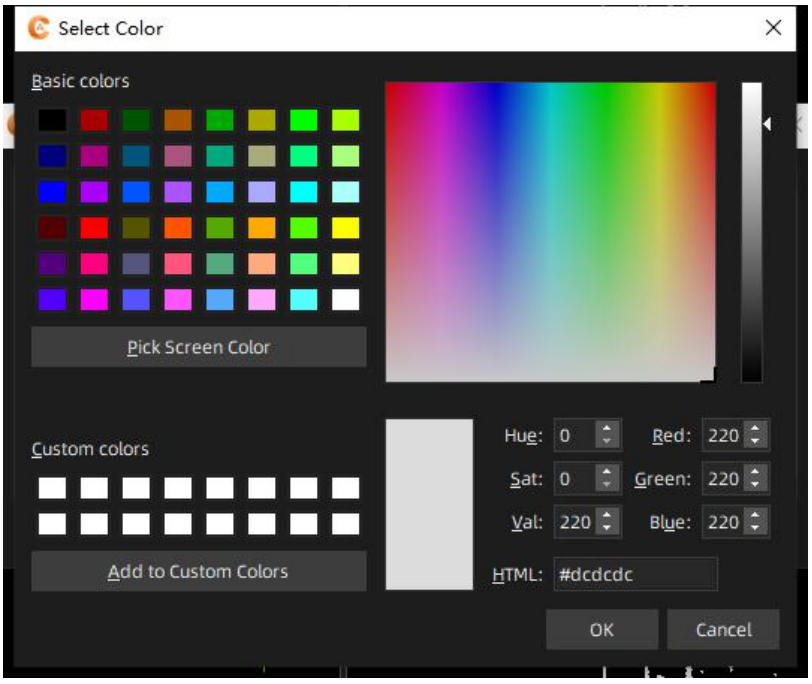


Figure: Set Classification Color

Note: This function is only effective for point cloud data containing classific ation information

2.1.2.5.5 RGB Rendering

Function Description:

Uses the color attribute (RGB values) of point cloud data to display the poi nt cloud.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → RGB.
2. The point cloud in the view is rendered according to its own RGB color values.



Figure: True Color Rendering

Note: This function is only effective for point cloud data containing RGB inf ormation.

2.1.2.5.6 Mixed Rendering

Function Description:

This function implements mixed rendering of point cloud data, mapping the elevation and intensity attributes of the point cloud data to a uniformly va

rying color range, displaying the combined effect of elevation and intensity, facilitating clear distinction of object boundaries.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → Mixed to view the mixed rendering effect of elevation and intensity.

2. After selecting a color ramp, the point cloud is displayed with mixed rendering.

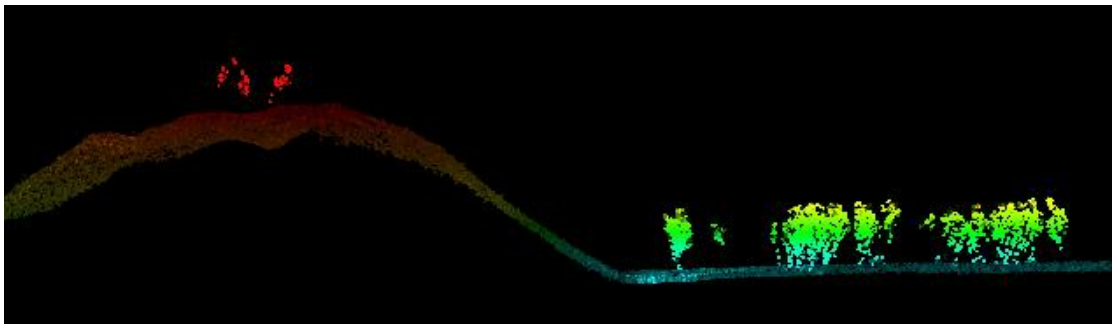


Figure: Blend Rendering

3. Click Rendering Settings. As shown below, drag the scroll bar, scroll the mouse wheel, or enter numbers to modify the maximum and minimum values of elevation and intensity to view the mixed rendering effect in real time. Click the Reset button to restore default values.

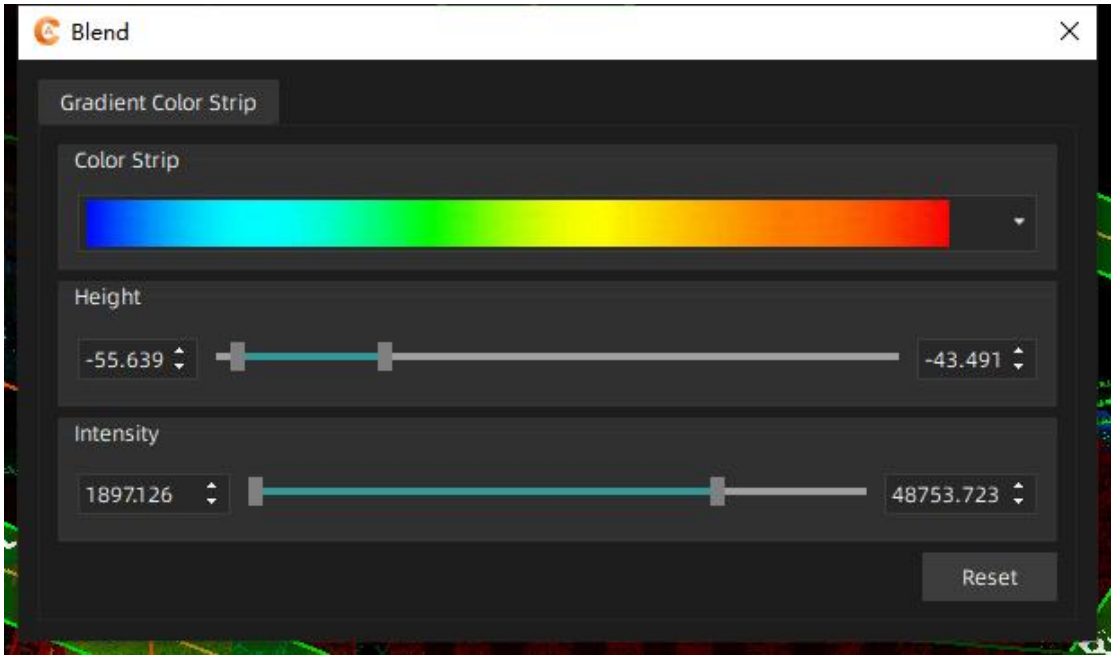


Figure: Blend Rendering Settings

2.1.2.5.7 Return Number Rendering

Function Description:

Renders point clouds with different color values according to the return number attribute value, facilitating intuitive distinction of point clouds with different return numbers.

Operation Steps:

Click Elevation view toolbar → Point Cloud Rendering → Others → Return Number to view the rendering result of the data according to different return numbers.

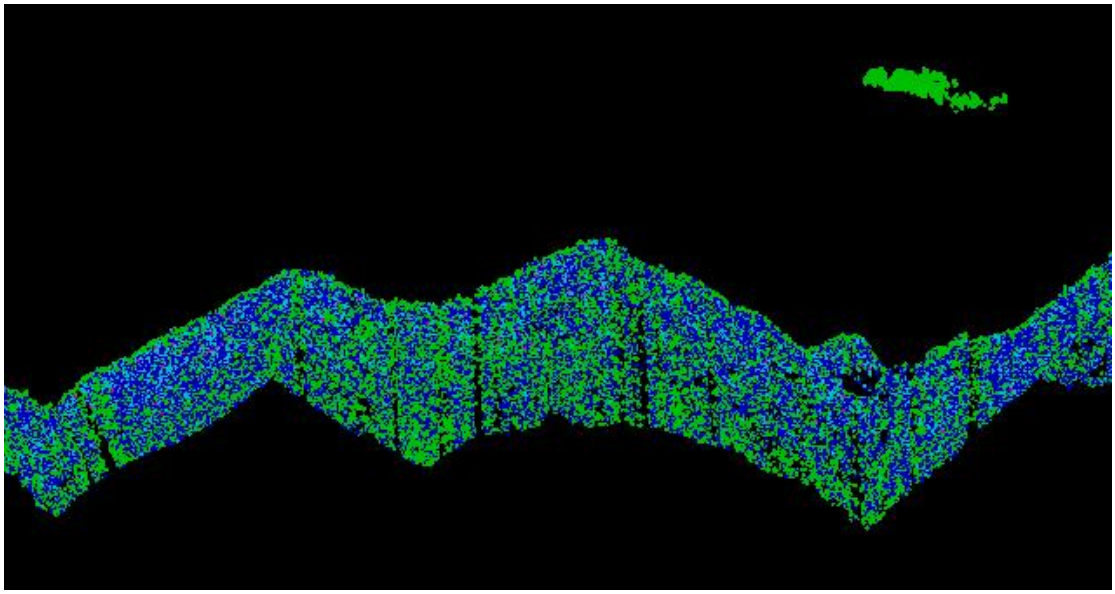


Figure: Number of Echo Rendering

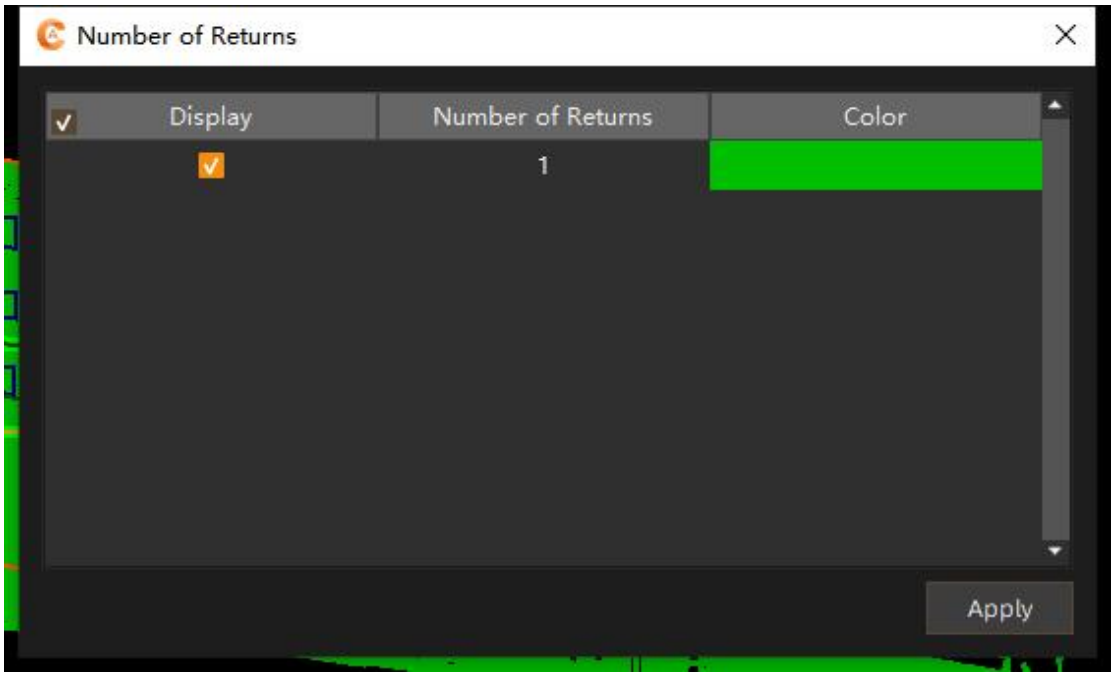


Figure: Echo Number Rendering Settings

2.1.2.5.8 Return Index Rendering

Function Description:

Renders point clouds with different color values according to the return index attribute, allowing quick viewing of rendering effects of different return indices.

Operation Steps:

Click Elevation view toolbar → Point Cloud Rendering → Others → Return Index to view the return index rendering of the point cloud.

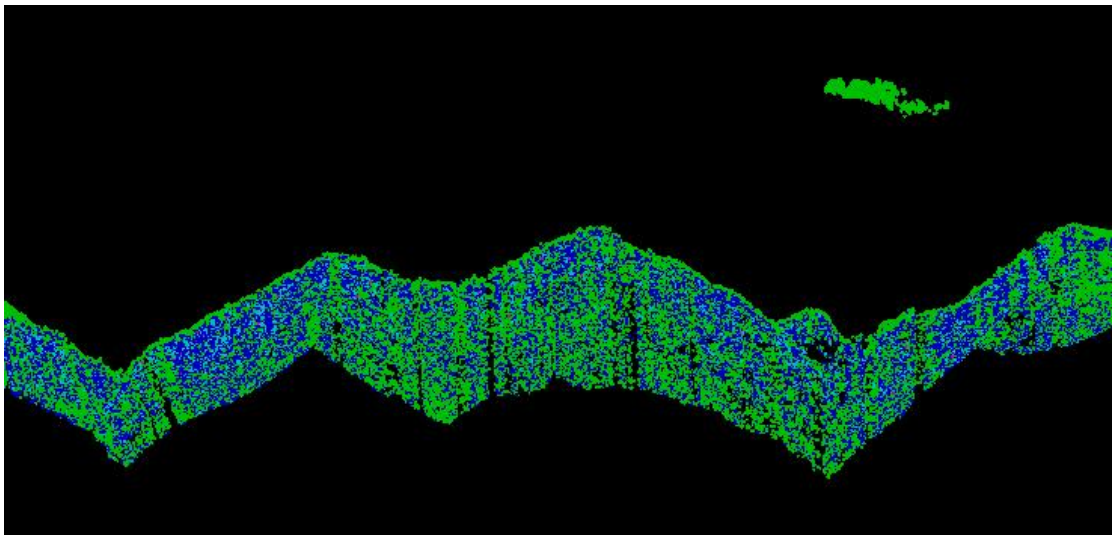


Figure: Echo Sequence Number Rendering

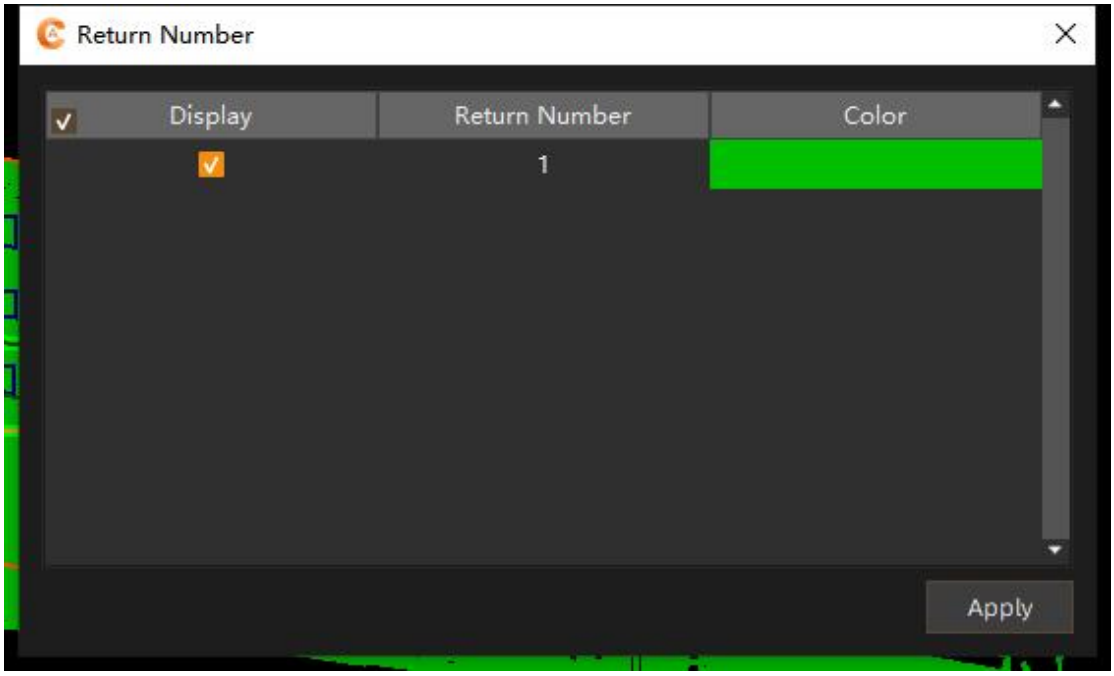


Figure: Echo Sequence Number Rendering Settings

2.1.2.5.9 Time Rendering

Function Description:

Render point clouds with different color values according to the acquisition time.

Operation Steps:

Click Facade View Toolbar -> Point Cloud Rendering -> Other -> Time to view the time rendering effect.

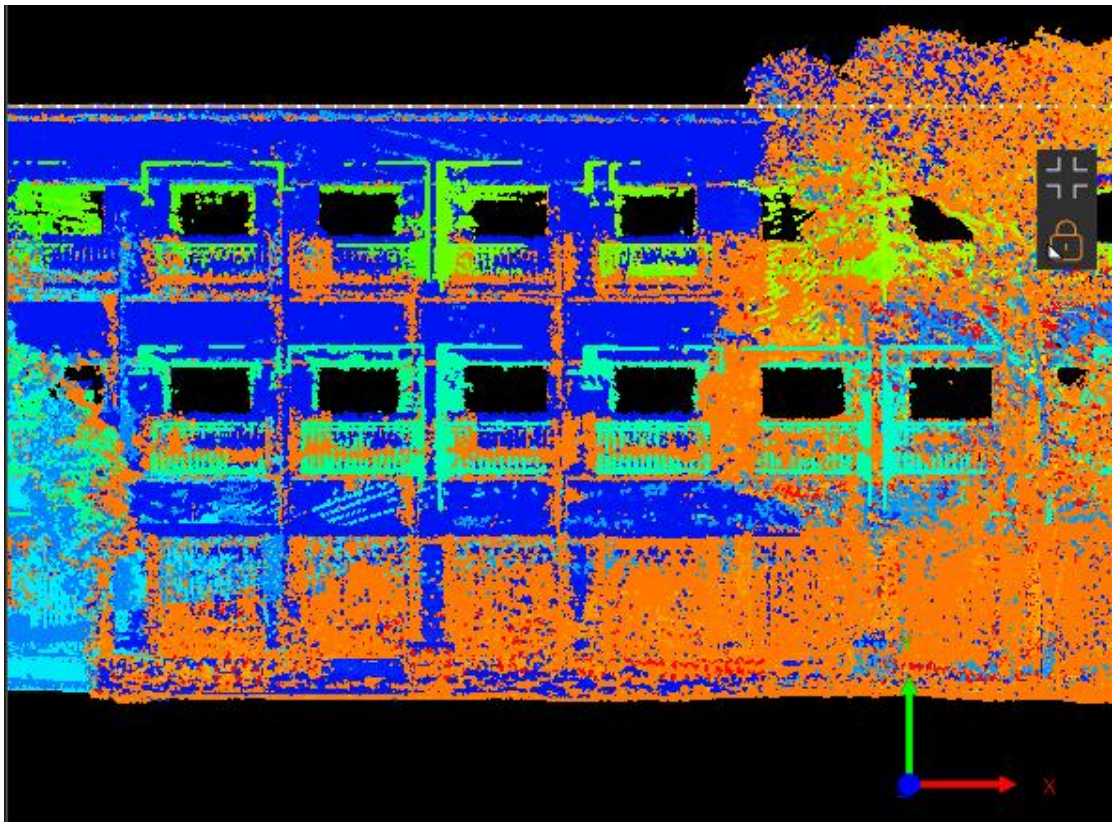


Figure: Time Rendering

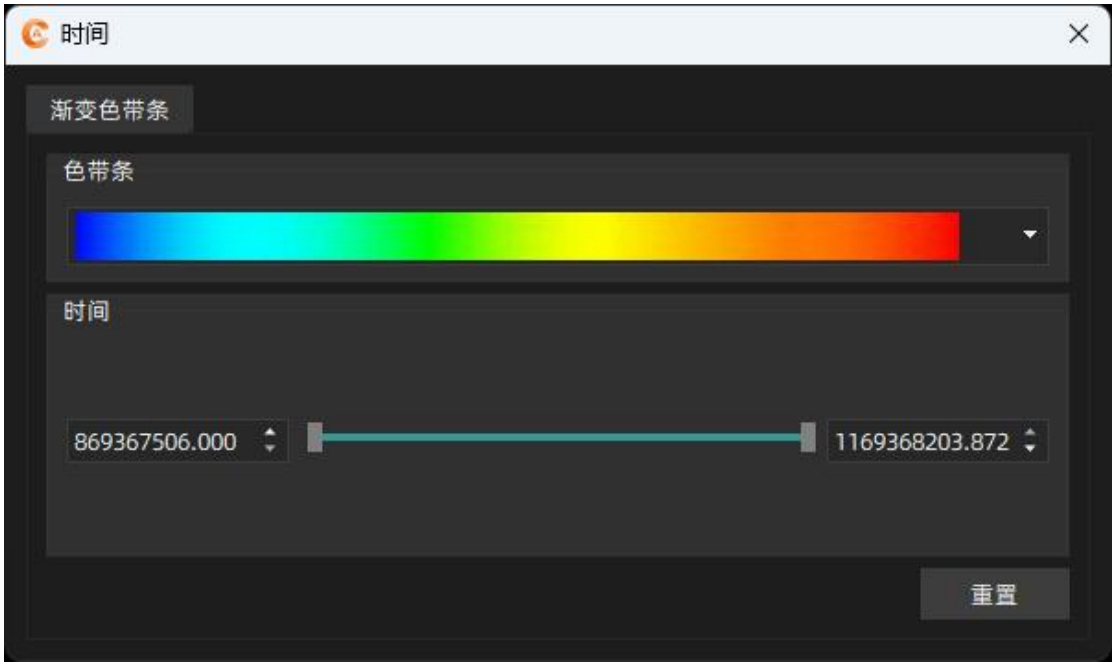


Figure: Time Rendering

2.1.2.5.10 Monochrome Rendering

Function Description:

Map point cloud data from different point cloud files to different color values, facilitating intuitive differentiation of point cloud data from different segments.

Operation Steps:

Click Facade View Toolbar -> Point Cloud Rendering -> Other -> Single Color to view the monochromatic rendering effect.

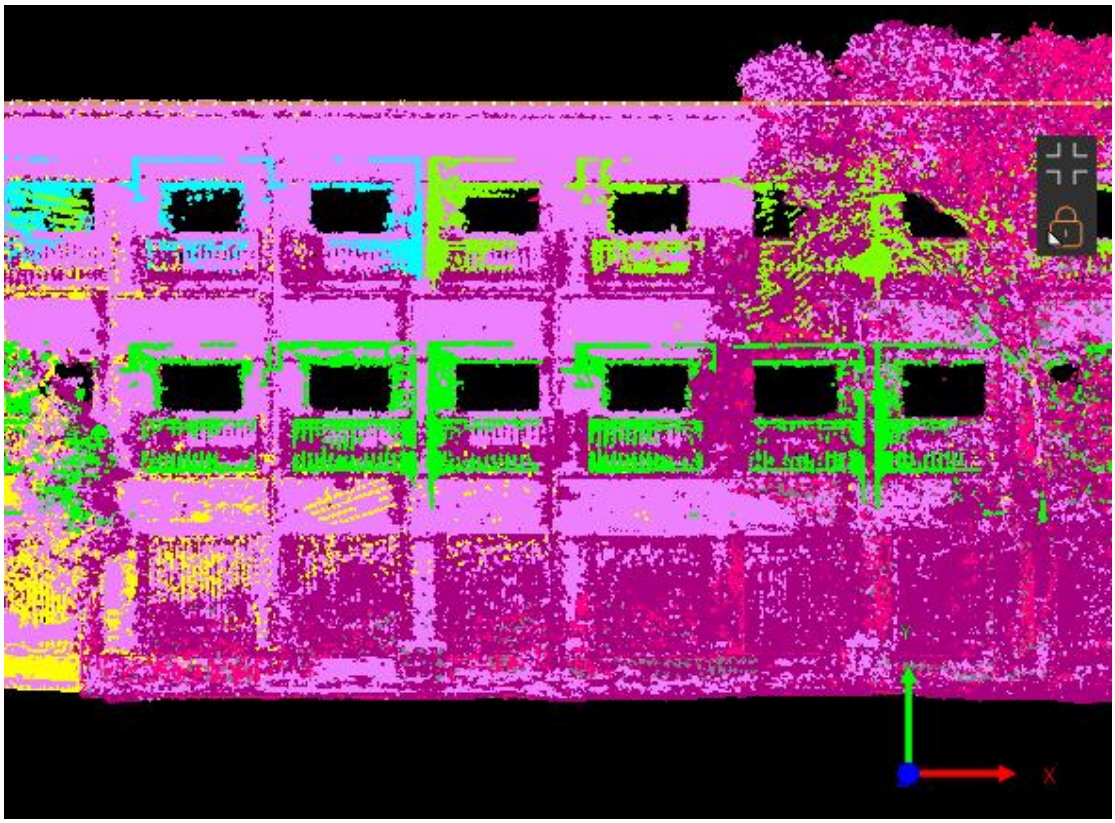


Figure: Single Color Rendering

2.1.2.5.11 Scan Angle Rendering

Function Description:

Map the scan angle attribute to uniformly varying color values based on different scan angle values of the point cloud data.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → Others → Scan Angle to view the scan angle rendering effect.

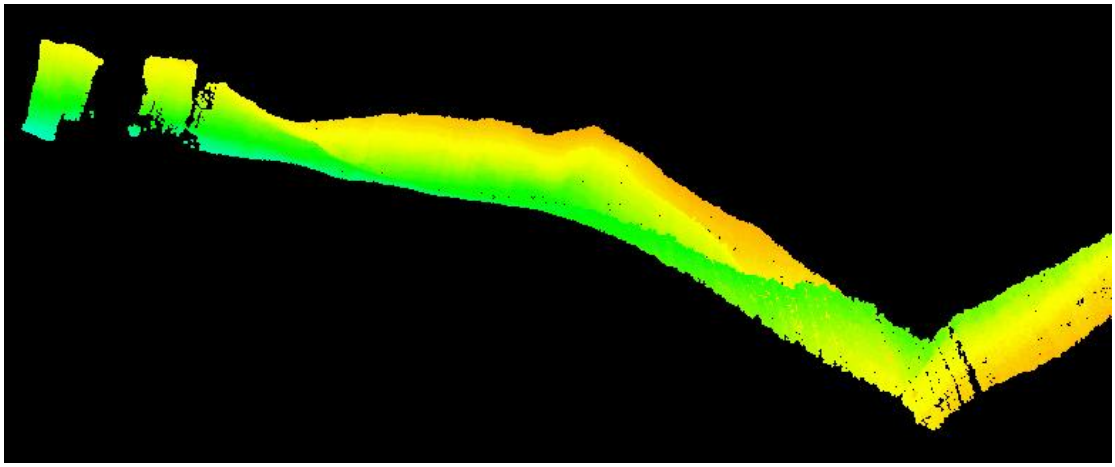


Figure: Scan Angle Rendering

2. You can select different color ramps as needed. Click Rendering Settings, drag the scroll bar or scroll the mouse wheel to modify the maximum and minimum values of the scan angle range to view the scan angle rendering effect in real time. Reset restores the default values.

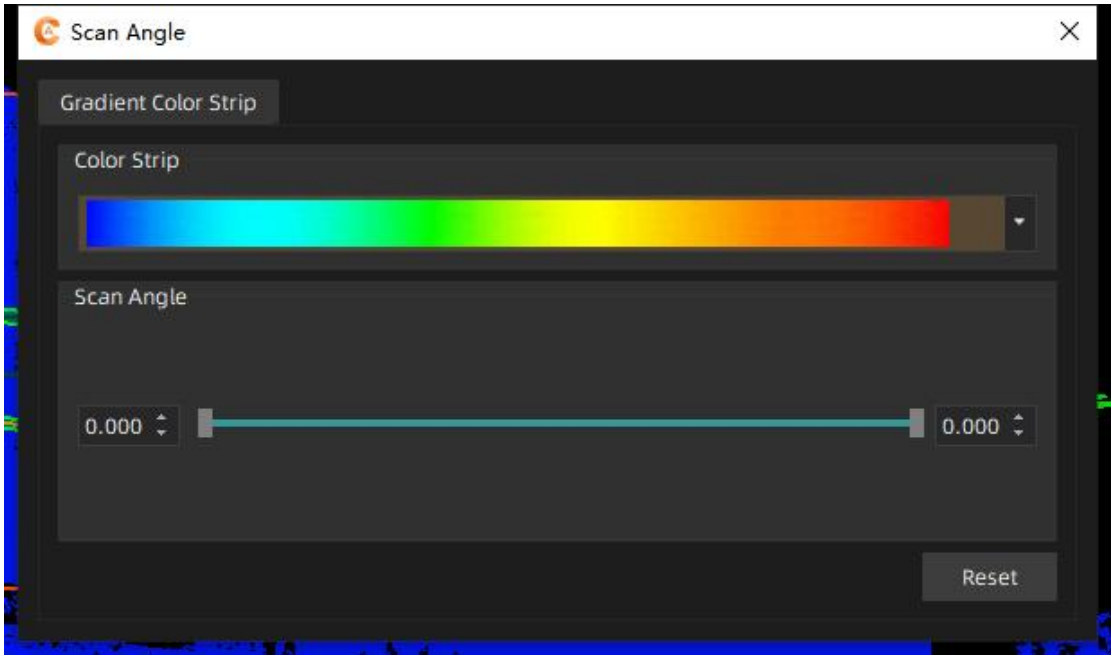


Figure: Scan Angle Rendering Settings

2.1.2.5.12 Scan Direction Rendering

Function Description:

Maps the scan direction values to uniformly varying color values according to different scan directions of point cloud data.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → Others → Scan Direction to view the scan direction rendering effect.

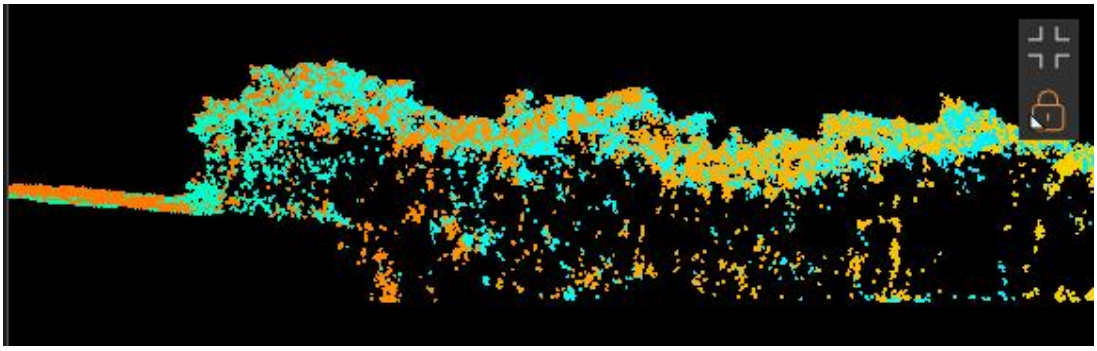


Figure: Scan Direction Rendering

2. You can select different color ramps as needed. Click Rendering Settings, drag the scroll bar or scroll the mouse wheel to modify the maximum and minimum values of the scan direction range to view the scan direction rendering effect in real time. Reset restores the default values.

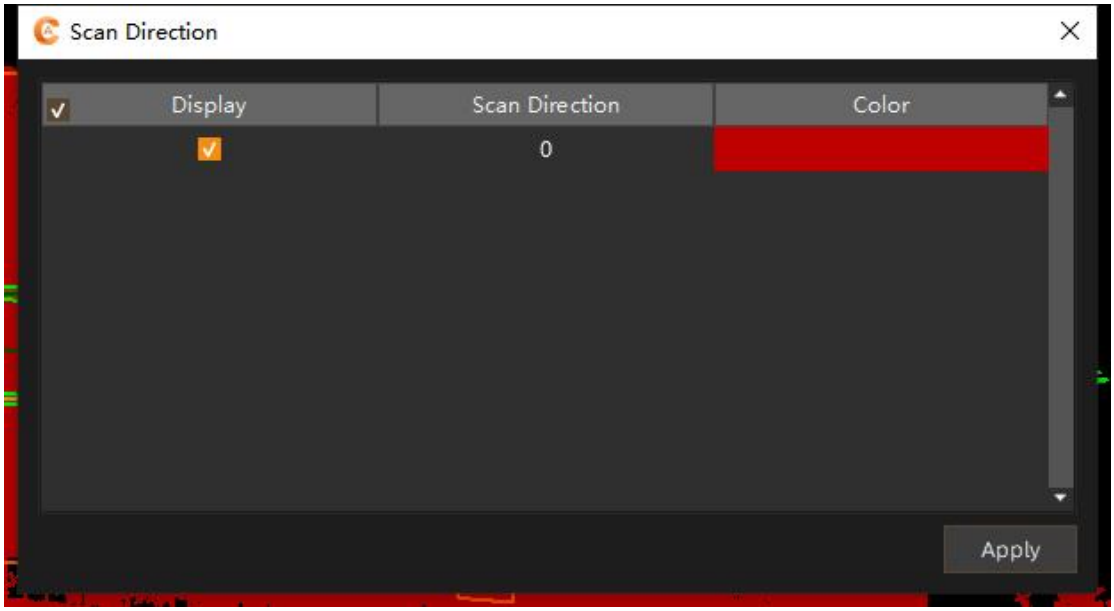


Figure: Scan Direction Rendering Settings

2.1.2.5.13 Point Source ID Rendering

Function Description:

Maps the point source ID attribute to uniformly varying color values according to different point source ID values of point cloud data.

Operation Steps:

1. Click Elevation view toolbar → Point Cloud Rendering → Others → Point Source ID to view the point source ID rendering effect.

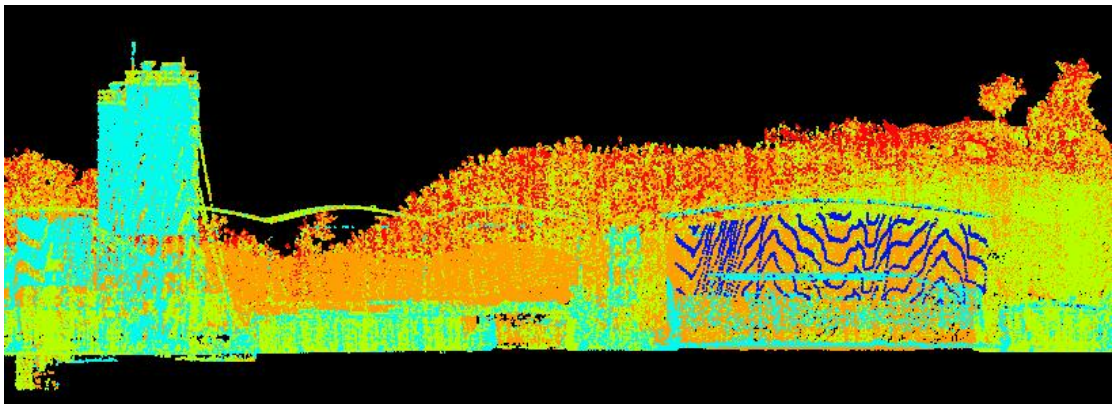


Figure: Source ID Rendering

2. You can select different color ramps as needed. Click Rendering Settings, drag the scroll bar, scroll the mouse wheel, or enter numbers to modify the maximum and minimum values of the point source ID range to view the point source ID rendering effect in real time. Click the Reset button to restore default values.

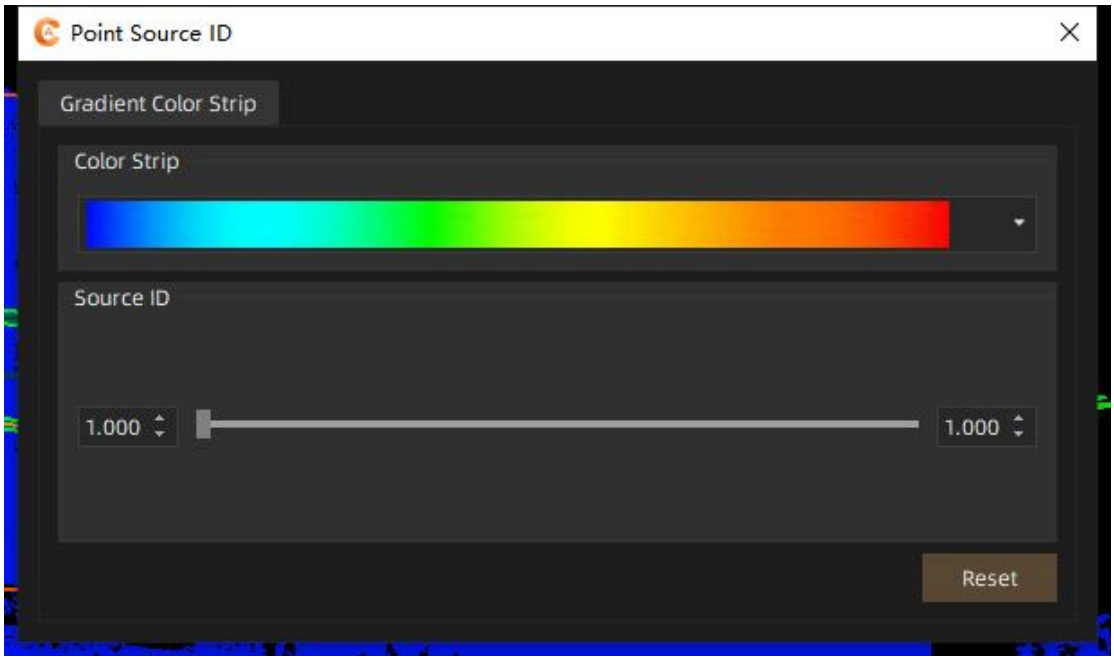


Figure: Source ID Rendering Settings

2.1.2.6 Point Size

Function Description:

Adjusts the size of point objects in the point cloud data in the view.

Operation Steps:

Click the Elevation view toolbar → Set Point Size, scroll the mouse wheel (up to increase, down to decrease), or directly enter a point size value. The adjustment effect is displayed in real time in the view window.

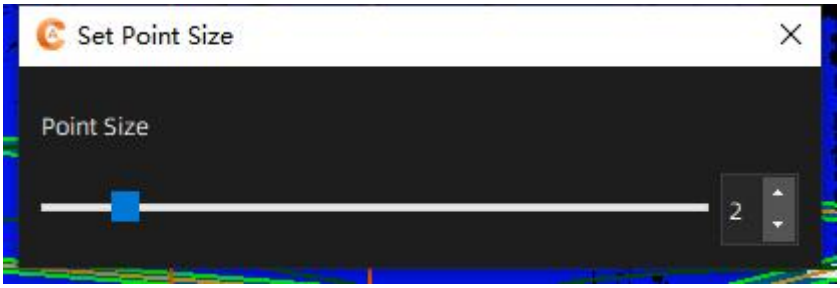


Figure: Point Size Settings

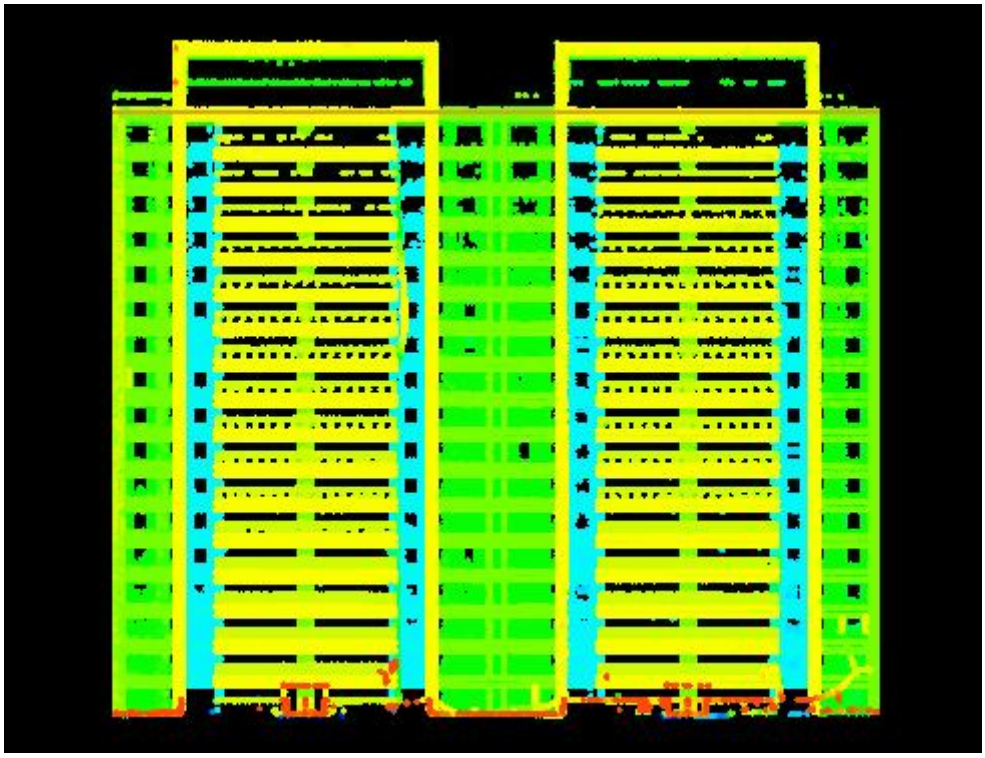


Figure: Point Size is 3

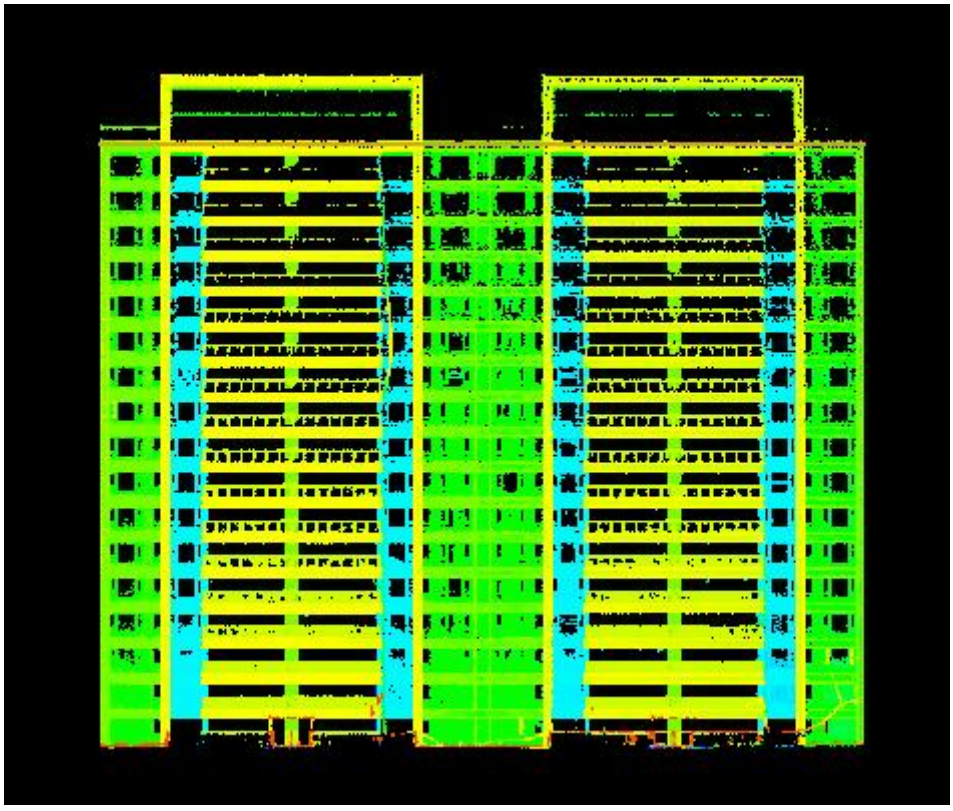


Figure: Point Size is 1

Note: The point size setting range is 1-10, and it only takes effect for point objects in the point cloud data.

2.1.2.7 Opacity Setting

Function Description:

Adjusts the opacity of point cloud data in the view.

Operation Steps:

Click the Elevation view toolbar → Opacity Setting, scroll the mouse wheel (up to increase opacity, down to decrease), or directly enter an opacity value. The adjustment effect is displayed in real time in the view window.

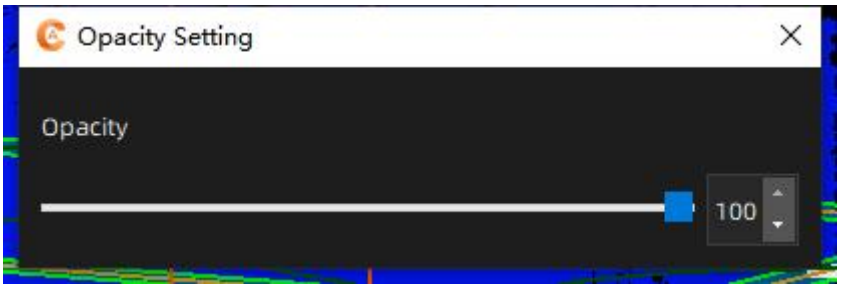


Figure: Opacity Settings

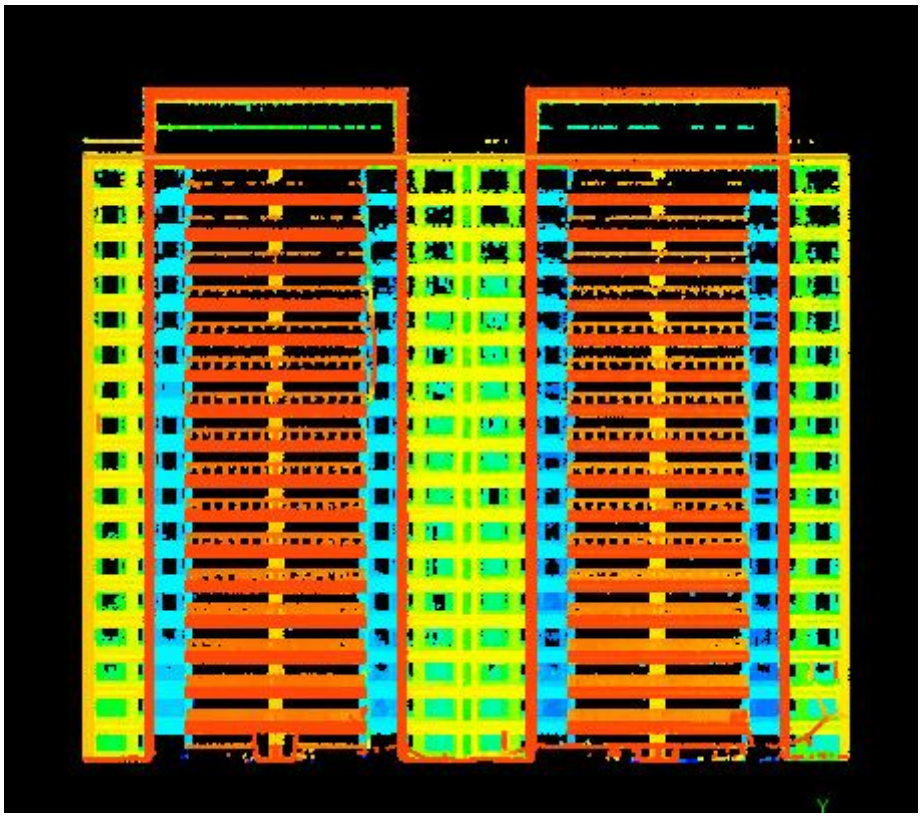


Figure: Opacity 100%

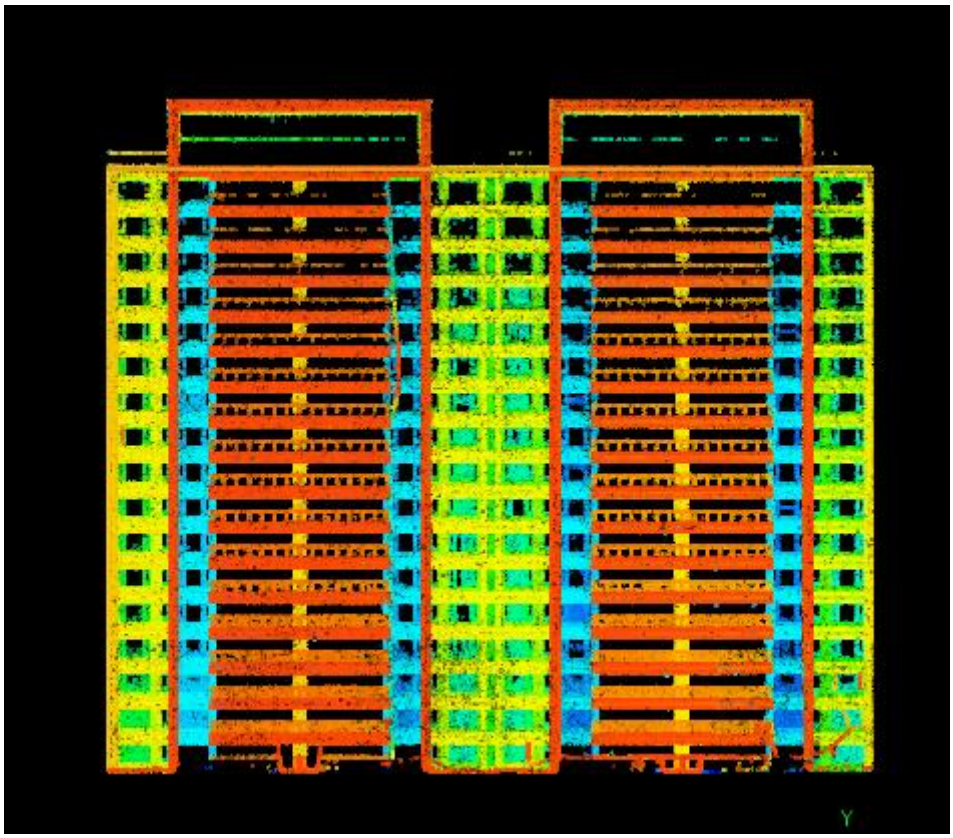


Figure: Opacity 50%

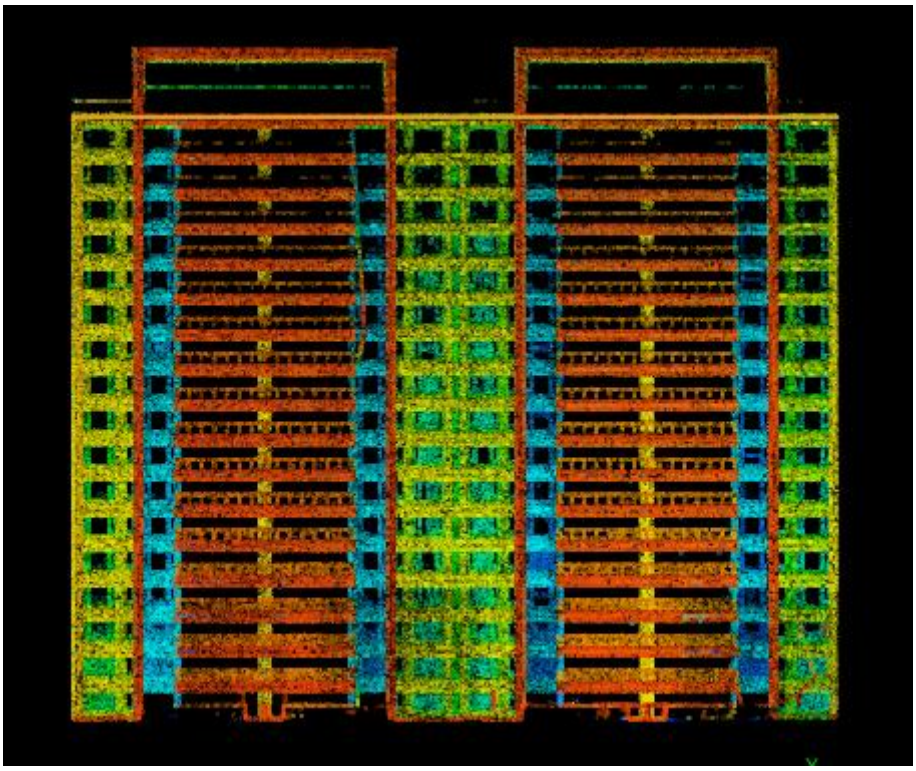


Figure: Opacity 20%

Note: The point size setting range is 0-100, and it only takes effect for point cloud data.

2.1.2.8 Wireframe Rendering

Function Description:

Switch for wireframe display of OSGB model data in the elevation view.

Operation Steps:

Click Facade View Toolbar -> Wireframe to switch the display and closing of the wireframe, which is closed by default.

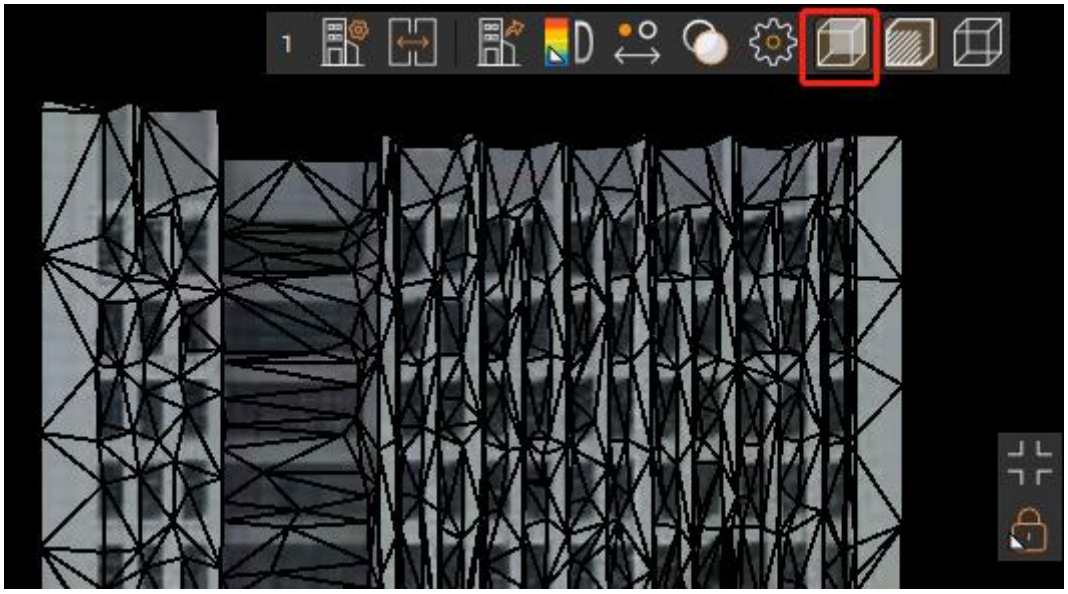


Figure: Facade View Wireframe Rendering

2.1.2.9 Texture Rendering

Function Description:

Switch for displaying textures of OSGB model data in the elevation view.

Operation Steps:

Click the Elevation view toolbar → Texture to toggle texture display on/off. Default is on.

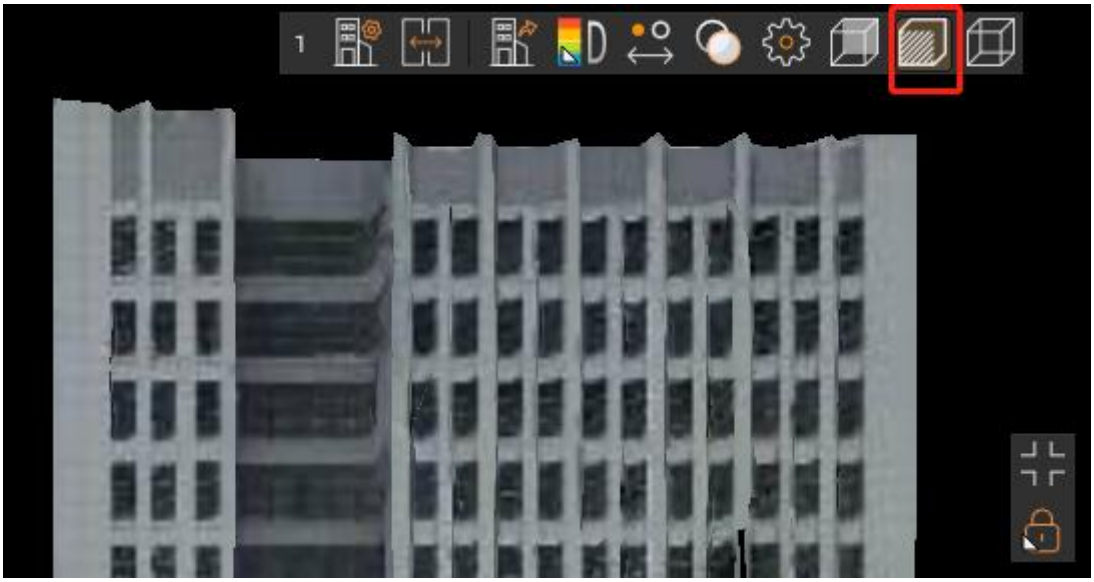


Figure: Enable Texture Rendering

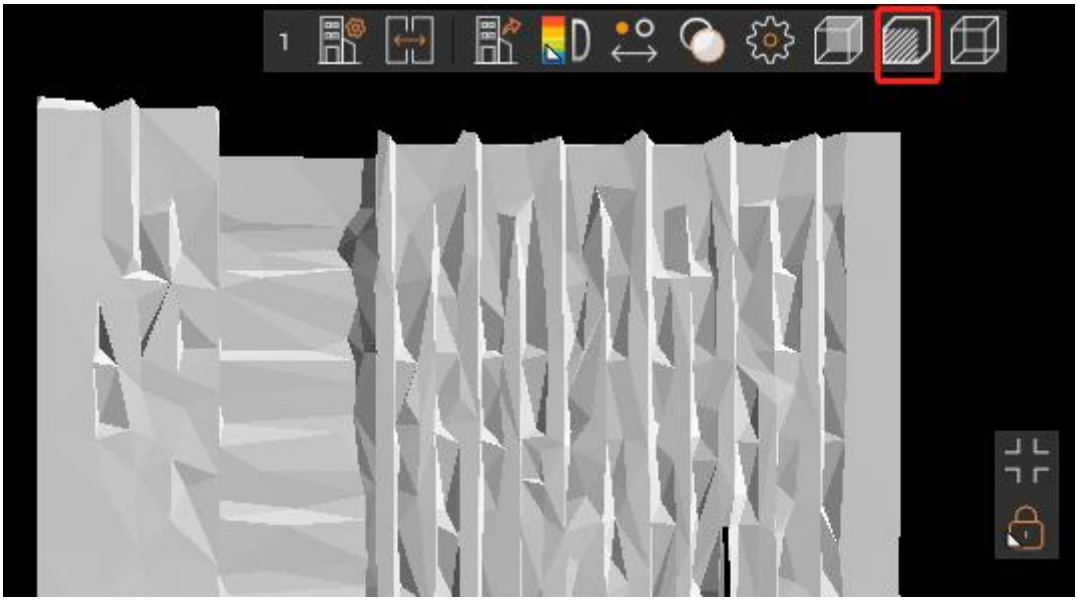


Figure: Disable Texture Rendering

2.1.2.10 Only Wireframe Rendering

Function Description:

Switch for the only-wireframe rendering mode of OSGB models in the elevation view.

Operation Steps:

Click the Elevation view toolbar → Only Wireframe to toggle only-wireframe mode on/off. Default is off. When only-wireframe mode is on, only the wireframe part of the model is displayed.

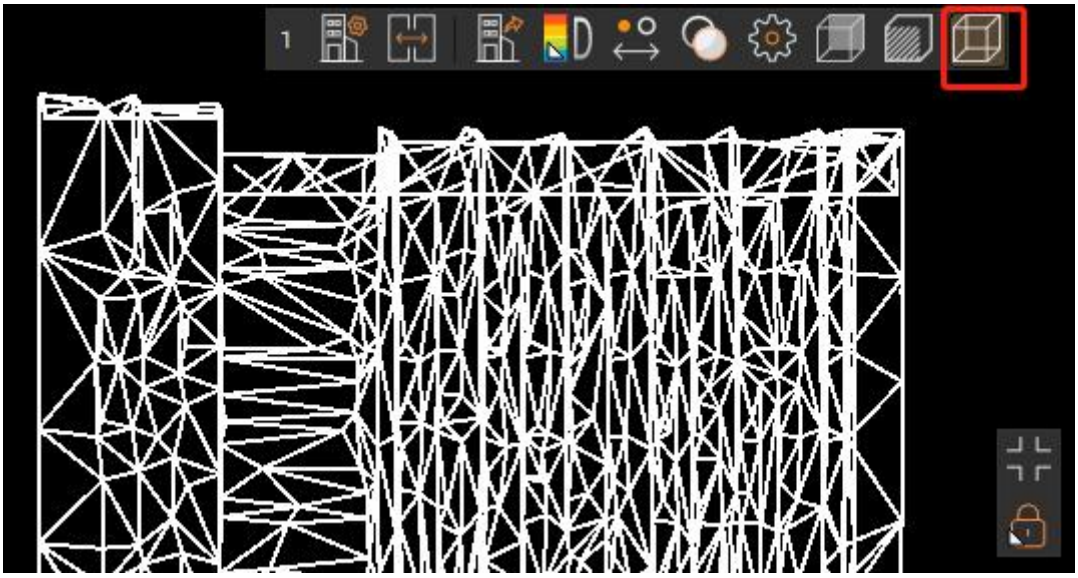


Figure: Facade View Wireframe Rendering

Note: After enabling wireframe-only rendering, the wireframe and texture rendering buttons are grayed out. You can set wireframe and texture rendering only after exiting the wireframe-only rendering mode.

2.1.2.11 Center Display

Uses the maximum zoom factor to fully display the bounding box range of all displayed data in the view.

Operation Steps:

Click the Elevation view toolbar → Center to center the elevation data in the view.

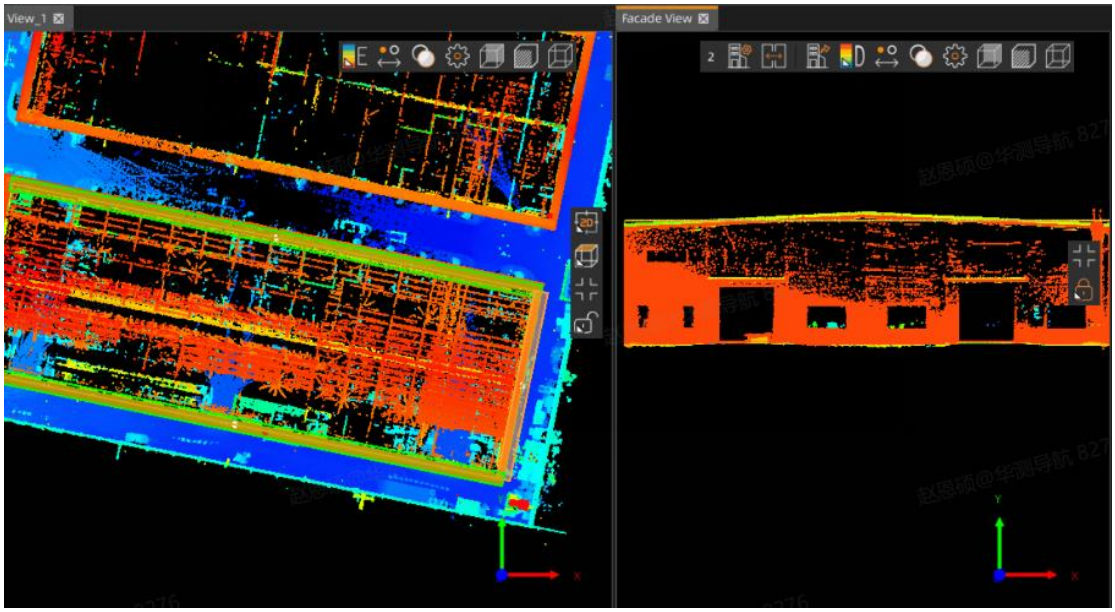


Figure: Facade View Centering Effect

2.1.2.12 View Lock

View lock can lock the pan, rotate, and zoom functions of the view.



Figure: Lock View

2.1.2.12.1 Lock Pan

In the elevation view, right-click and drag to pan objects in the view.

Activating the lock pan function makes data objects in the view non-pannable.

2.1.2.12.2 Lock Rotate

Objects in the elevation view do not support rotation. Lock rotate is enabled by default and cannot be unlocked.

2.1.2.12.3 Lock Zoom

In the elevation view, scroll the mouse wheel upward to zoom in on objects, downward to zoom out.

Activating the lock zoom function makes data objects in the view non-zoomable.

2.1.2.13 Real-time 3D Coordinate Axis

Displays the direction of the current elevation view. The Y axis is vertically upward; the X axis is horizontal and parallel to the elevation proxy line; the Z axis points toward the user, indicating the positive direction of depth. The depth at the centerline of the proxy line is zero.

Operation Steps:

After creating an elevation view, the real-time elevation coordinate axis is displayed in the lower right corner of the elevation view.

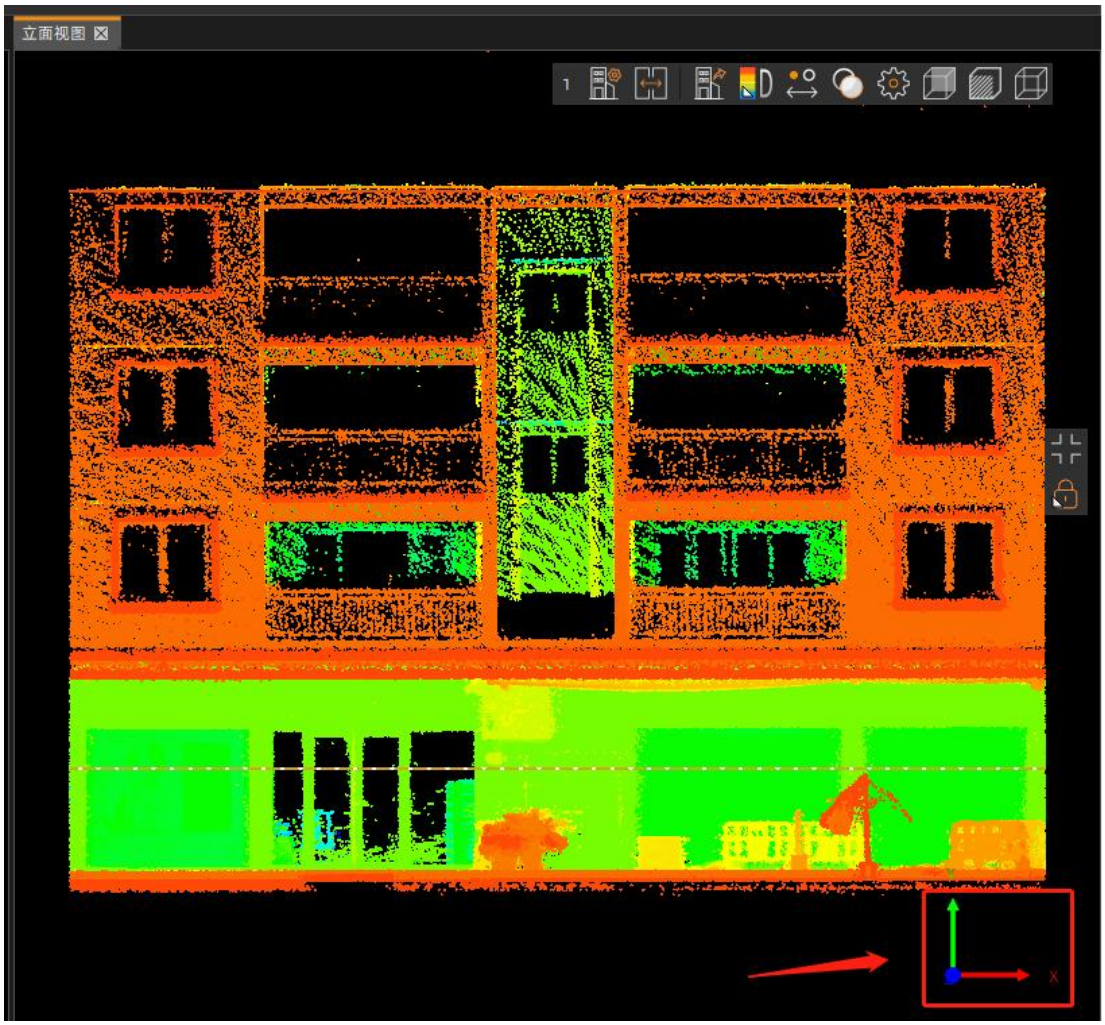


Figure: Facade Real-Time Coordinate Axis

2.1.3 Snap

The snapping types supported by the software include: Point Cloud Snapping, Model Snapping, Polar Tracking, Endpoint Snapping, Node Snapping, Nearest Point Snapping, Intersection Snapping, Midpoint Snapping, Center Snapping.

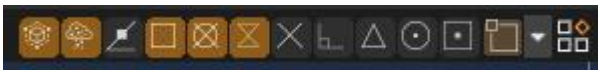


Figure: Snap Status Bar

2.1.3.1 Model Snap

Function Description:

When Model Snapping is enabled, during vector drawing/editing/measurement, you can snap to models near the mouse position.

Operation Steps:

Click the Model Snapping button on the status bar at the bottom right of the software. When the button is highlighted, snapping is enabled. The software enables Model Snapping by default. To disable model snapping, click the button to turn off highlighting.



Figure: Model Snap Button



Figure: Model Snap Style

2.1.3.2 Point Cloud Snapping

Function Description:

When Point Cloud Snapping is enabled, during vector drawing/editing/measurement, you can snap to point clouds near the mouse position.

Operation Steps:

Click the Point Cloud Snapping button on the status bar at the bottom right of the software. When the button is highlighted, snapping is enabled. The software enables Point Cloud Snapping by default. To disable point cloud snapping, click the button to turn off highlighting.



Figure: Point Cloud Snap Button



Figure: Point Cloud Snap Style

2.1.3.3 Polar Tracking

Function Description:

When Polar Tracking is enabled, during vector drawing/editing/measurement, you can track and snap in directions parallel to the X or Y axis.

Operation Steps:

Click the Polar Tracking button on the status bar at the bottom right of th e software. When the button is highlighted, snapping is enabled. To disable polar tracking, click the button to turn off highlighting.



Figure: Polar Snap Button



Figure: Polar Snap Style

2.1.3.4 Endpoint Snapping

Function Description:

When Endpoint Snapping is enabled, during vector drawing/editing/measure

ment, you can snap to endpoints of vector lines or corner points.

Operation Steps:

Click the Endpoint Snapping button on the status bar at the bottom right of the software. When the button is highlighted, snapping is enabled. The software enables Endpoint Snapping by default. To disable endpoint snapping, click the button to turn off highlighting.



Figure: Endpoint Snap Button

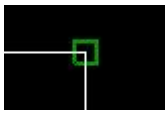


Figure: Endpoint Snap Style

2.1.3.5 Node Snapping

Function Description:

When Node Snapping is enabled, during vector drawing/editing/measurement, you can snap to point objects.

Operation Steps:

Click the Node Snapping button on the status bar at the bottom right of the software. When the button is highlighted, snapping is enabled. The software enables Node Snapping by default. To disable node snapping, click the button to turn off highlighting.



Figure: Node Snap Button



Figure: Node Snap Style

2.1.3.6 Nearest Point Snapping

Function Description:

When Nearest Point Snapping is enabled, during vector drawing/editing/measurement, you can snap to vector lines near the mouse position.

Operation Steps:

Click the Nearest Point Snapping button on the status bar at the bottom right of the software. When the button is highlighted, snapping is enabled. The software enables Nearest Point Snapping by default. To disable nearest point snapping, click the button to turn off highlighting.



Figure: Intersection Snap Button



Figure: Intersection Snap Style

2.1.3.7 Intersection Snapping

Function Description:

When Intersection Snapping is enabled, during vector drawing/editing/measurement, you can snap to intersections of vector lines.

Operation Steps:

Click the Intersection Snapping button on the status bar at the bottom righ

t of the software. When the button is highlighted, snapping is enabled. To disable intersection snapping, click the button to turn off highlighting.



Figure: Intersection Snap Button

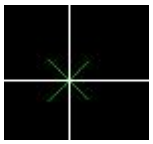


Figure: Intersection Snap Style

2.1.3.8 Midpoint Snapping

Function Description:

When Midpoint Snapping is enabled, during vector drawing/editing/measurement, you can snap to the midpoints of vector line segments.

Operation Steps:

Click the Midpoint Snapping button on the status bar at the bottom right of the software. When the button is highlighted, snapping is enabled. To disable midpoint snapping, click the button to turn off highlighting.



Figure: Midpoint Snap Style



Figure: Midpoint Snap Style

2.1.3.9 Center Snapping

Function Description:

When Center Snapping is enabled, during vector drawing/editing/measurement, you can snap to the centers of circles/arcs.

Operation Steps:

Click the Center Snapping button on the status bar at the bottom right of the software. When the button is highlighted, snapping is enabled. To disable center snapping, click the button to turn off highlighting.

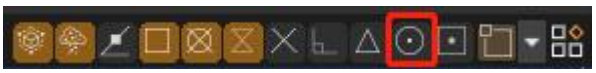


Figure: Center Snap Button

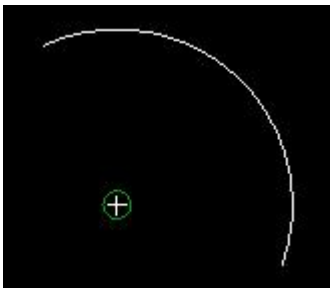


Figure: Center Snap Style

2.1.3.10 Snap Switch

Function Description:

Enables or disables the snap mode. The button is highlighted when the snap mode is enabled, and not highlighted when disabled.

Operation Steps:

Click the snap switch button in the status bar at the bottom right of the software. The button is highlighted when the snap mode is enabled (the sof

tware enables snap by default). To disable all snap types, click the button t o cancel the highlight.

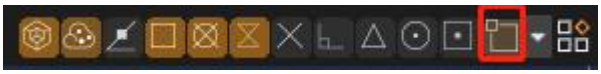


Figure: Snap Switch Button

2.1.3.11 Snap Settings

Function Description:

In the Snap Settings dialog box, users can choose whether to enable the s napping function and select snapping types.

Operation Steps:

1. Click the down arrow button on the status bar at the bottom right of th e software to open the snap panel. In the snap panel, you can also turn a specific snapping type on or off.

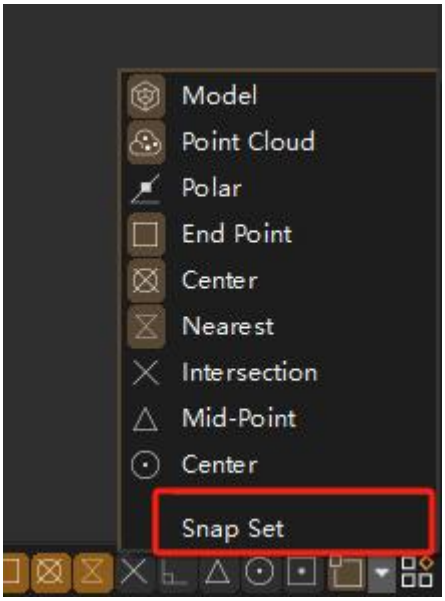


Figure: Snap Settings Button

2. Click the Snap Settings button in the panel to open the Snap Settings di

alog box. In the dialog box, users can choose whether to enable the snapping function and select snapping types. Checking "Enable Object Snap" enables snapping mode; unchecking disables it. Checking a snapping type enables it; unchecking disables it.

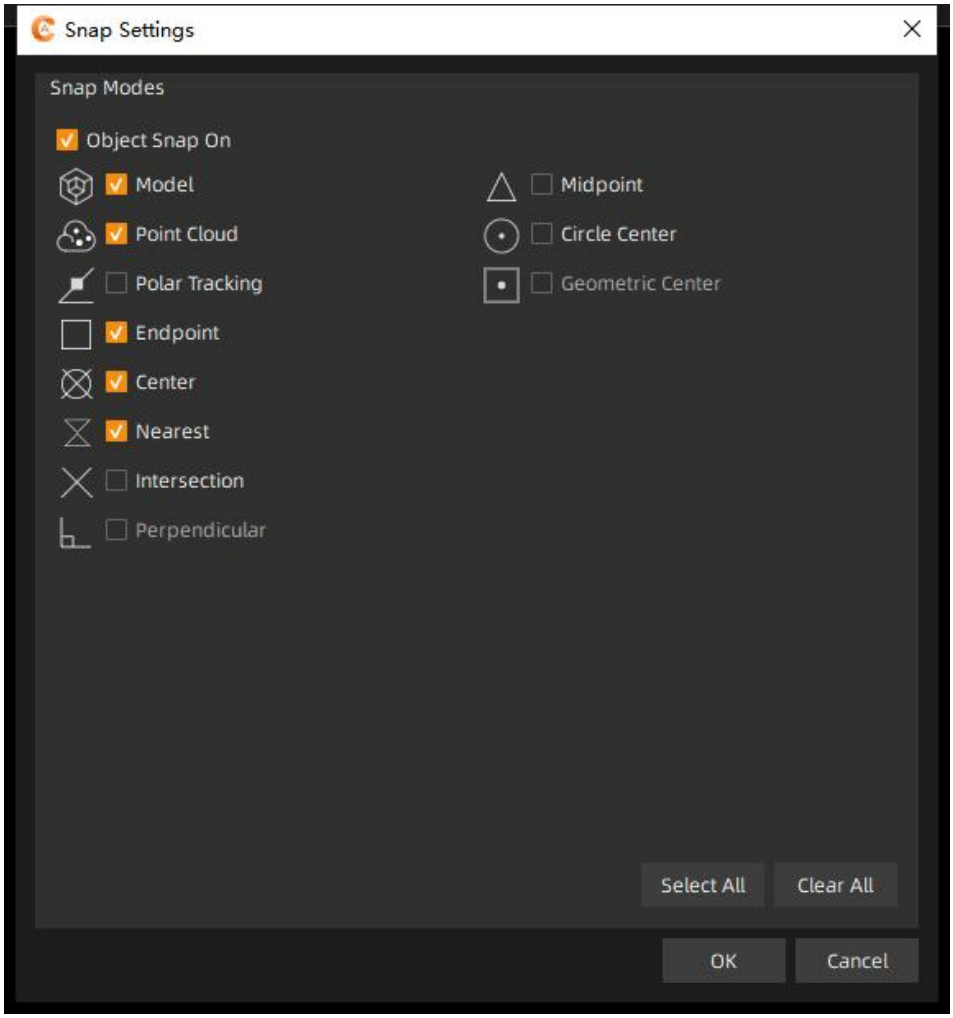


Figure: Snap Settings Dialog Box

3. Click "Select All" to check all snapping types; click "Clear All" to uncheck all snapping types.

4. Click "OK" for settings to take effect; click "Cancel" for settings not to take effect.

2.1.4 Spacebar Shortcut

The software supports pressing the spacebar to confirm the current selection set or repeat the last command.

2.1.4.1 Spacebar to Confirm Selection Set

Function Description:

When using functions in vector editing, after activating a function and selecting vectors, pressing the spacebar or Enter key confirms the current vector selection set, with the same effect as the right-click menu confirmation.

Vector functions that support spacebar confirmation of selection set are: Copy, Move, Standard Extend, Standard Trim, Rotate, Array, Elevation Modify, Add Point, Delete Point, Merge, Split.

Operation Steps:

For example, after activating Copy, selecting one or more vector elements, pressing the spacebar or Enter confirms the selection set, and you can then use the mouse to select insertion points for copying.

2.1.4.2 Spacebar to Confirm Current Effect

Function Description:

When performing vector drawing or measurement functions, if a preview effect is present, pressing the spacebar or Enter key confirms the currently completed drawing part and ends the current drawing, with the same effect as the right-click menu confirmation.

Functions that support spacebar confirmation of current effect are: Polyline-Vertex Mode, Polyline-Right Angle Mode, Polyline-Edge Mode, Polyline-Arc Mode, Measure-Length, Measure-Area, Measure-Angle.

Operation Steps:

For example, after activating Polyline-Vertex Mode and drawing more than t wo vertices, pressing the spacebar or Enter confirms the currently drawn li ne segments and exits drawing of the current vector element.

2.1.4.3 Spacebar to Reactivate the Last Function

Function Description:

During software use, after completing and exiting a function, pressing the s pacebar can reactivate the last used function.

Functions that support spacebar reactivation of the last function are: Select by Rectangle, Select by Polygon, Select by Lasso, Select by Range Line, Me asure-Point, Measure-Length, Measure-Area, Measure-Angle, Measure-Density, Draw-Point, Draw-Polyline, Draw-Circle, Draw-Rectangle, Draw-Hatch, Draw-2 D Spline Curve, Text-Single Line Text, Text-Multi-line Text, Dimension-Aligned Dimension, Dimension-Area Dimension, Planar Extraction-Trace, Planar Extr action-Box Select, Copy, Move, Close, Break, Extend, Trim, Rotate, Offset, Ar ray, Elevation Modify, Add Point, Delete Point, Align, Mirror, Merge, Split, Pr operty Painter.

Operation Steps:

For example, after activating the Move function and completing a move op eration (which automatically exits Move), pressing the spacebar reactivates t he Move function.

2.2 File Module

File includes New Project, Open Project, Save Project, and Settings.

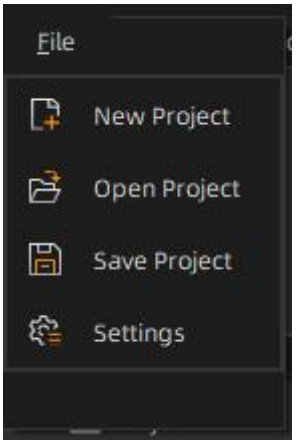


Figure: File Menu

2.2.1 New Project

Function Description:

Creates a new project for managing point cloud, vector, DEM, imagery, or OSGB model data.

Operation Steps:

Click File → New Project. Default new project: Project.hcprj.

2.2.2 Open Project

Function Description:

Opens a saved project, automatically loading point cloud, vector, DEM, imagery, or OSGB model data under the project.

Operation Steps:

Click File → Open Project, select the hcprj file, and click Open.

2.2.3 Save Project

Function Description:

Saving a project makes it easy to load point cloud, vector, DEM, imagery, or OSGB model data by directly opening the project next time.

Operation Steps:

After importing point cloud, vector, DEM, imagery, or OSGB model data, click File → Save Project, choose a save path, enter a file name, and click Save.

2.2.4 Settings

2.2.4.1 Shortcut Keys

Function Description:

Provides keyboard command combinations for high-frequency operations to execute commands quickly, switch interfaces, or trigger tools, reducing mouse dependency and improving operational efficiency. Supports user-defined key bindings, ensures consistent operation logic, and provides shortcut prompt visualization.

Operation Steps:

1. Click File → Settings → Shortcut Keys to open the Shortcut Keys settings interface.

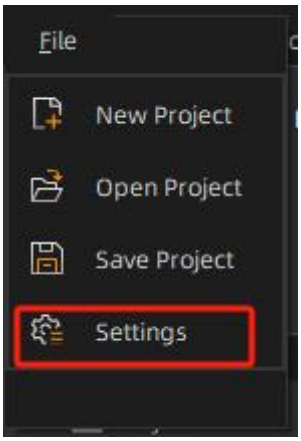


Figure: Settings Location

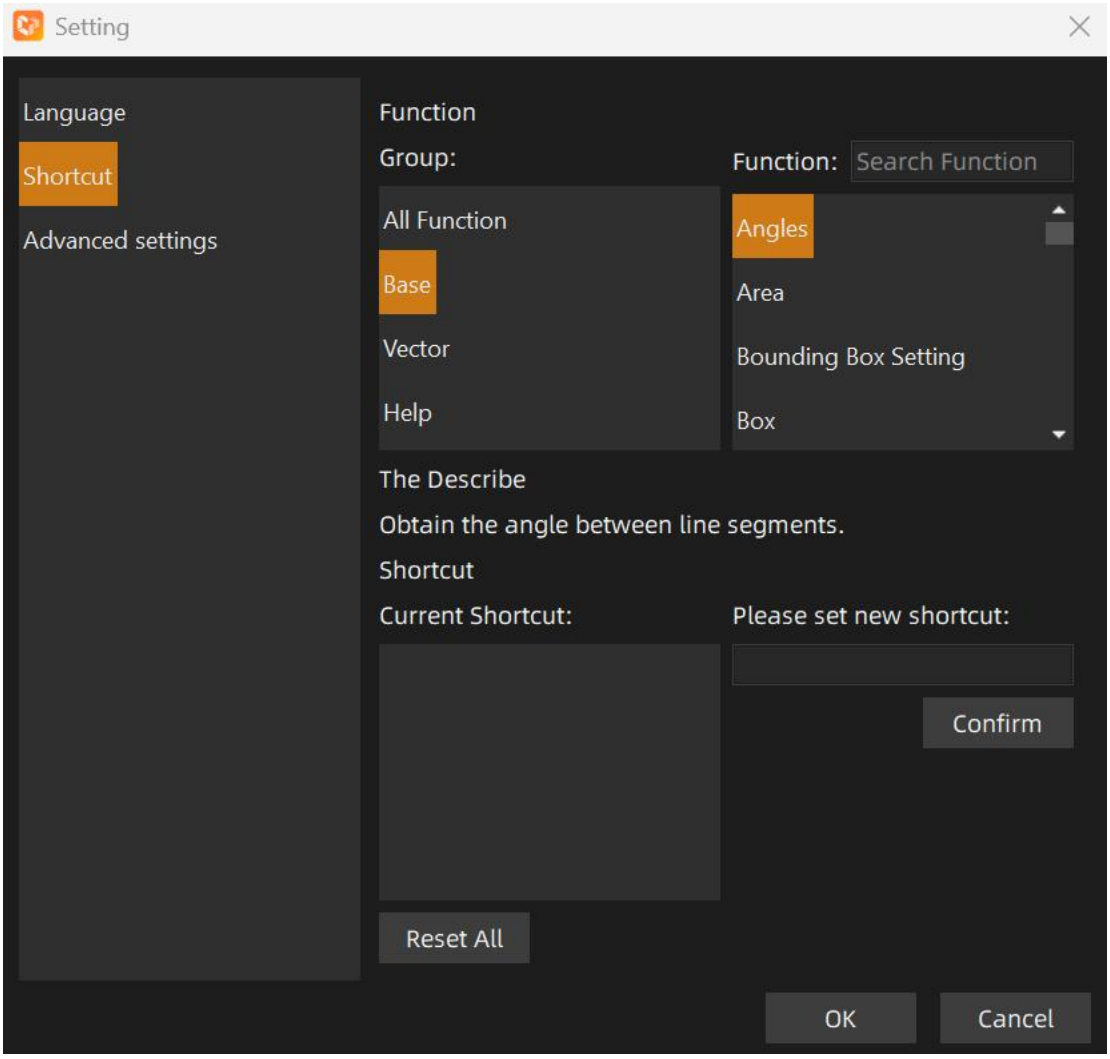


Figure: Shortcut Keys

2. In the function list, select the function for which you want to add or mo dify a shortcut key.

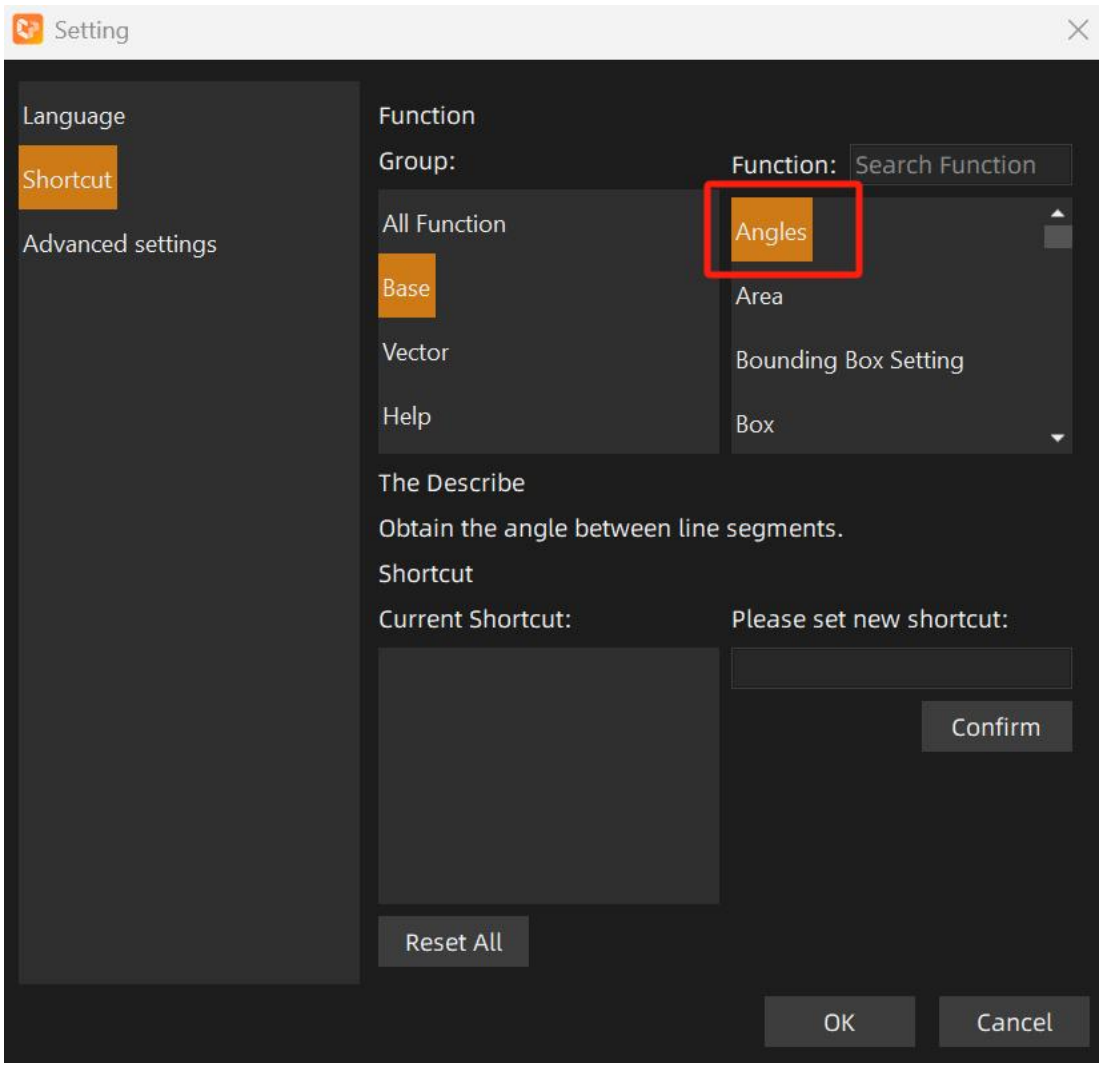


Figure: Select Function

3. Select the shortcut key input box, enter the shortcut key, then click the "Assign" button below the input box. The entered shortcut key will be bound to the currently selected function. Click "Confirm" in the lower right corner for the binding to take effect.

4. After selecting a function, all shortcut keys corresponding to the currently selected function will appear in the current shortcut key list. Click the red delete button to the right of a shortcut key to unbind it from the current function. Click "Confirm" for the unbinding to take effect.

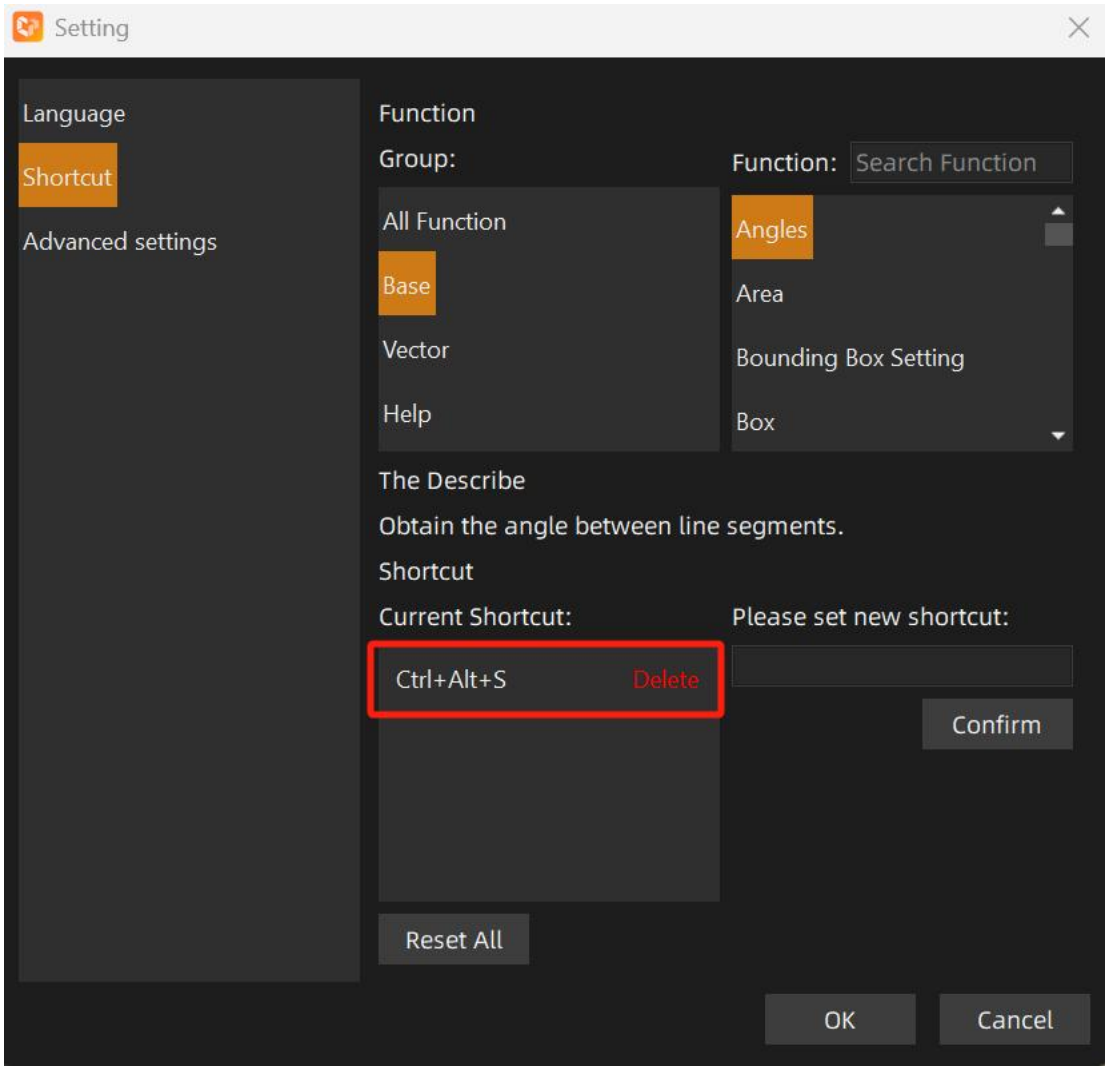


Figure: Delete Shortcut Key

5. Click the "Reset All" button in the lower left corner of the Shortcut Keys interface to reset all shortcuts in the software. Click "Confirm" for the reset to take effect.

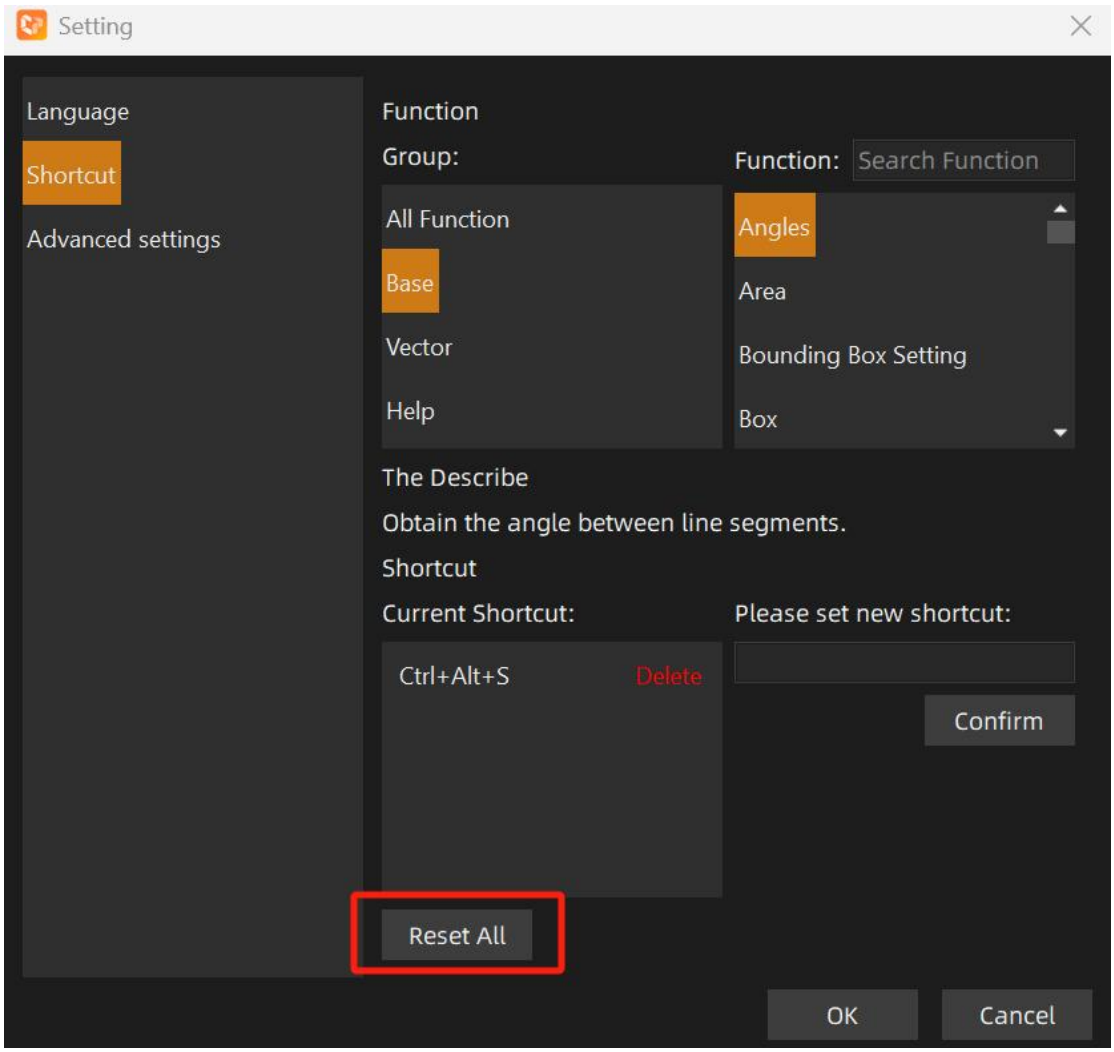


Figure: Reset All

6. The software occupies some default shortcut keys. When binding new sh ortcuts, you cannot bind them to the following default keys:

Table: Default Shortcut Keys

Shortcut Key	Function
Esc	Cancel
Ctrl+Z	Undo
Ctrl+Y	Redo
Delete	Delete

2.2.4.2 Language

Function Description:

Supports multi-language interface switching and content adaptation, coverin g user localization needs (e.g., Chinese/English), ensuring barrier-free cross-r egional collaboration and enhancing international user experience.

Operation Steps:

1. Click File → Settings → Language to open the Language settings interfac e.

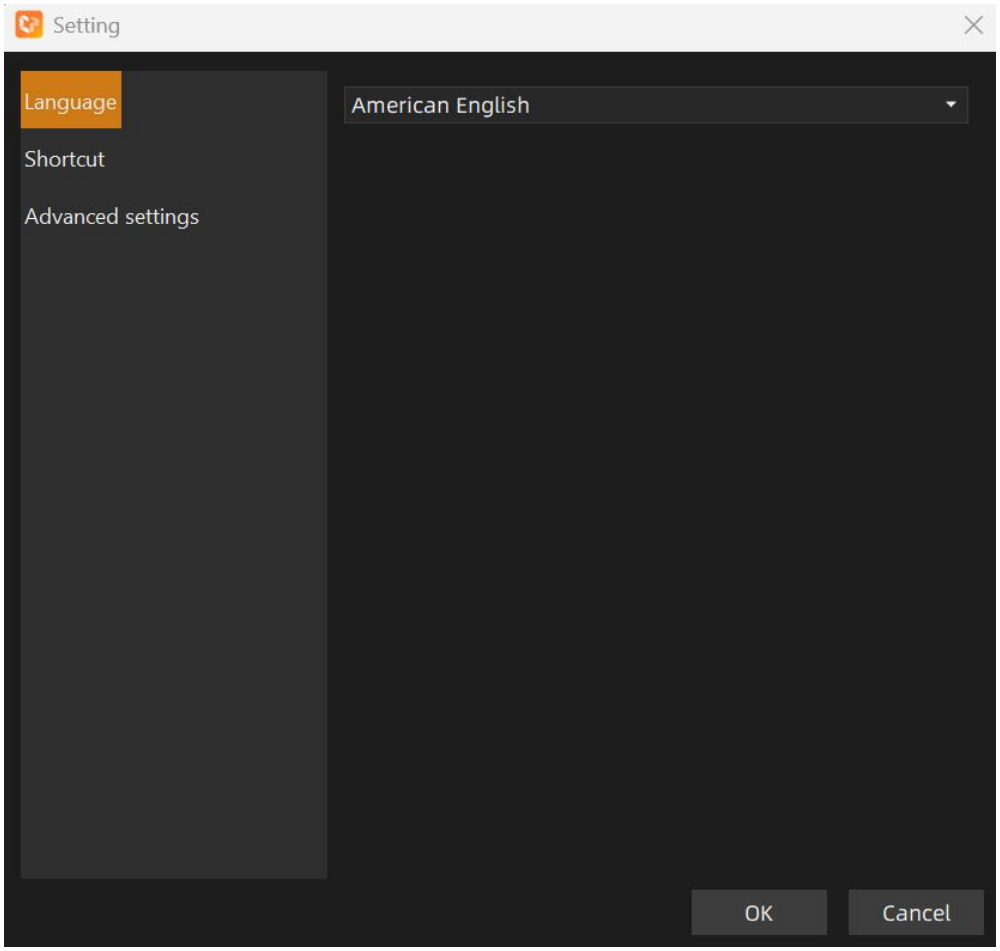


Figure: language

2. In the language option dropdown, select the language to change. Click " Confirm" and then click "OK" in the restart prompt box. After restarting, th e language change takes effect. (If the current project is not saved, you will need to save or discard the project before restarting.)

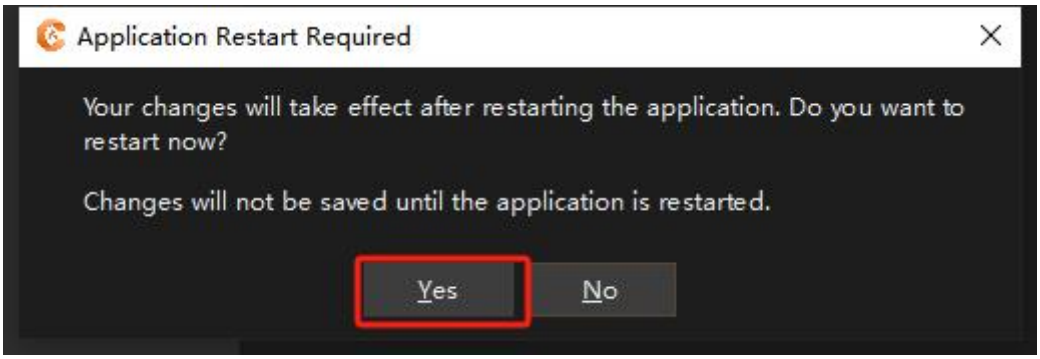


Figure: Restart After Language Modification

2.2.4.3 Advanced Settings

Function Description:

The User Experience Improvement Program aims to analyze abnormal information during product use to improve product stability, and analyze product usage to improve product usability, thereby providing users with more stable products and a better user experience. Therefore, the software will default to checking the "User Experience Improvement Program", which will collect software operation information (start time, shutdown time, crash time, operation records such as new project, open project, save project, open vector, open point cloud, open DEM, open imagery, open OSGB model, open OSGB folder, new drawing, open drawing, save drawing, save as drawing) and network information.

If "User Experience Improvement Program" is not checked, no information will be collected.

Operation Steps:

1. Click File → Settings → Advanced Settings to open the Advanced Settings interface.

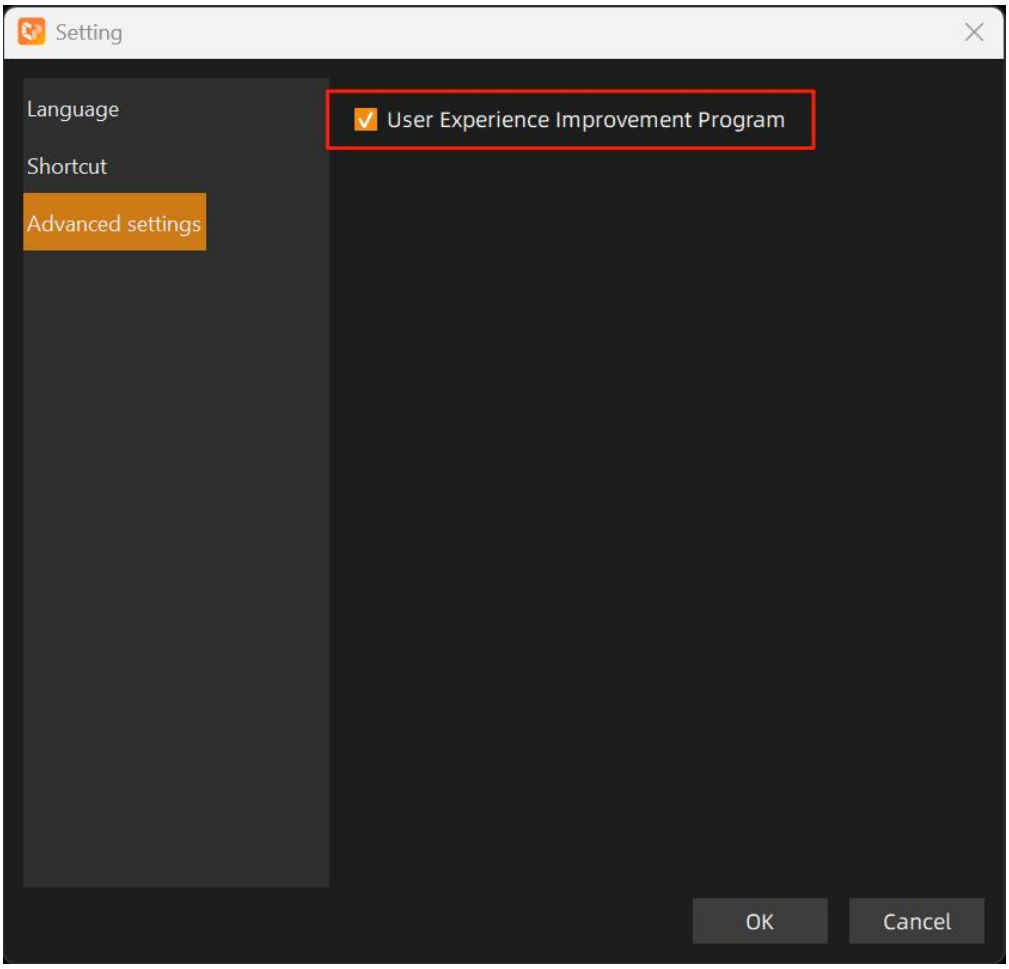


Figure: Advanced Settings

2. "User Experience Improvement Program" is checked by default, and soft ware operation information will be collected.

3. After changing the check status of "User Experience Improvement Progra m", clicking "Cancel" or the "X" in the upper right corner of the "Settings" dialog box will pop up a "Close" dialog box. Click "No" or the "X" in the "C lose" dialog box to close the "Close" dialog box and return to the "Settings " dialog box interface. The "User Experience Improvement Program" will sh ow the changed status.

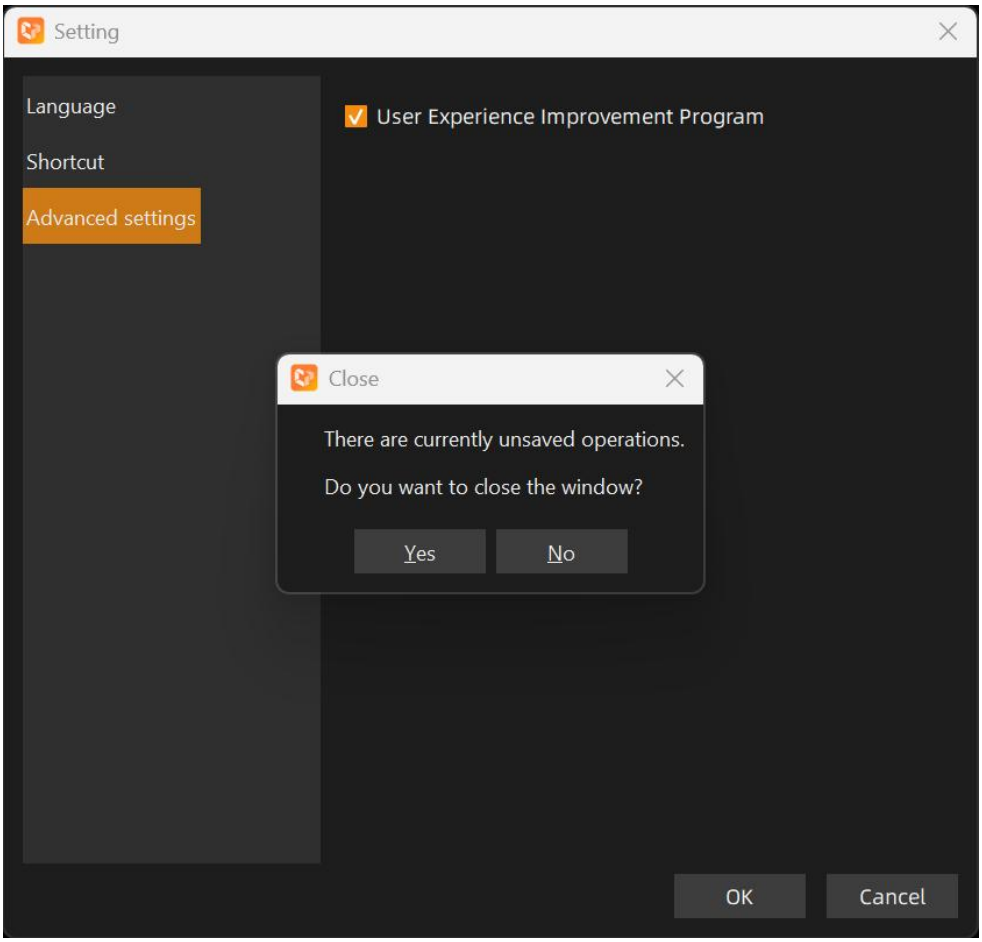


Figure: Close Dialog

4. After changing the check status of "User Experience Improvement Program", clicking the "Confirm" button will directly close the "Close" dialog box and the "Settings" dialog box. When opening this function again, the "User Experience Improvement Program" will show the changed status.

2.3 Basic Module

2.3.1 Data Exchange

2.3.1.1 Open Point Cloud

Function Description:

Opens point cloud data and displays it in the view. Supported point cloud data formats include *.hpc, *.las, *.laz, *.codata, and *.e57.

Operation Steps:

1. Click Basic → Open Point Cloud to open the file selection dialog box.

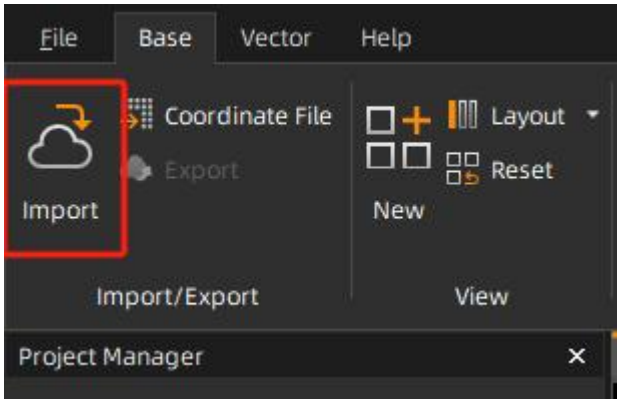


Figure: Import Point Cloud

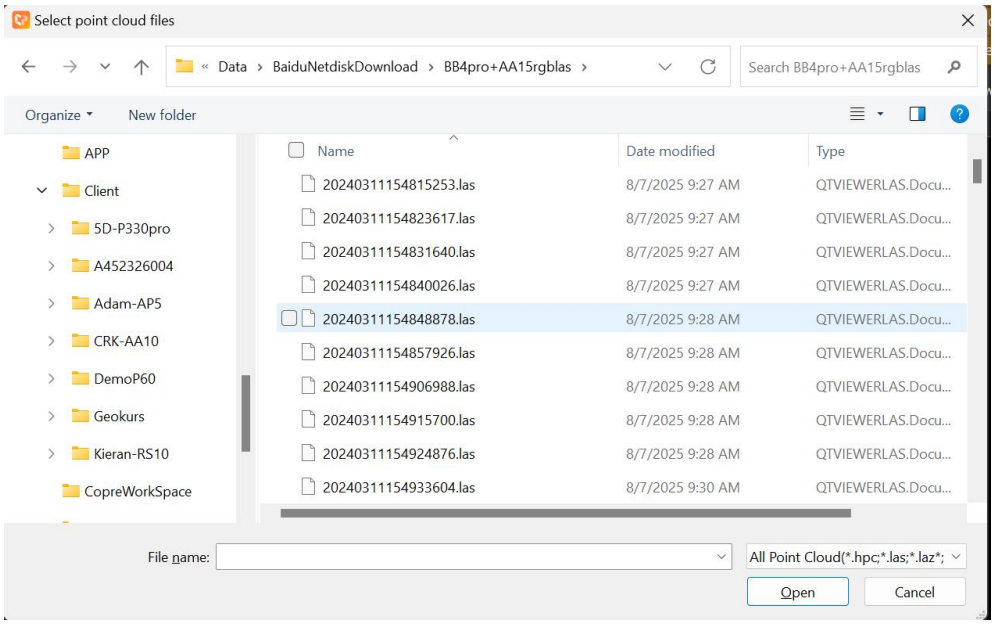


Figure: Select Point Cloud Data File Dialog Box

2. Select point cloud data in .hpc/.las/.laz/.codata/.e57 format and click Open. After the progress bar finishes, the point cloud data will be loaded into the view.

Notes:

① The *.hpc format is a custom data type of the software, supporting loading of large datasets with higher efficiency in browsing or processing data. When loading point cloud data in other formats (e.g., *.las, *.laz, *.codata), the data will first be converted to *.hpc format before being loaded into the view.

② Supports las format of version 1.4 and below.

2.3.1.2 Coordinate File

Function Description:

Loads coordinate data in .dat, .csv, .txt formats into the currently active drawing and displays it in the view.

Operation Steps:

1. Click Basic → Data Import → Coordinate File to open the file selection dialog box.

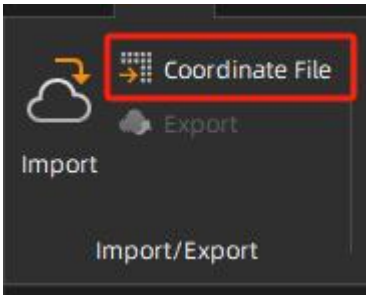


Figure: Coordinate File Button

2. Select a coordinate file in .txt, .dat, or .csv format, click Open. The Import Coordinate File dialog box appears.

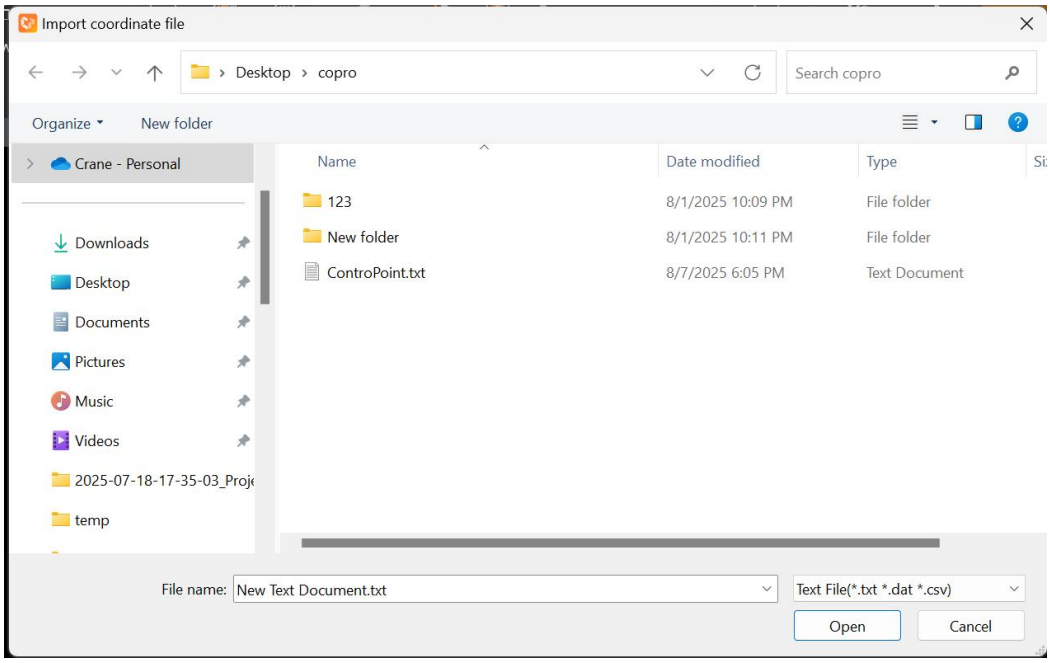


Figure: Open Coordinate File

3. In the Import Coordinate File dialog box, make settings so that both X and Y columns have data, then click OK. The coordinate file will be imported into the current active drawing and displayed in the view.

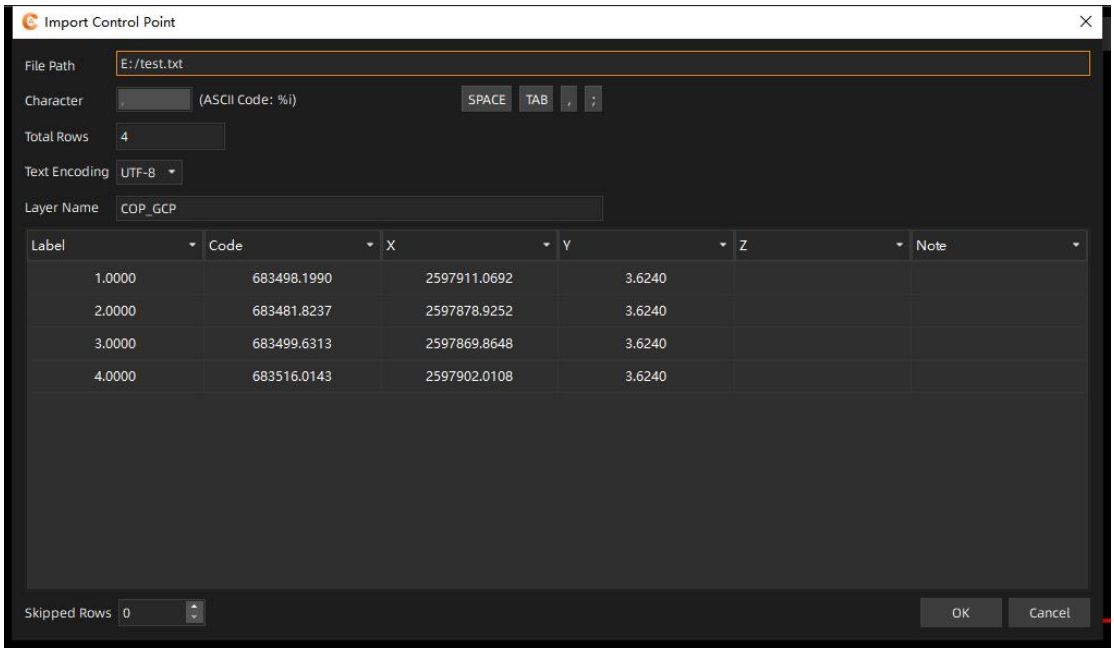


Figure: Import Coordinate File Dialog Box

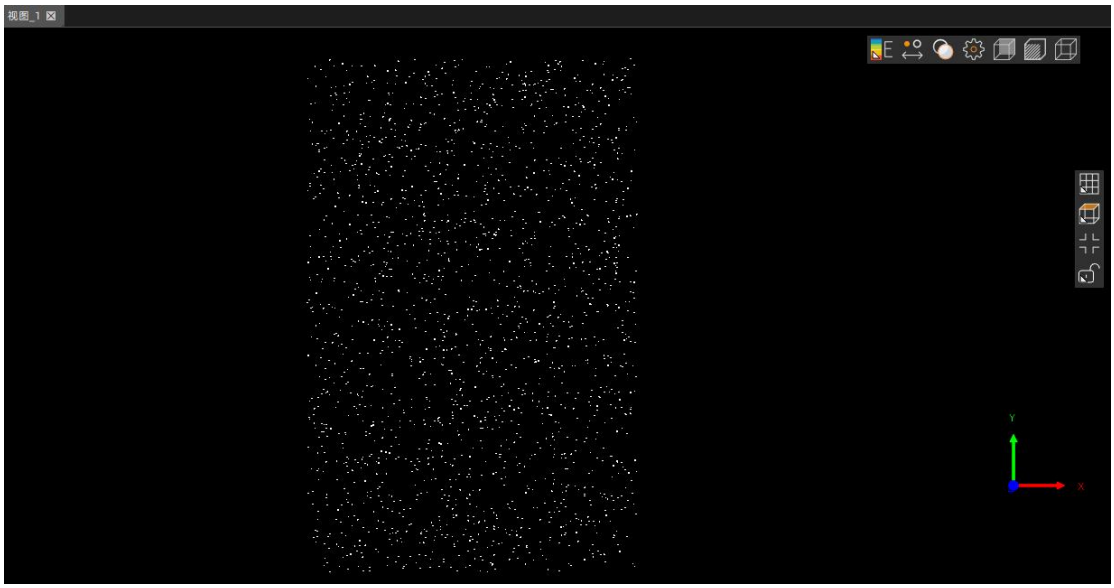


Figure: Coordinate File Display Effect

2.3.1.3 Export Point Cloud

Function Description:

Exports point cloud data to a specified format point cloud file. Users can customize export parameters as needed.

Operation Steps:

1. Load point cloud data, click Basic → Export Point Cloud. The Export Point Cloud dialog box appears. Select the original point cloud file(s) to export, set parameters, and click OK.

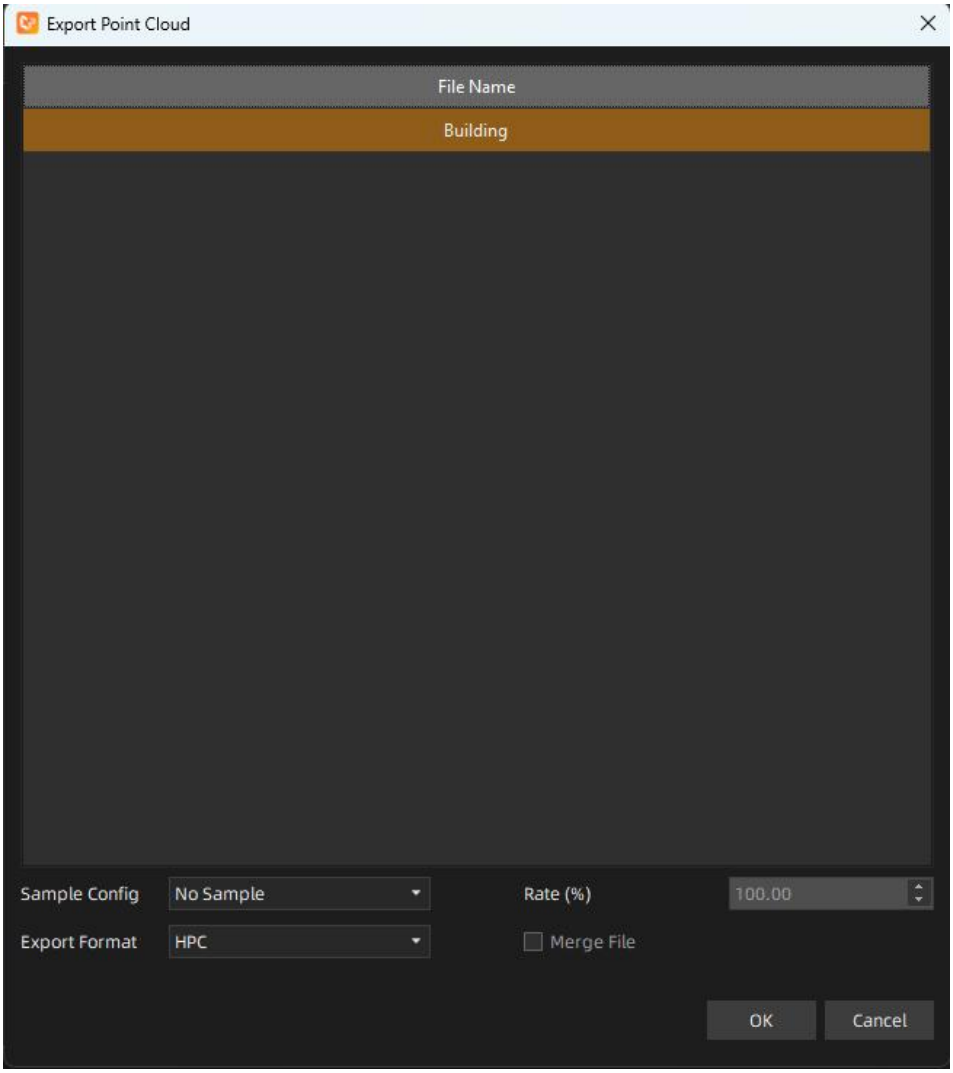


Figure: Expert PointCloud

2. If "Merge into a single file" is selected, a file save dialog box appears. Choose a directory, enter a file name, and click Save to export as a single point cloud file. If exporting as multiple separate files, select a folder and confirm. The point clouds will be saved separately to the chosen folder with naming rule: timestamp_original_point_cloud_name.

Parameter Settings:

Sampling Setting: Three sampling methods: Random Sampling, Grid Sampling, No Sampling.

Sampling Rate (%): For random sampling, the thinning ratio. Default 10%, range 0.01-99.99%. The smaller the sampling rate, the fewer points retained.

Grid Cell Size (m): For grid sampling. Each grid cell retains at most one po

int. Default 0.1m. Smaller grid size results in slower thinning but more poin ts retained; larger grid size results in faster thinning but fewer points retai ned.

Export Format: Supports exporting point clouds to HPC, Las1.2, Las1.3, Las 1.4, and E57 formats.

Merge into a single file:If more than one point cloud is selected for expor t, checking this option merges them into a single point cloud file.

2.3.2 View

This section introduces view management functions, including creating a ne w view window, arranging view layouts, and resetting layouts.

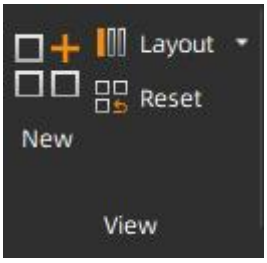


Figure: View Management Buttons

2.3.2.1 New View

Function Description:

Creates and opens a new view.

Operation Steps:

1. Click Basic → New View to create a new view.
2. Drag point cloud, vector, DEM, imagery, or OSGB model data from the P roject Manager into the new view to load the data.

Note: A maximum of four views can exist simultaneously.

2.3.2.2 Layout

Function Description:

Window layout applies when multiple views exist, providing four layout mo des: Tabbed Layout, Tiled Layout, Horizontal Layout, and Vertical Layout.



Figure: Layout Button Options

Operation Steps:

1. Click Basic → New View to create at least two view windows.
2. Click Basic → Layout and select Horizontal Layout, Vertical Layout, Tiled L ayout, or Tabbed Layout to see the different layouts.

Note:

The layout function is effective for multiple views. When multiple views exis t, the currently active view is marked with an orange horizontal line in the view title.

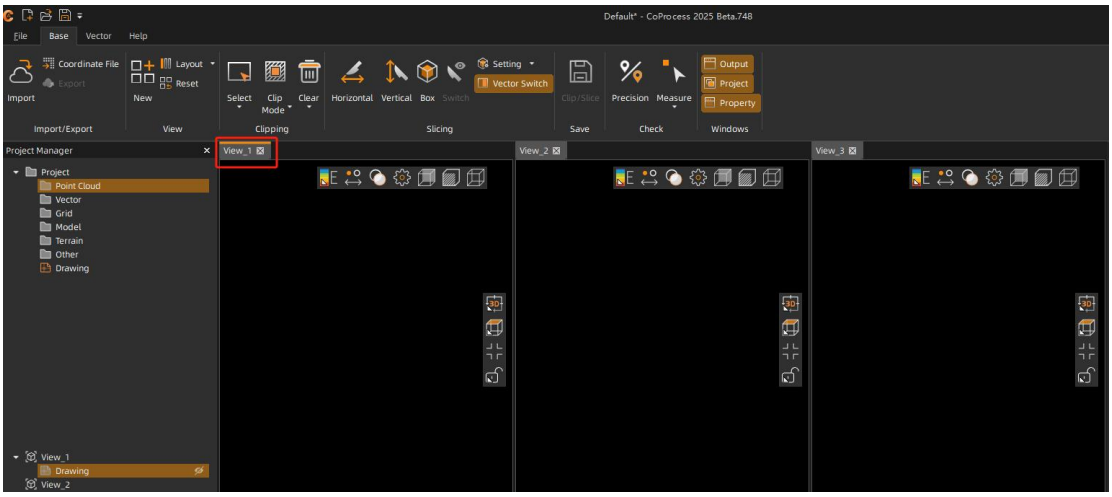


Figure: Current Active View Mark

2.3.2.3 Reset

Function Description:

Restores multiple views to the default layout state (Tabbed Layout).

Operation Steps:

1. Click Basic → Reset.
2. The software interface multiple views return to the initial state (Tabbed Layout).

2.3.3 Clipping

2.3.3.1 Rectangle

Function Description:

Selects point clouds by drawing a rectangular area.

Operation Steps:

1. Load point cloud data, click Basic → Clip → Select → Rectangle to activat

e the rectangle selection command.

2. In the view window, left-click to select the top-left corner position of the rectangle, hold and drag the mouse until reaching the bottom-right corner, then release. Point clouds within the rectangle are highlighted.

3. After the first selection, you can continue making rectangle selections. D epending on the subtraction mode state, the selection area will be added t o or subtracted from the already selected area.

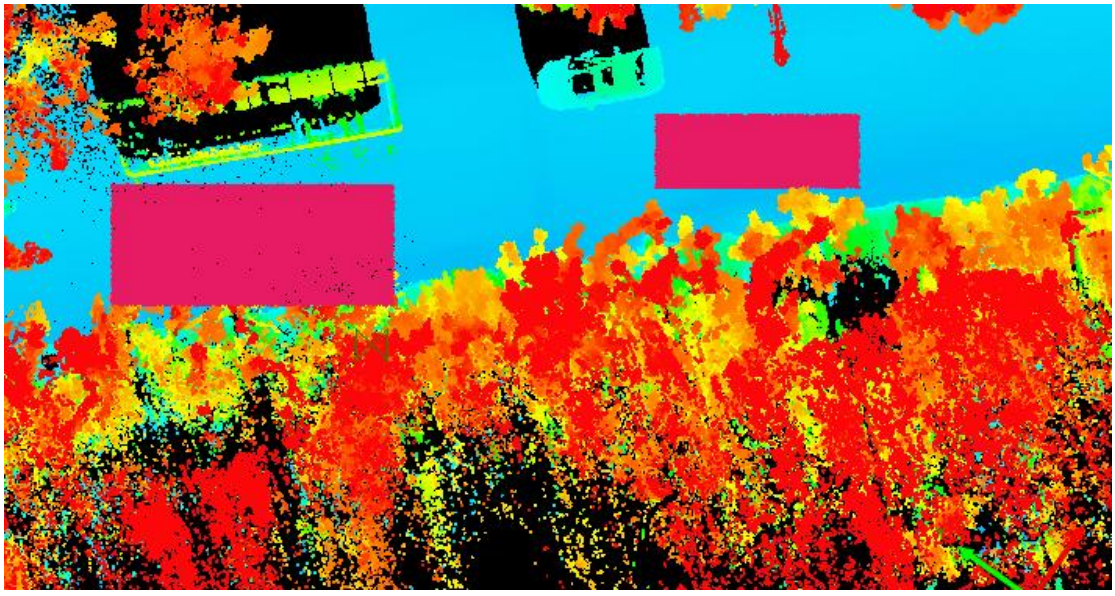


Figure: Rectangle Selection of Point Cloud

2.3.3.2 Polygon

Function Description:

Selects point clouds by drawing a polygon.

Operation Steps:

1. Load point cloud data, click Basic → Clip → Select → Polygon to activate the polygon selection command.

2. Left-click sequentially to select polygon vertex positions. Double-click the

last vertex to end polygon selection. The selected area is highlighted.

3. If a vertex is selected incorrectly, use Ctrl+Z to cancel the previous point selection, supporting multiple cancellations.

4. After the first selection, you can continue making selections. Depending on the subtraction mode state, the selection area will be added to or subtr acted from the already selected area.

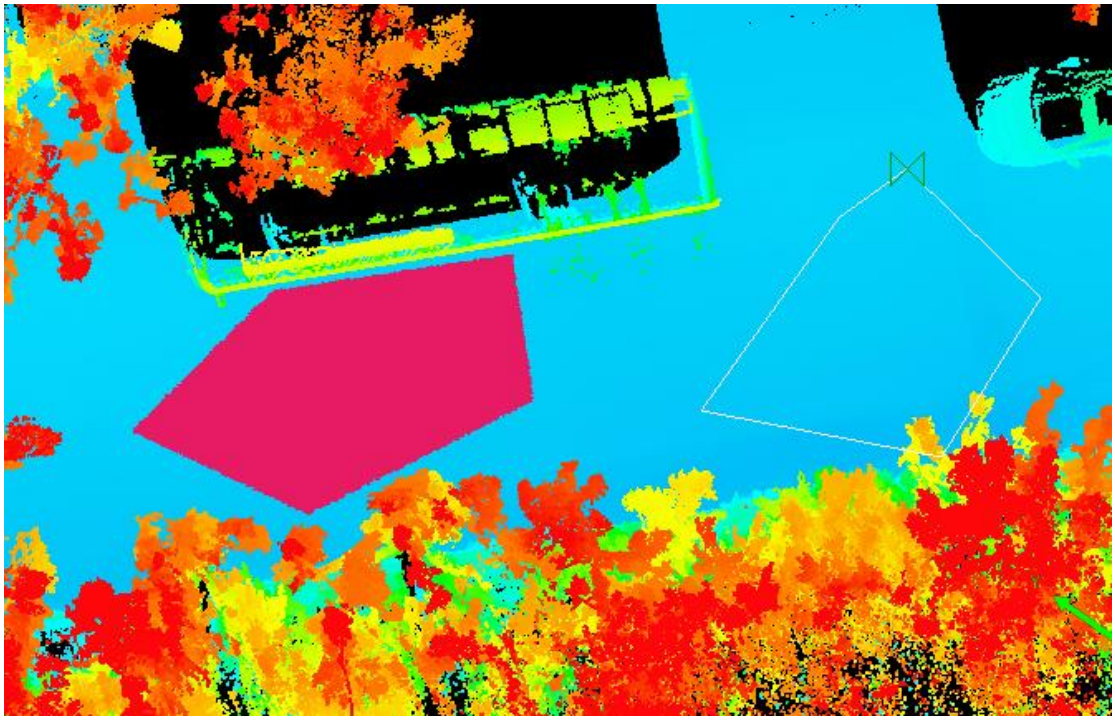


Figure: Polygon Selection of Point Cloud

2.3.3.3 Lasso

Function Description:

Selects point clouds by drawing a lasso.

Operation Steps:

1. Load point cloud data, click Basic → Clip → Select → Lasso to activate th e lasso selection command.

2. Left-click once, then move the mouse. Point clouds within the closed are

a formed during mouse movement will be selected. Left-click again to com plete a single lasso selection. The selected area is highlighted.

3. After the first selection, you can continue making selections. Depending on the subtraction mode state, the selection area will be added to or subtr acted from the already selected area.

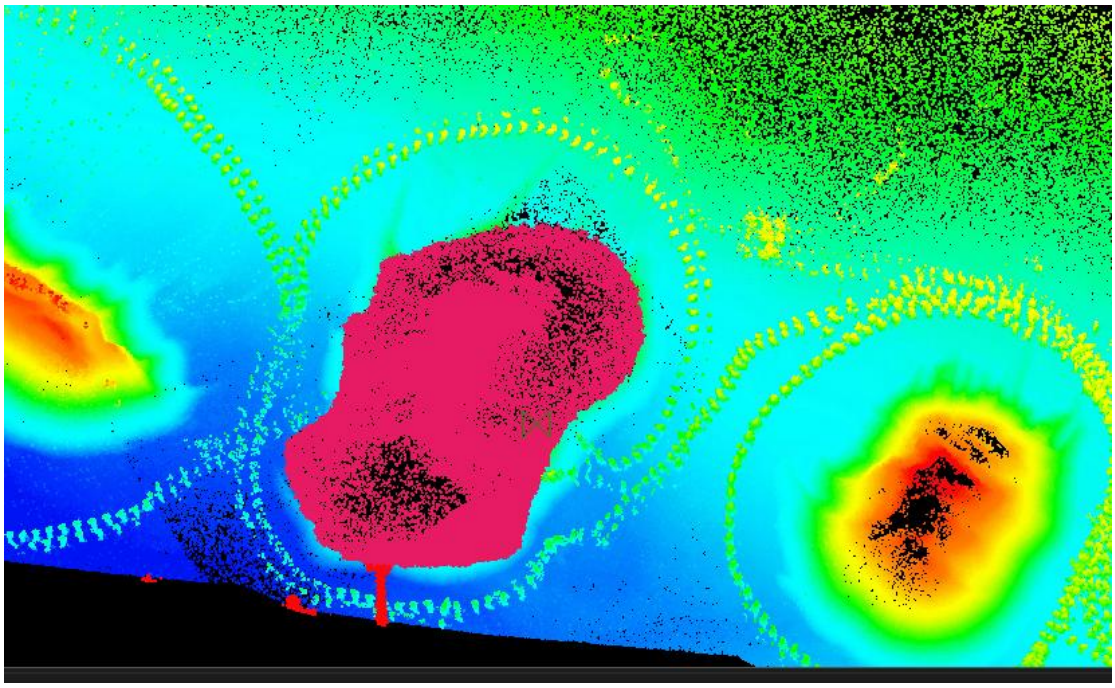


Figure: Lasso Selection of Point Cloud

2.3.3.4 Select by Range Line

Function Description:

Selects point clouds by selecting a range line.

Operation Steps:

1. Load point cloud data and a range line, click Basic → Clip → Select → S elect by Range Line to activate the command.

2. In the view, select a range line (supports point selection and box selecti on). Point clouds within the range line are selected. The selected area is hi ghlighted.

3. After the first selection, you can continue making selections. Depending on the subtraction mode state, the selection area will be added to or subtr acted from the already selected area.

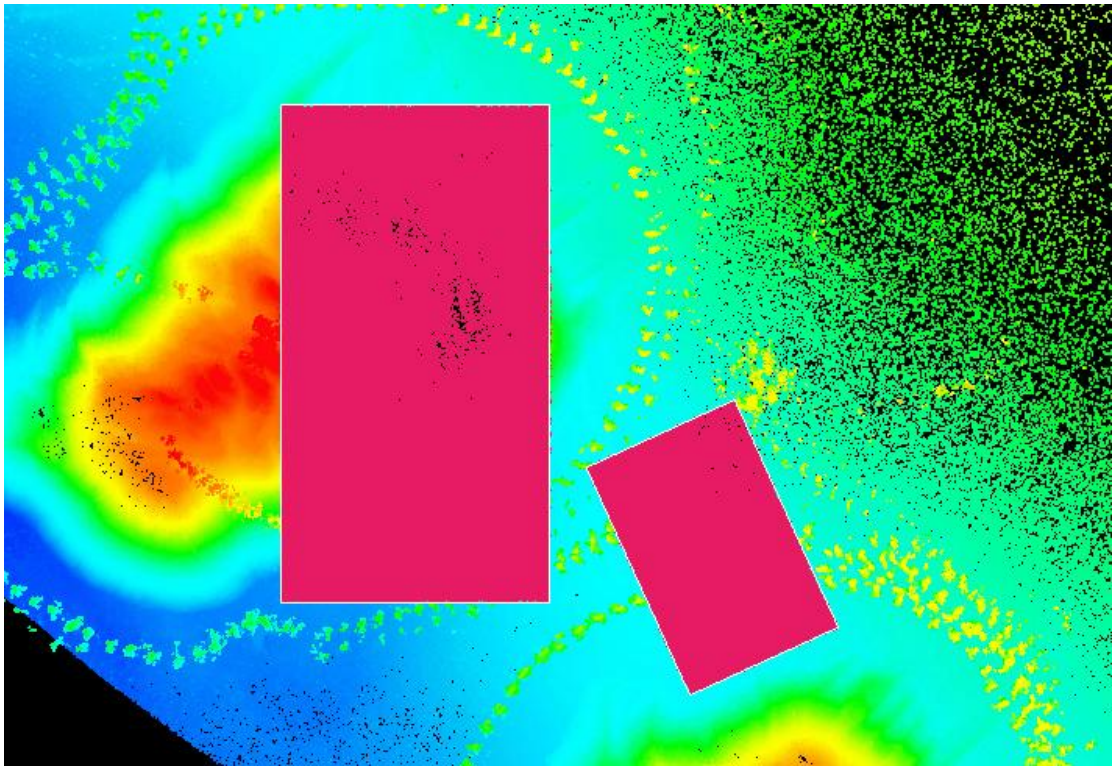


Figure: Range Line Selection of Point Cloud

2.3.3.5 Inner Clip

Function Description:

Clips away point clouds outside the selected area.

Operation Steps:

1. Activate a selection function to obtain a selection area. Execute Inner Cli p to see the clipping effect.
2. After one clipping operation, you can continue making multiple selections and clippings on the result.

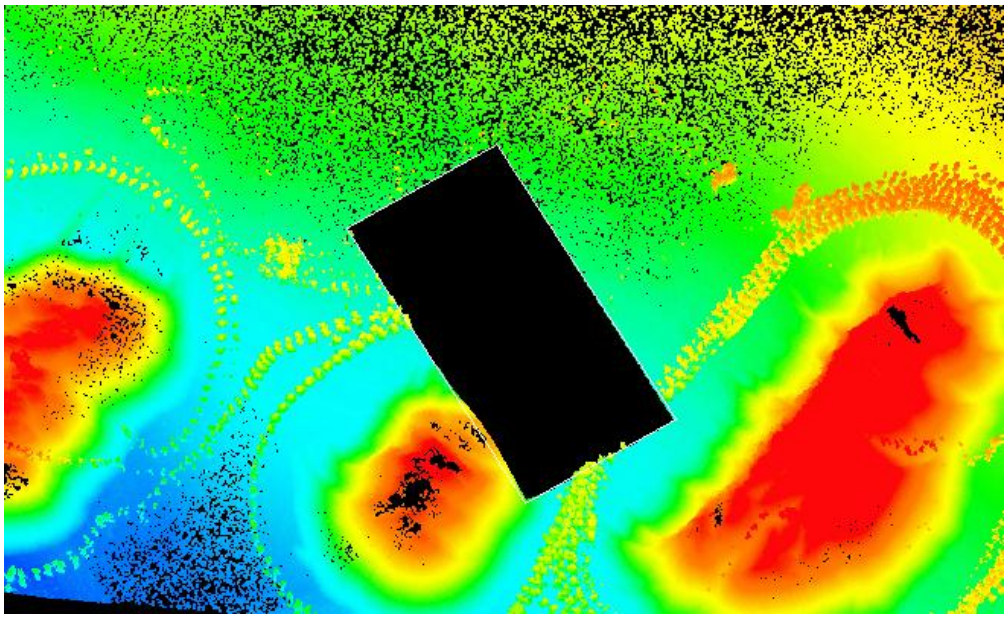


Figure: Inner Clipping Result

Note:

Undo: Cancels the last clipping and the coloring result of the selected point cloud.

Redo: Reverts the last undo operation.

2.3.3.6 Outer Clip

Function Description:

Clips away point clouds inside the selected area.

Operation Steps:

1. Activate a selection function to obtain a selection area. Execute Outer Cli p.
2. After one clipping operation, you can continue making multiple selections and clippings on the result.

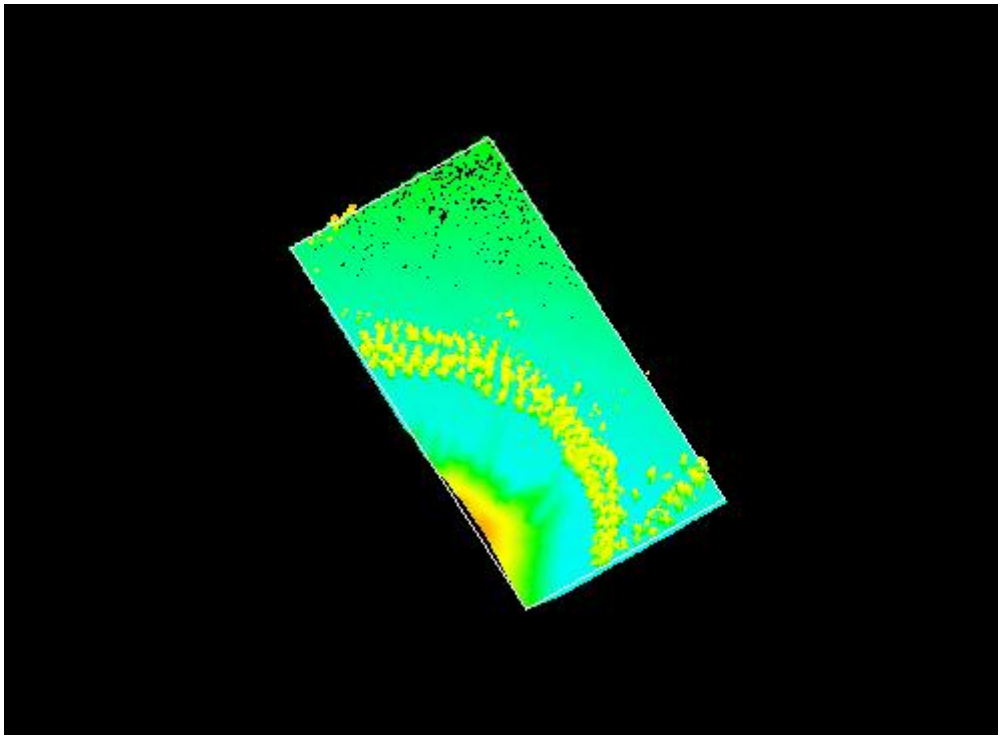


Figure: Outer Clipping Result

Note:

Undo: Cancels the last clipping and the coloring result of the selected point cloud.

Redo: Reverts the last undo operation.

2.3.3.7 Subtract

Function Description:

This function works in conjunction with Rectangle, Polygon, Lasso, and Rang e Line selections, controlling whether the current selection is in additive or subtractive mode. When a selection command (Rectangle, Polygon, Lasso, R ange Line) is active, the Subtract mode becomes selectable.

Operation Steps:

1. By default, the Subtract button is not active, and selections are in additi

ve mode. Each selection increases the selected area.

2. Activating the Subtract function puts it in subtractive mode. The final sel ection result is the area of the already selected region minus the overlappi ng part of the current selection.

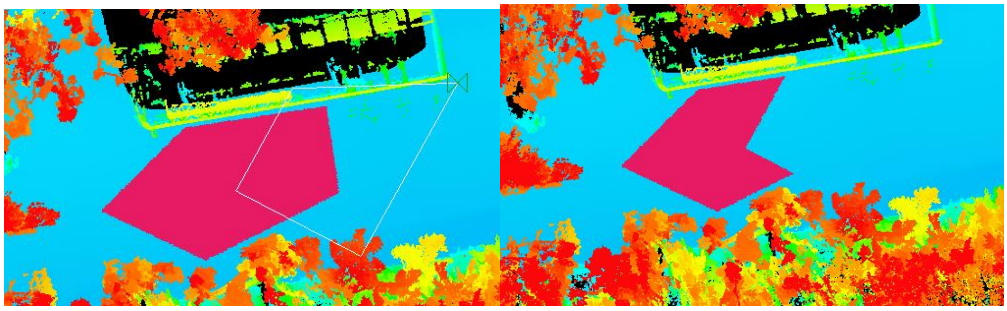


Figure: Deselect

2.3.3.8 Clear

Function Description:

Cancels and clears all selection operations and clipping results.

Operation Steps:

1. Perform selection or clipping operations to highlight selected areas or pr oduce clipping results.
2. Execute Clear to immediately delete all selections and clipping results.

Note:

Undo: Cancels the last clipping and the coloring result of the selected point cloud.

Redo: Reverts the last undo operation.

2.3.4 Slicing

2.3.4.1 Horizontal

Function Description:

Creates a new horizontal slice by selecting a point.

Operation Steps:

1. Click Basic → Slice → Horizontal. The Slice Settings panel appears on the right. If point cloud and model snapping are not enabled, they are automatically turned on.

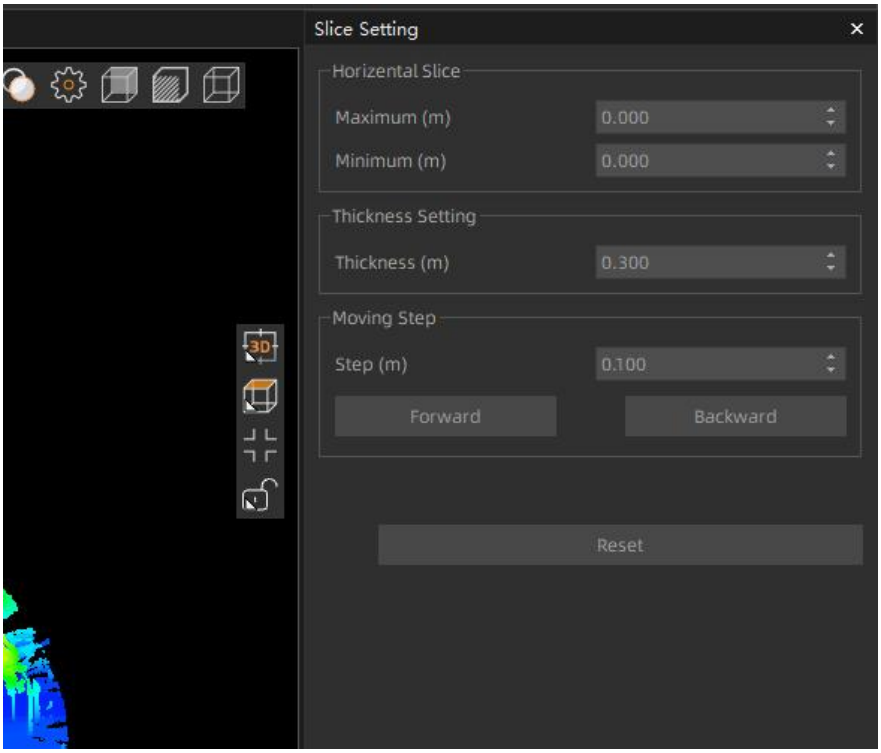


Figure: Activate Horizontal Slice

2. Left-click to select a point on the point cloud to create a new horizontal slice. Hold Ctrl and scroll the mouse wheel to move the slice. Hold Shift and scroll the mouse wheel to adjust the display thickness of the horizontal slice.

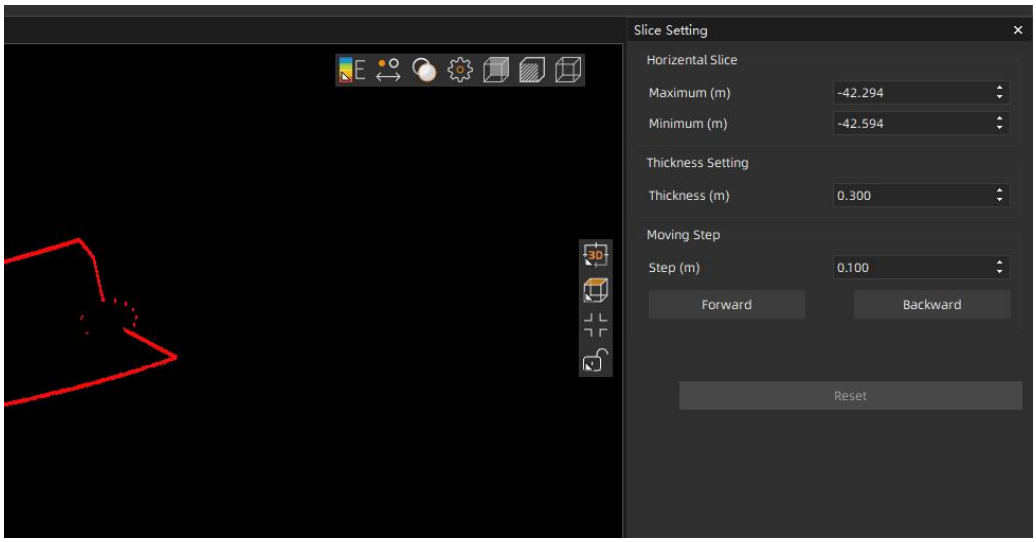


Figure: Horizontal Slice

3. In the Slice Settings panel, modifying the maximum and minimum values of the elevation range and slice thickness can directly and accurately update the horizontal slice result.

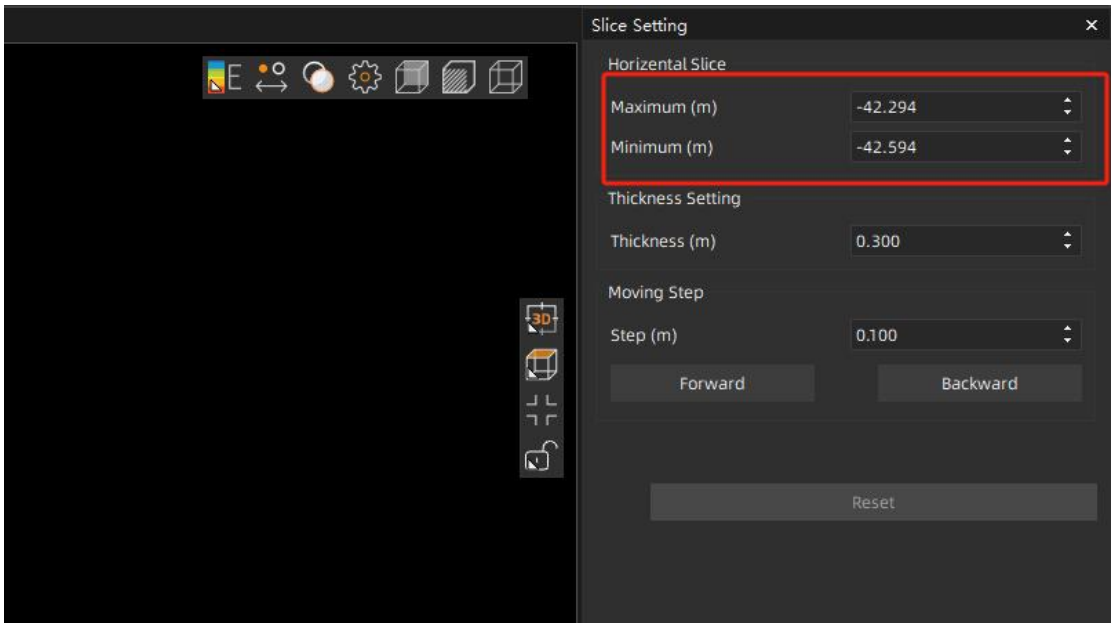


Figure: Modifying Elevation Range for Horizontal Slice

4. Modify the movement step size and click Forward or Backward to update the horizontal slice result. The maximum and minimum values of the elevation range will also be updated in real time.

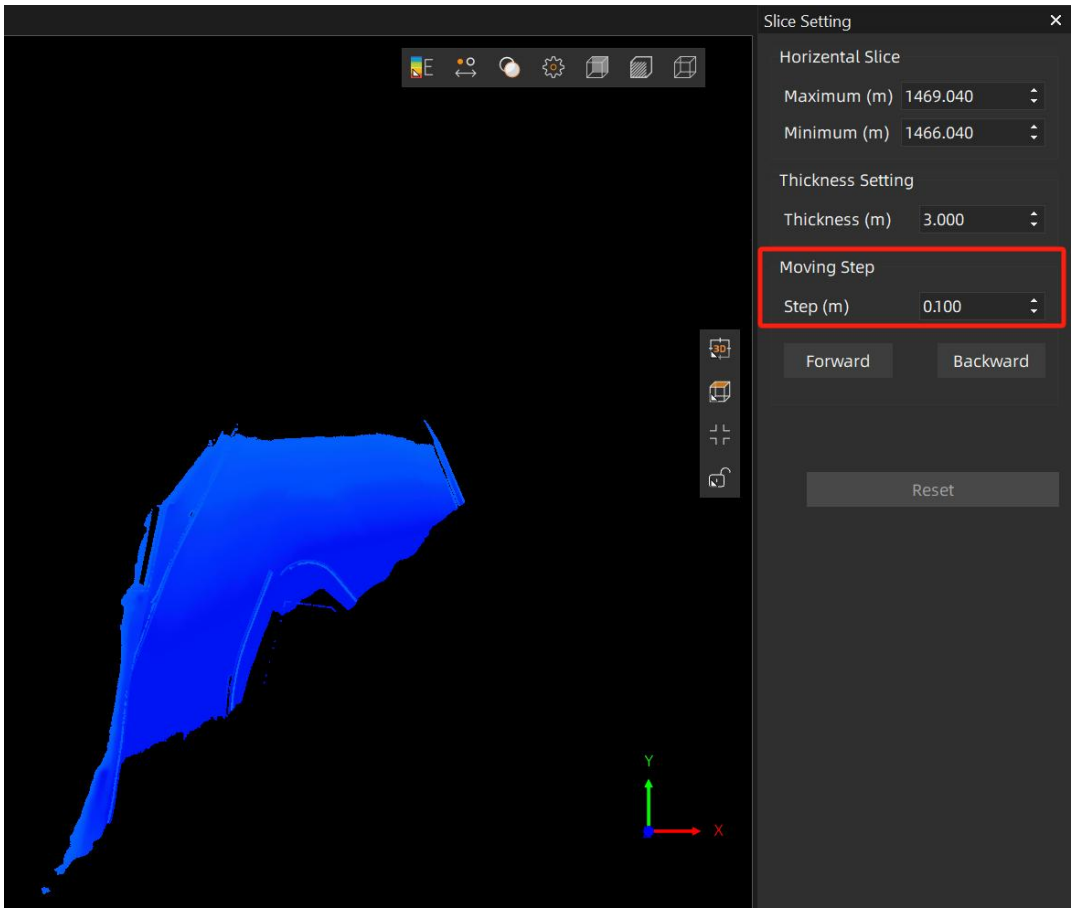


Figure: Modify Movement Step for Horizontal Slice

5. Click Toggle to display the point cloud before slicing; click again to displa y the point cloud after slicing.

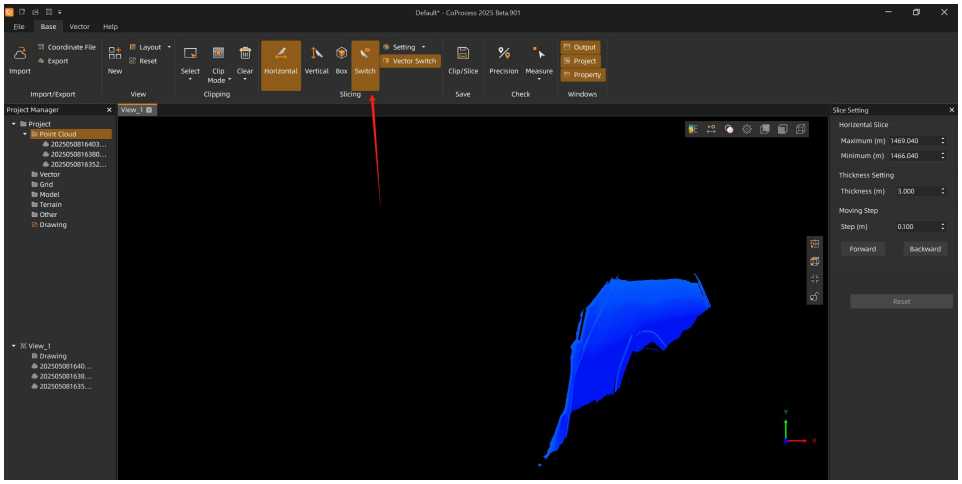


Figure: Horizontal Slice Modify Movement Step

Note:

For horizontal slicing, the "Reset" button in the slice settings is grayed out.

2.3.4.2 Vertical

Function Description:

Creates a new vertical slice.

Operation Steps:

1. Click Basic → Slice → Vertical to enter the vertical slice command. The vi ew automatically switches to top-down view. The Slice Settings panel appea rs on the right. If point cloud and model snapping are not enabled, they a re automatically turned on.

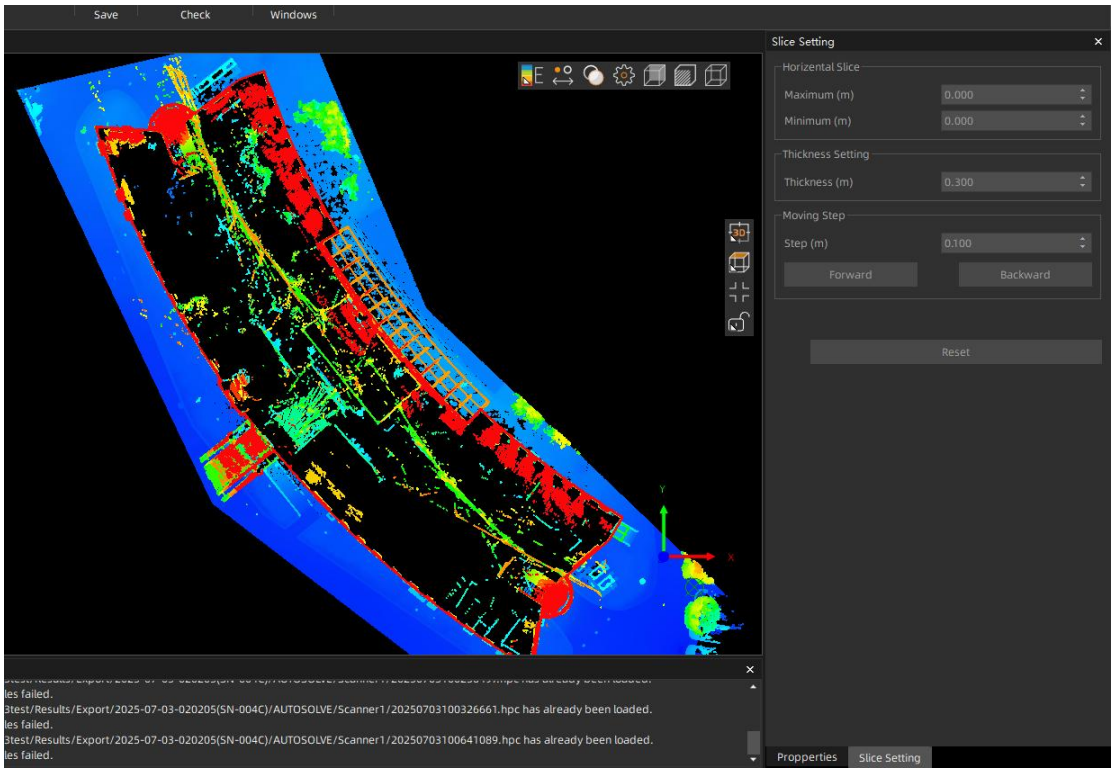


Figure: Activate Vertical Slice

2. Left-click to select two points in sequence to create a new vertical slice. Hold Ctrl and scroll the mouse wheel to move the slice. Hold Shift and scr

oll the mouse wheel to adjust the display thickness of the slice.

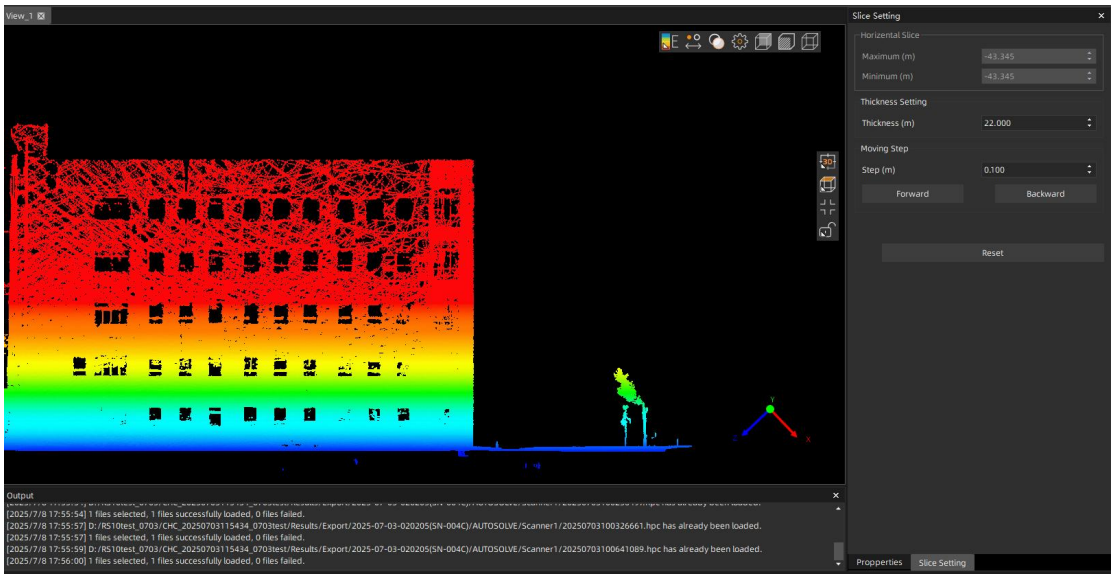


Figure: Vertical Slice

3. In the Slice Settings panel, modifying the slice thickness can directly upd ate the vertical slice result.

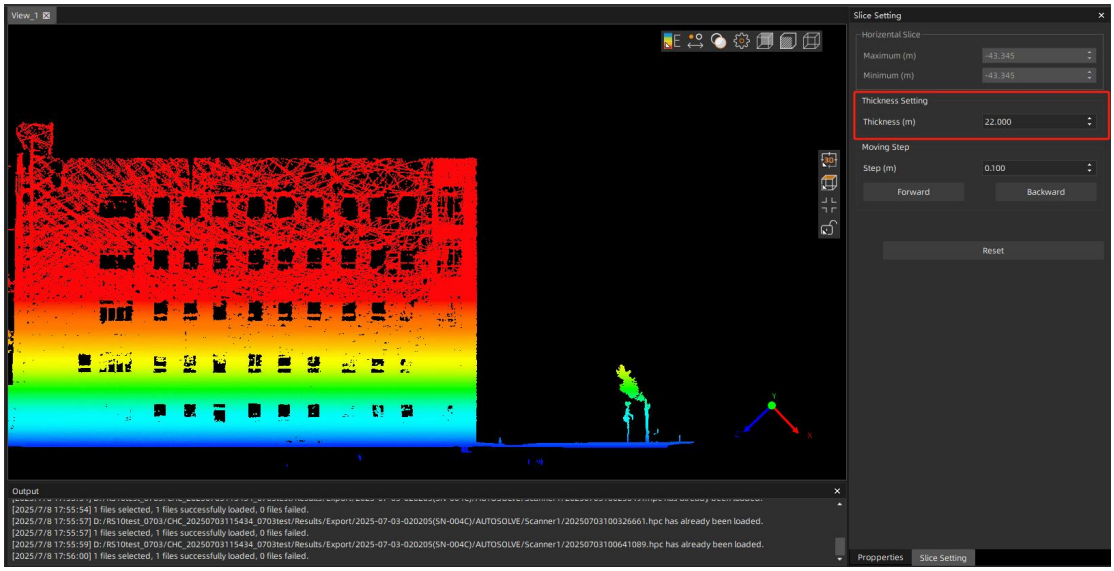


Figure: Modify Vertical Slice Thickness

4. Modify the movement step size and click Forward or Backward to directl y update the vertical slice result.

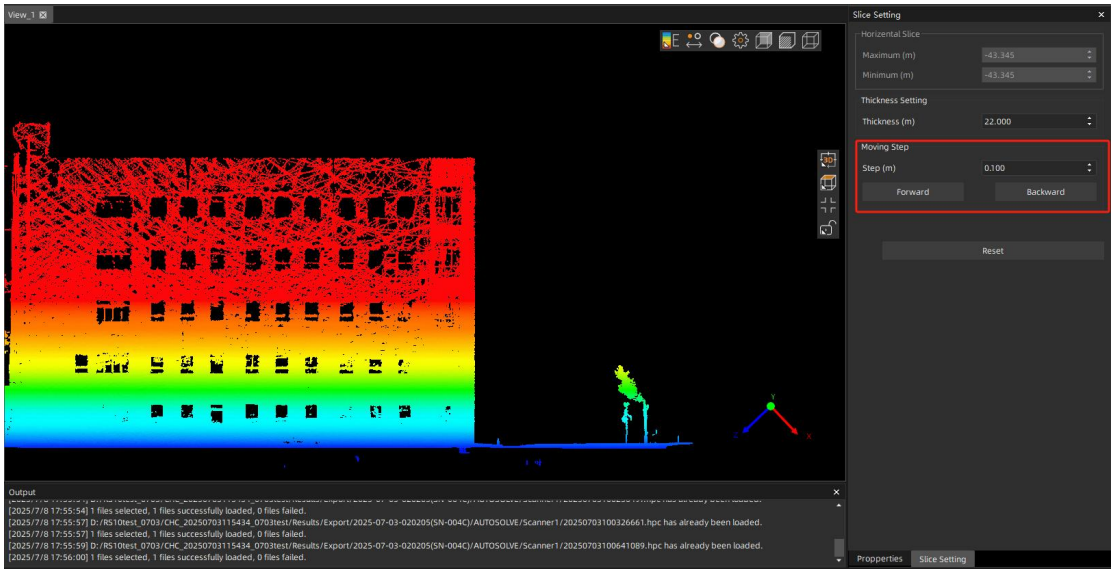


Figure: Modify Movement Step for Vertical Slice

5. Click Reset in Slice Settings to restore the point cloud view after vertical slicing to the view after the first slice.

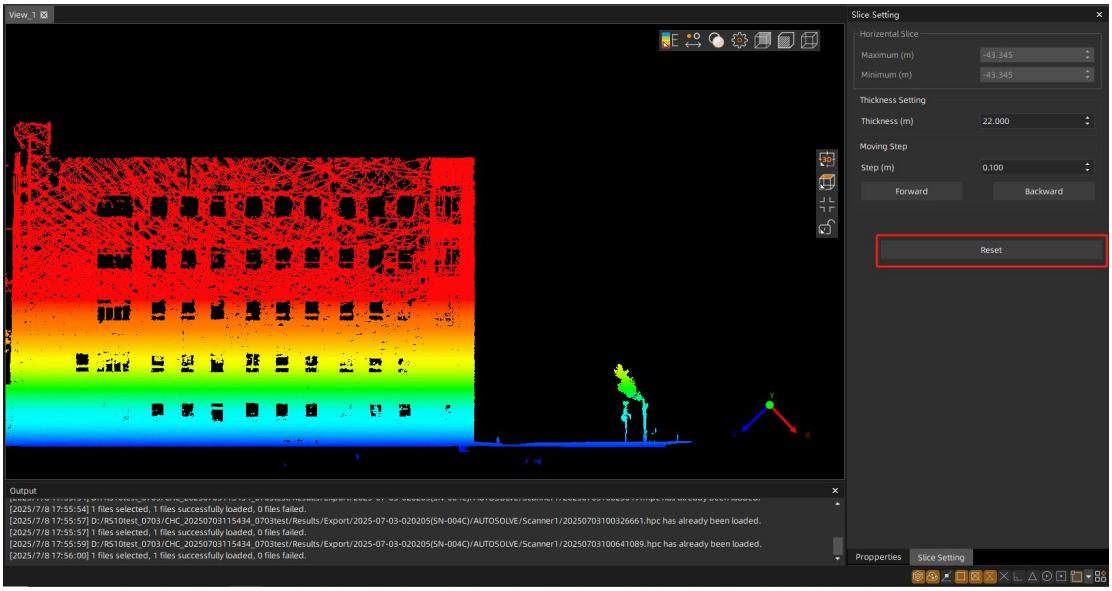


Figure: Vertical Slice Reset Effect

6. Click Toggle to display the point cloud before vertical slicing; click again t o display the point cloud after vertical slicing.

Note:

In vertical slice thickness, the maximum and minimum values of the elevati on range are grayed out and cannot be modified.

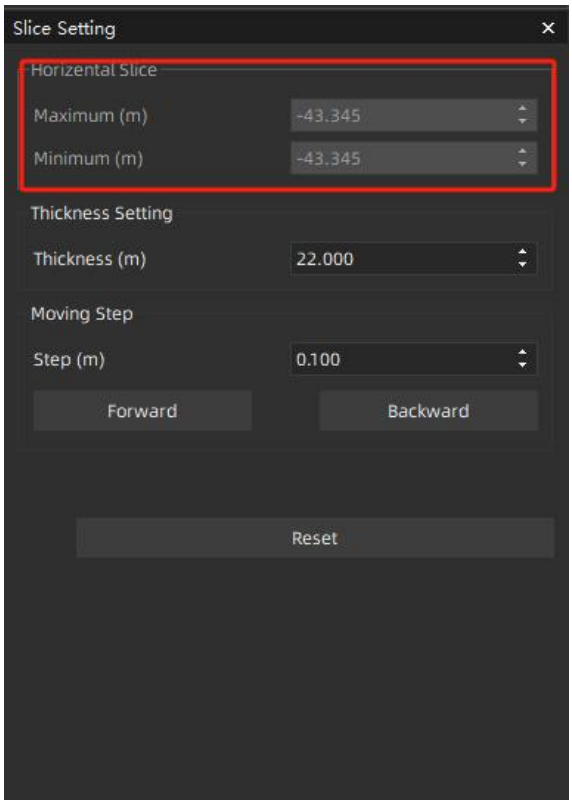


Figure: Grayed-Out Elevation Range for Vertical Slice

2.3.4.3 Bounding Box

Function Description:

Creates a new bounding box slice.

Operation Steps:

1. Click Basic → Slice → Bounding Box to enter the bounding box slice command. The view displays the bounding box frame, corner points, center point, and plane grips. The Bounding Box Slice Settings panel appears on the right.

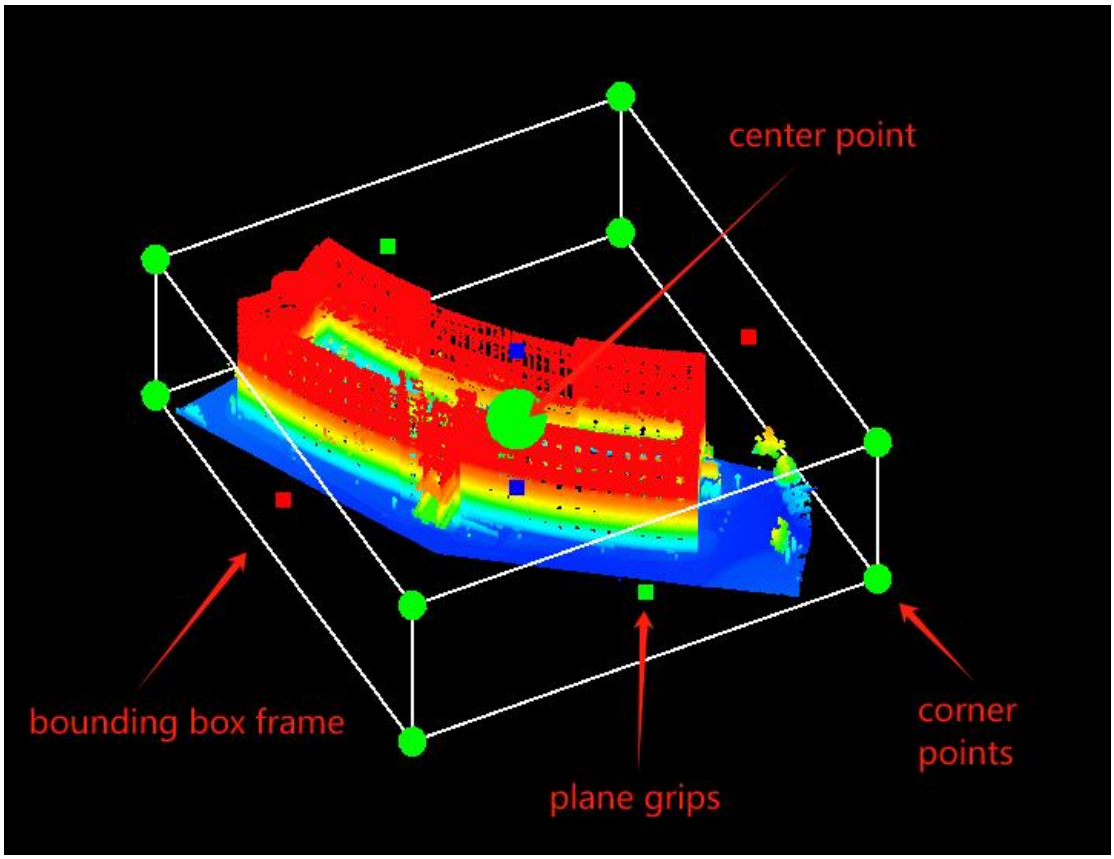


Figure: Bounding Box Slice

2. Select a corner point with the mouse. Dragging outward expands the bo unding box (point cloud unchanged); dragging inward shrinks the bounding box (point cloud is clipped accordingly). During dragging, only the bounding box and point cloud are displayed; all corner points, plane grips, and cent er point are hidden.

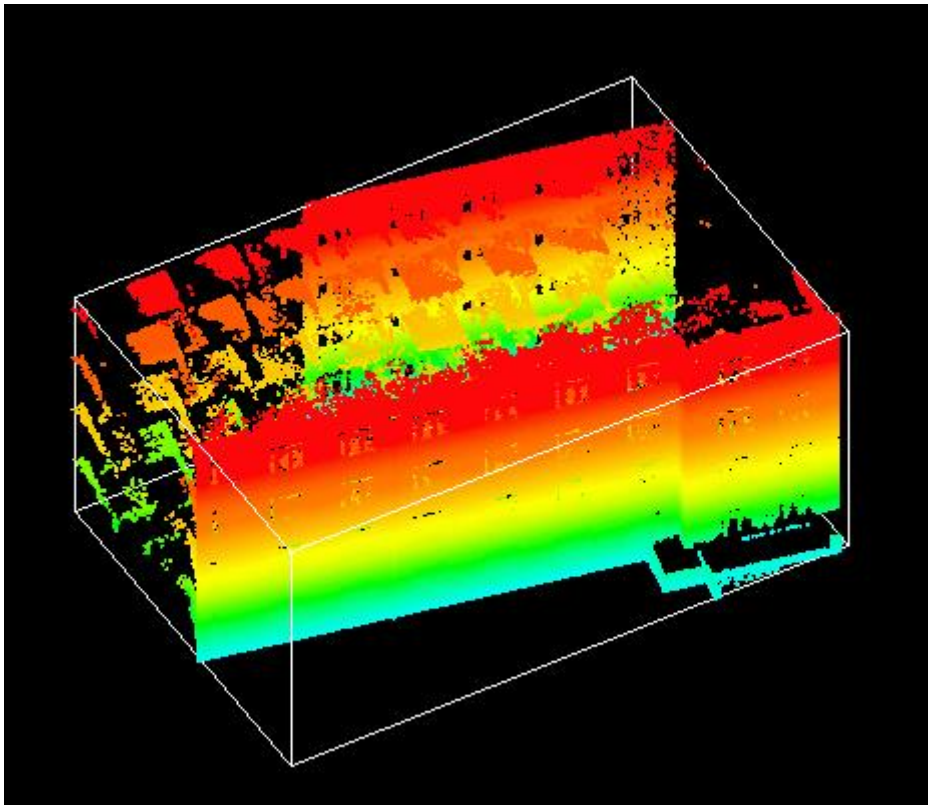


Figure: Effect of Moving Corner Points

3. Hover the mouse over a plane grip on a bounding box face. Dragging o utward pushes the slice outward (point cloud unchanged, bounding box fac e moves outward); dragging inward pushes the slice inward (point cloud is clipped smaller, bounding box face moves inward).

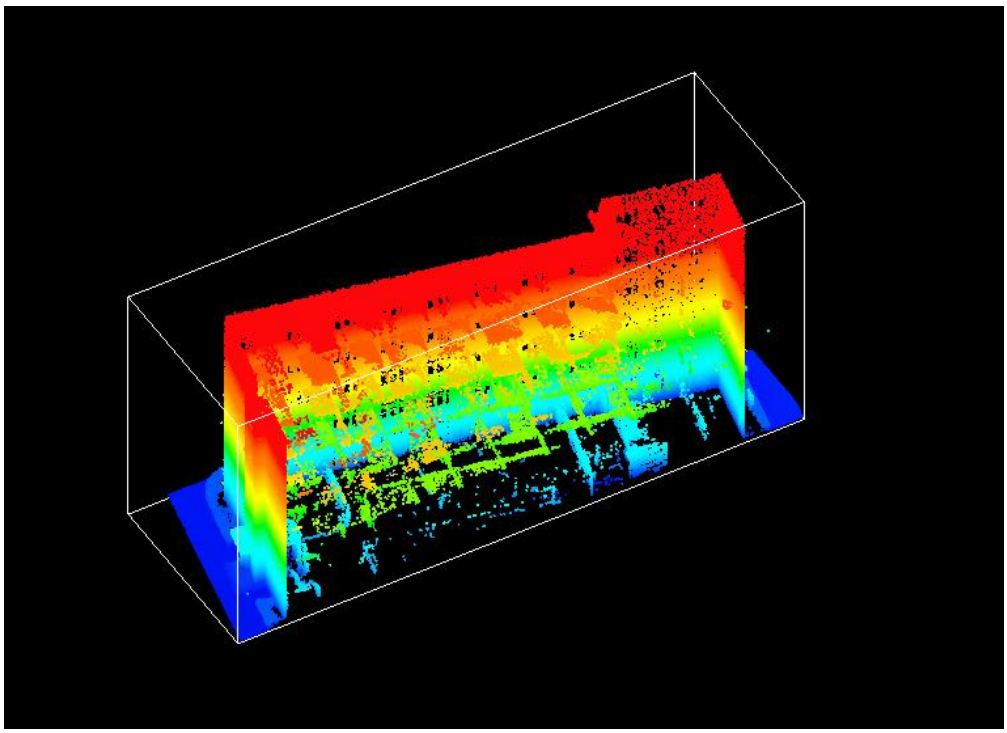


Figure: Effect of Moving Plane Grips

4. Hover near the center point of the bounding box, left-click and hold to move the bounding box arbitrarily. The point cloud position and size remai n unchanged. The bounding box clips the point cloud: points inside the bo unding box are retained, points outside are not displayed.

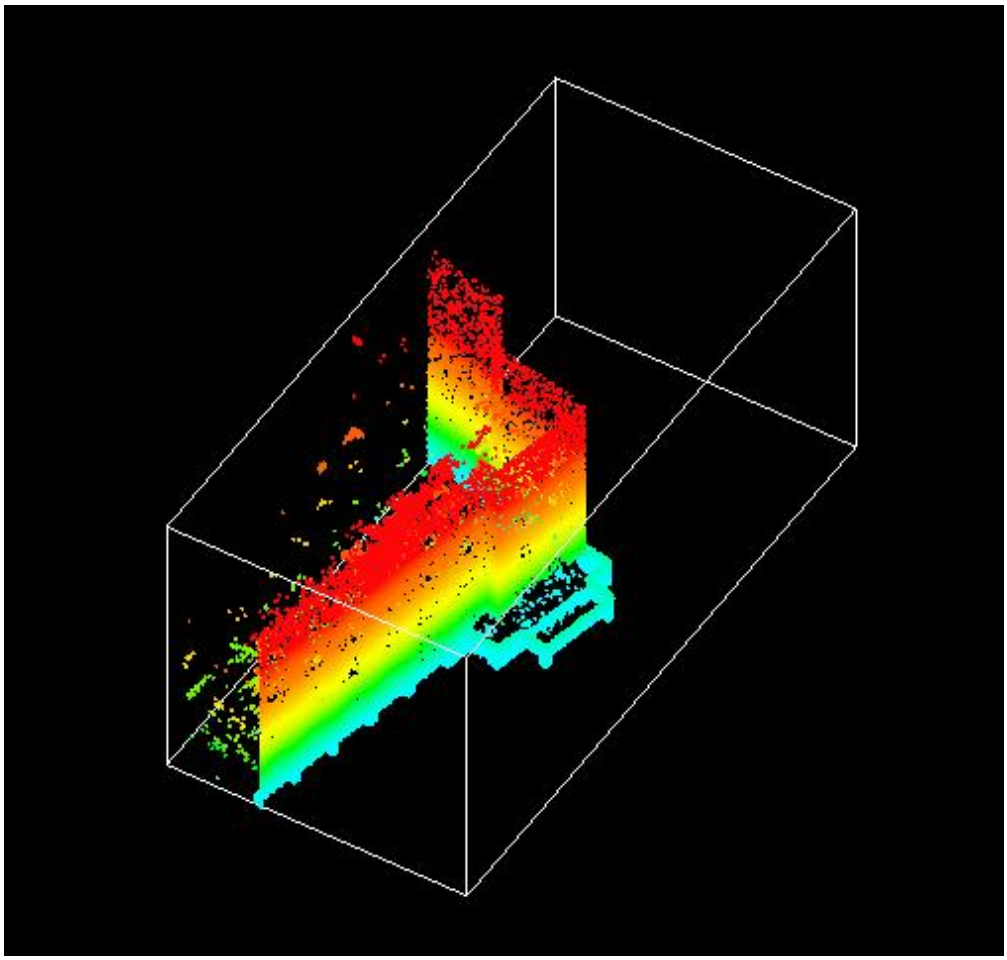


Figure: Effect of Moving Center Point

Note: The X-axis is red, the Y-axis is green, and the Z-axis is blue.

2.3.4.4 Bounding Box Slice Settings

Function Description:

Modifies the bounding box slice result directly by modifying parameters in the Bounding Box Slice Settings panel.

Operation Steps:

1. Click Basic → Slice → Bounding Box to enter the bounding box slice co mmand. The Slice Settings panel appears on the right.

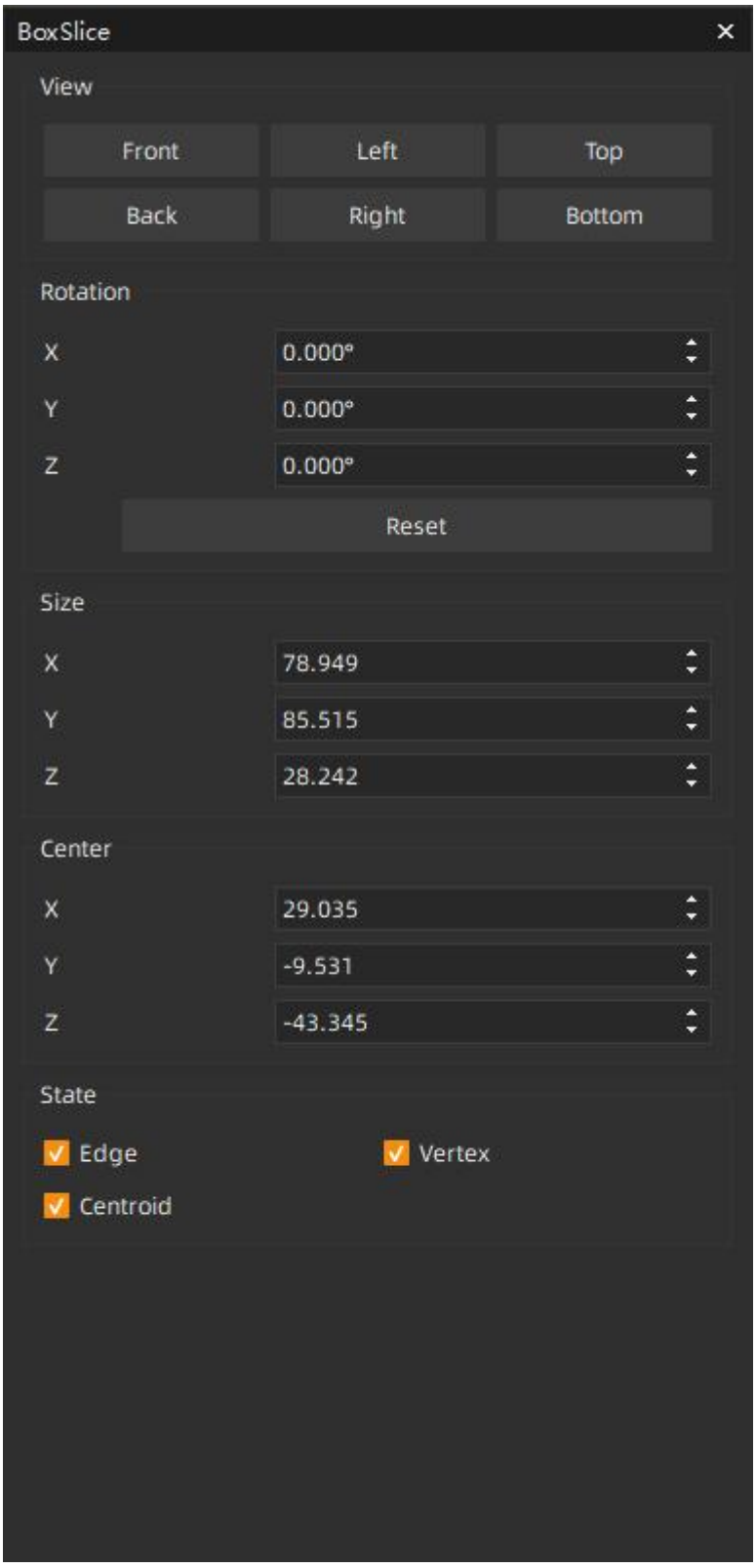


Figure: Bounding Box Settings Pane

2. Click Front, Left, Top, Rear, Right, Bottom in the View Angle section of th e Bounding Box Slice Settings panel to switch the view angle of the boundi ng box display.

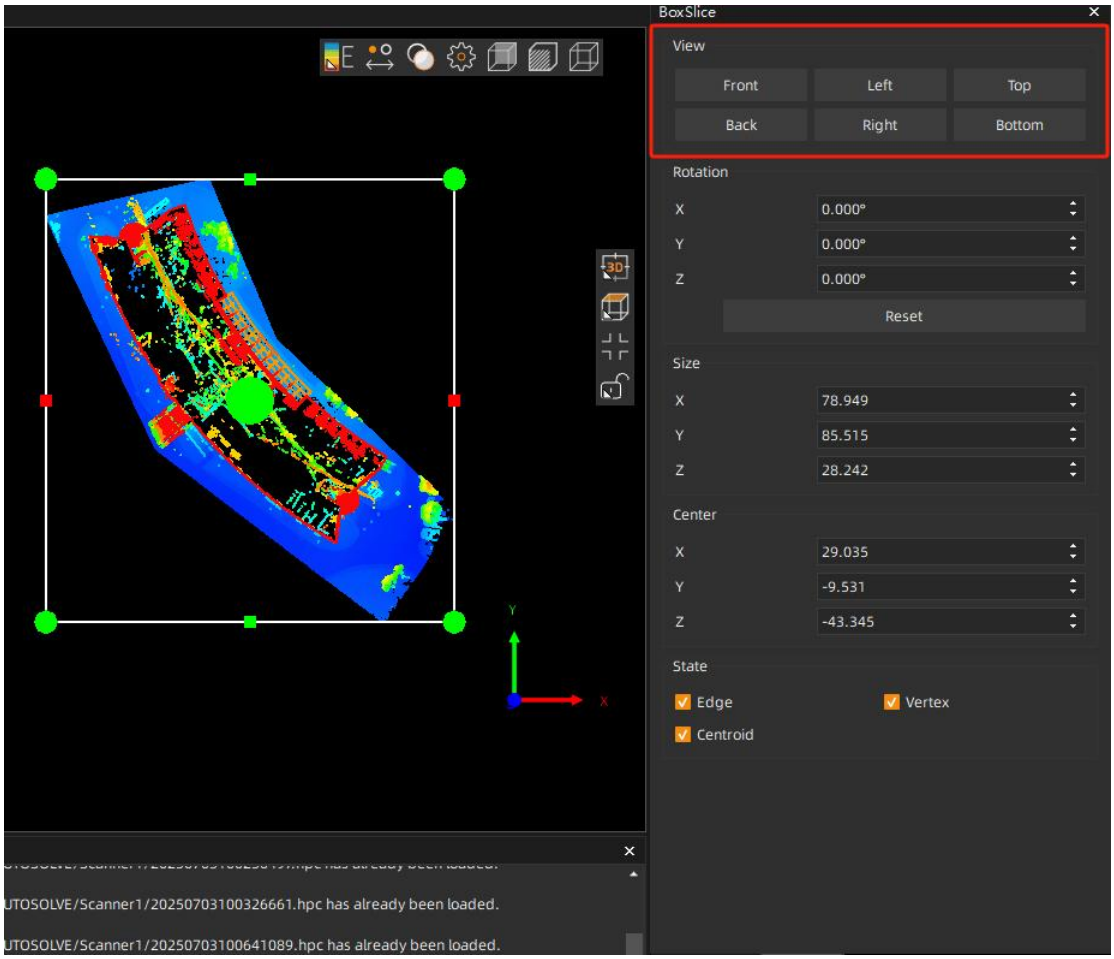


Figure: Top View Effect

3. Hover over the X-axis angle modification area. Scroll the mouse wheel: f orward increases the angle, backward decreases. The bounding box rotates around the X-axis. Angle modification range -360° to 360°. Click the up/do wn icons next to X-axis to increase/decrease the angle. Alternatively, directl y enter an angle value in the X-axis input box. YZ axes behave similarly.

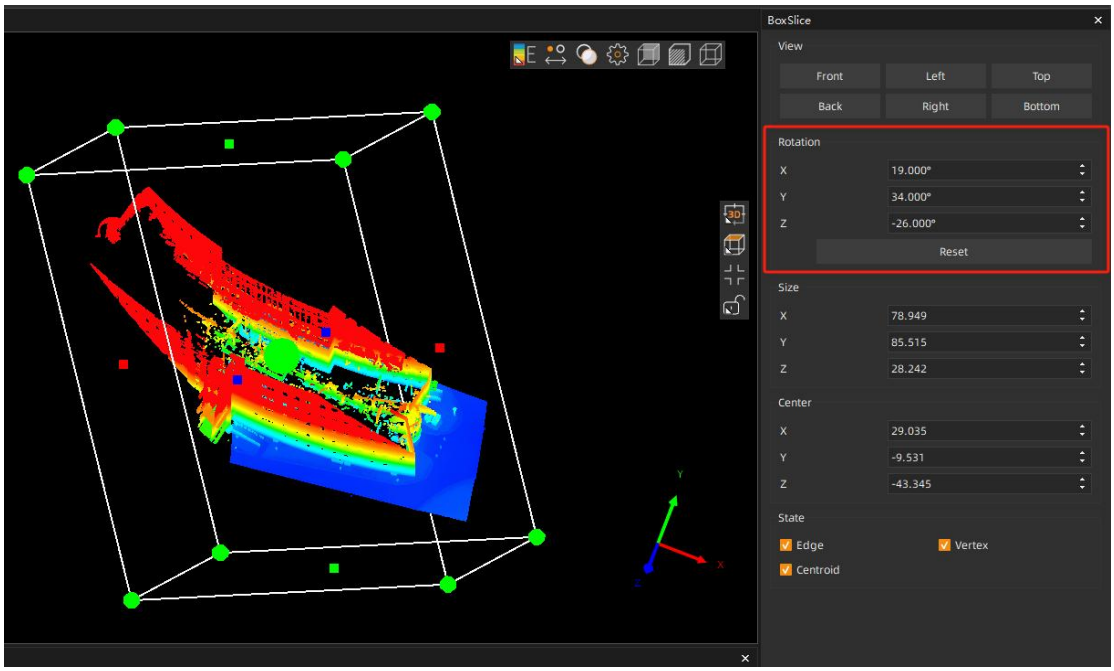


Figure: Effect of Modifying XYZ Rotation Angles

4. Click the Rotation Reset button to restore the default XYZ axes.

5. When the bounding box is changed in the view, the XYZ (length, width, height) dimensions in the Bounding Box Slice Settings panel update in real time. Modifying the XYZ dimension values updates the bounding box dimen sions accordingly, and the point cloud is clipped in real time (points inside retained, outside hidden).

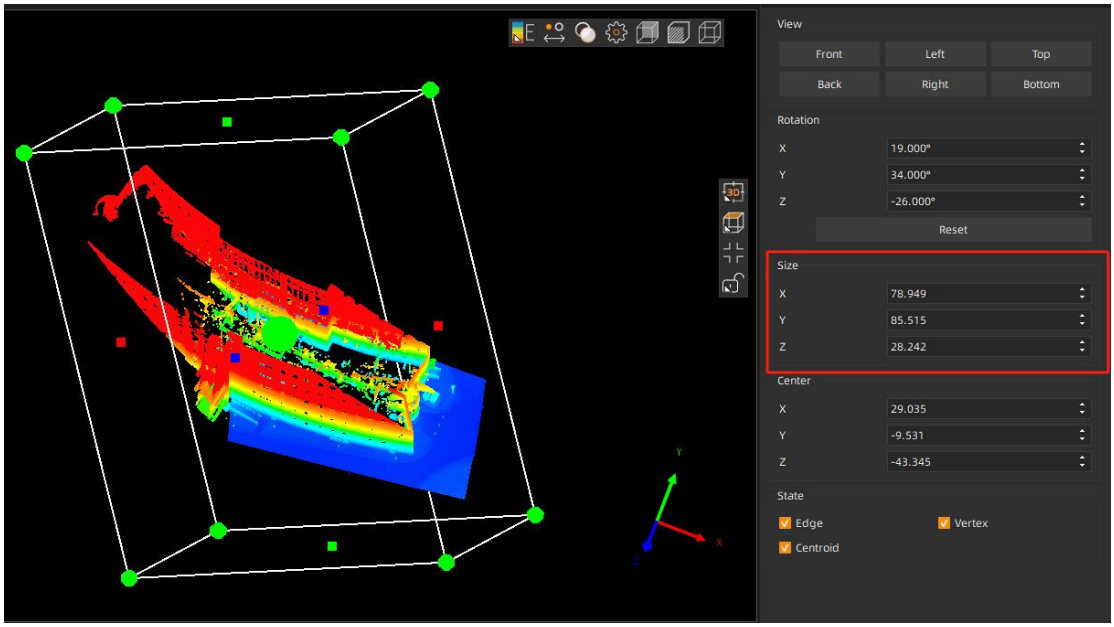


Figure: Effect of Modifying XYZ Dimensions

6. When the bounding box center point is dragged in the view, the center point XYZ coordinates in the Settings panel update in real time. Modifying t he center point XYZ coordinates translates the bounding box accordingly. T he point cloud position and size remain unchanged. The bounding box clip s the point cloud.

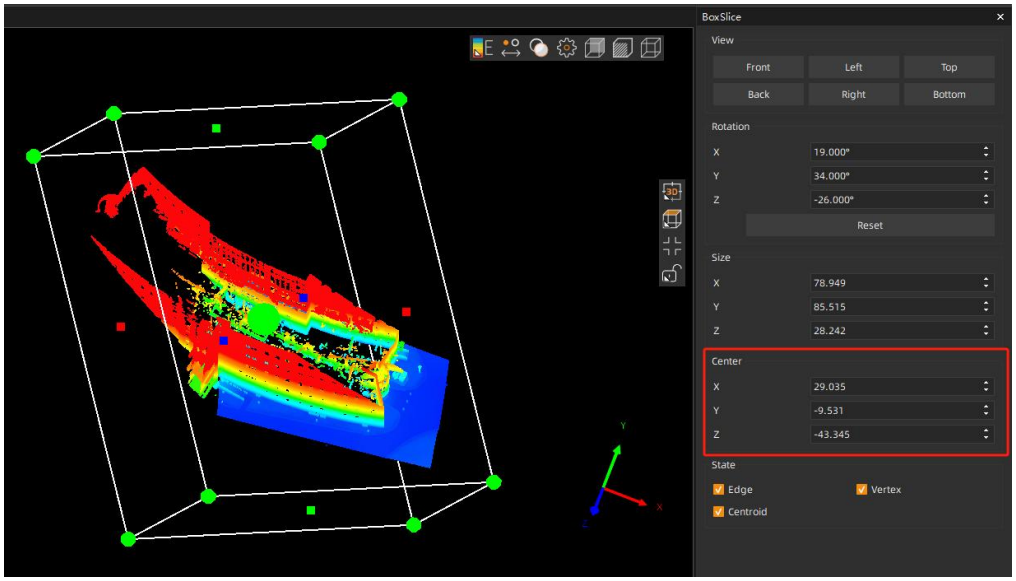


Figure: Effect of Modifying XYZ Coordinates of Center Point

7. Check "Show Frame" to display the bounding box frame in the view; unc heck to hide. Similarly for "Show Corners" and "Show Plane Grips".

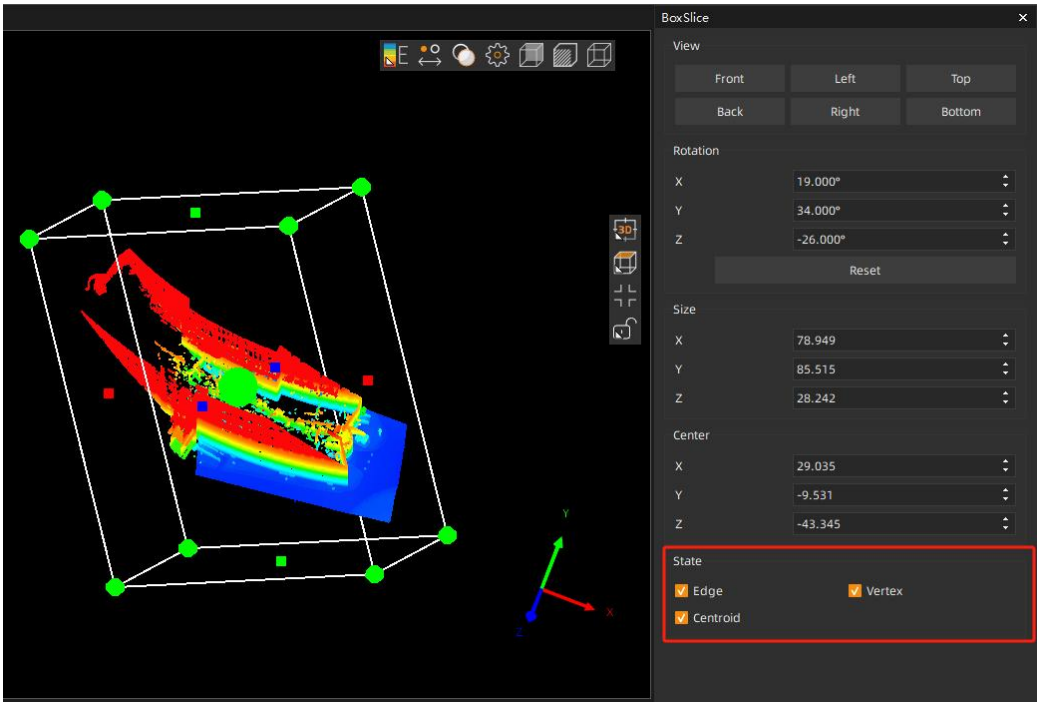


Figure: Effect of Hiding Frame, Vertex, Centroid

Note: The X-axis is red, the Y-axis is green, and the Z-axis is blue.

2.3.4.5 Switch

Function Description:

Toggles between normal view and slice view. Highlighted indicates slice vie w is displayed.

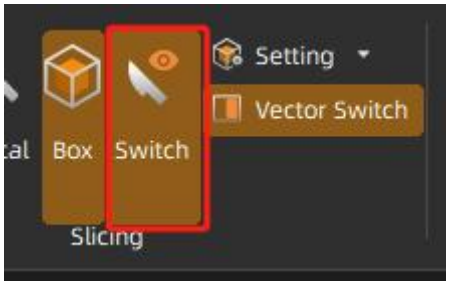


Figure: Switch Function Button

Operation Steps:

1. Load point cloud and vector data and perform slicing. After slicing, the b utton is highlighted.
2. Click Basic → Slice → Toggle to unhighlight the button and switch to nor mal view.
3. Click Basic → Slice → Toggle again to highlight the button and switch to slice view.

2.3.4.6 Vector Switch

Function Description:

Controls whether vector data is clipped during slicing. By default, the butto n is not highlighted, meaning vectors are not clipped.

Operation Steps:

1. Load point cloud and vector data.
2. Click Basic → Slice → Vector Switch to highlight the button.
3. Click Basic → Slice → Horizontal to enter horizontal slice. Left-click to select a point on the point cloud to create a new horizontal slice. Vector data will also be clipped.

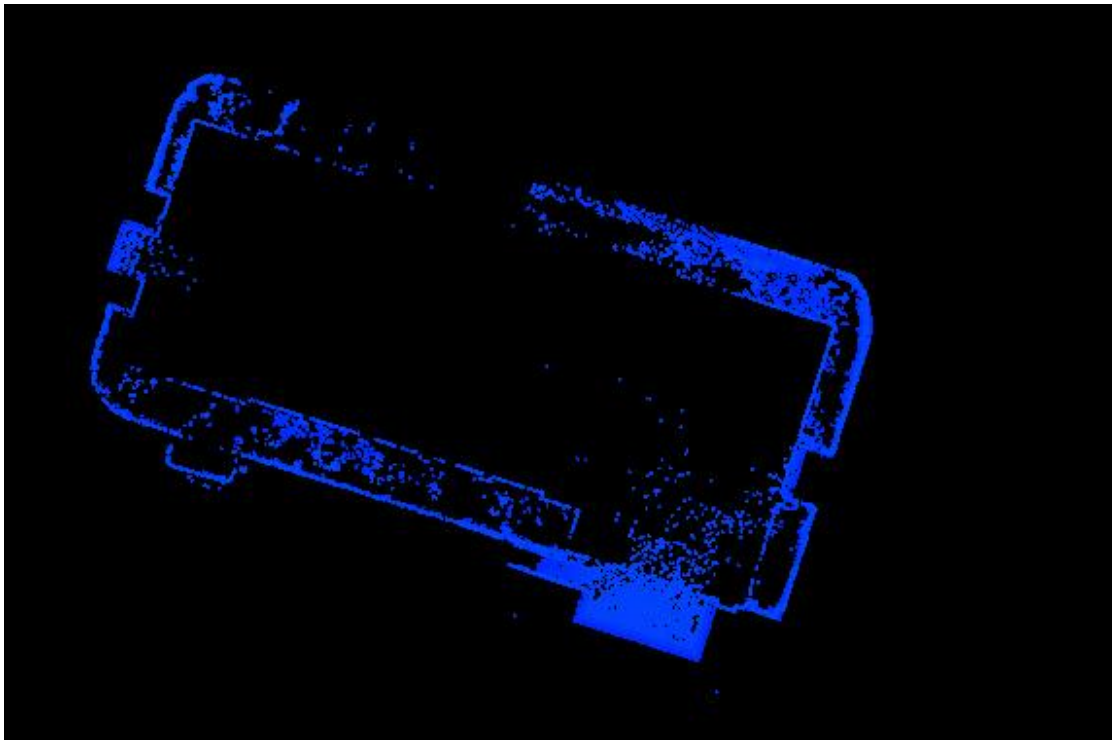


Figure: Horizontal Slice Without Clipping Vectors

4. Click Basic → Slice → Vector Switch to unhighlight the button.
5. Click Basic → Slice → Horizontal to enter horizontal slice. Left-click to select a point on the point cloud to create a new horizontal slice. Vector data will not be clipped. Same for vertical slice and bounding box slice.

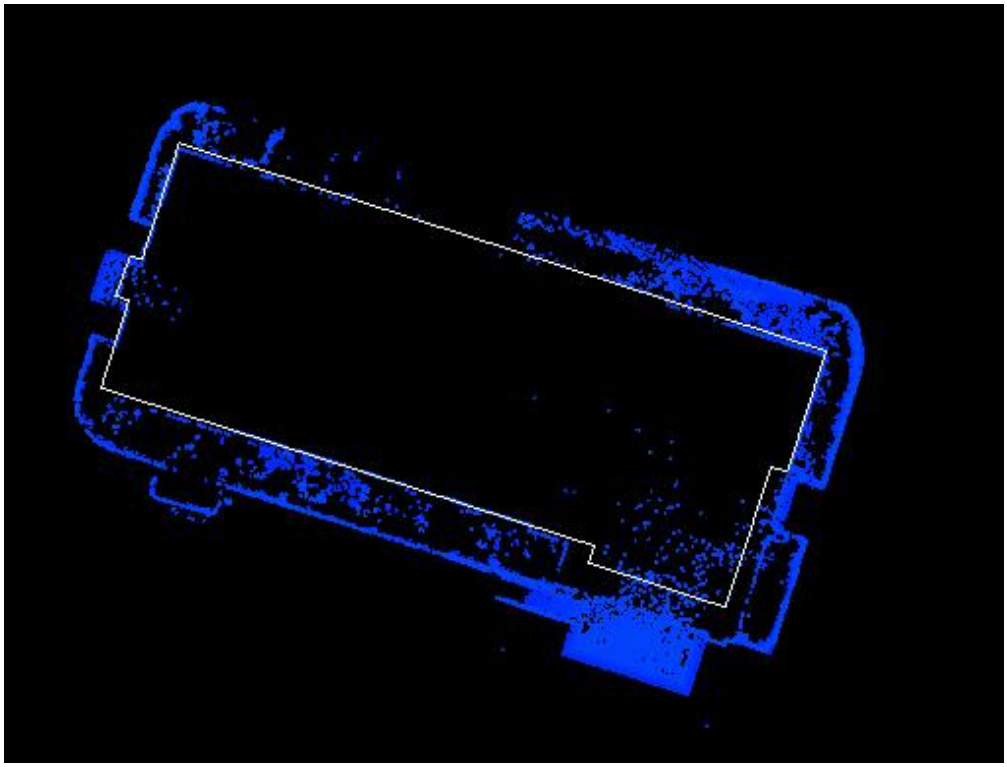


Figure: Horizontal Slice With Clipping Vectors

2.3.5 Save

Function Description:

Saves and exports the results of point cloud clipping or slicing.

Operation Steps:

1. Load point cloud data. Click to activate the "Rectangle/Polygon/Lasso/Select by Range Line" drawing function and draw a clipping area in the view.
2. Select "Inner Clip/Outer Clip" to obtain the clipping result.
3. Click Horizontal/Vertical/Bounding Box slice to perform slicing based on the clipping result, obtaining the slice result.
4. Click Basic → Save → Clip/Slice Save. The save interface appears. Select the original point cloud file(s) to clip/save, set parameters, and click OK.

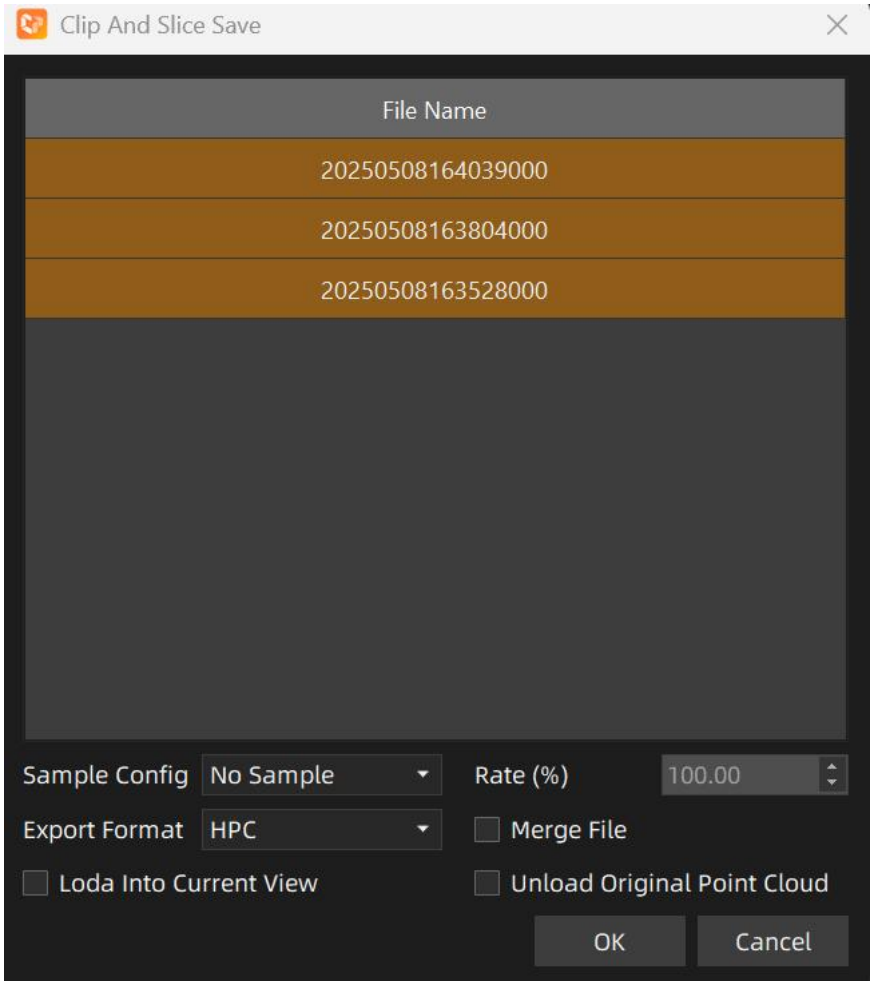


Figure: Save Clipped Slice

5. In the pop-up dialog box, choose a file save directory and enter a file name, then click Save. When there is only one original point cloud file, a folder selection dialog box appears. After selecting a folder, the clipped point cloud is saved directly to that folder with naming rule: timestamp_original_point_cloud_name.

Parameter Settings:

Sampling Setting: Random Sampling, Grid Sampling, No Sampling.

Sampling Rate (%): For random sampling. Default 10%, range 0.01-99.99%. The smaller the sampling rate, the fewer points retained.

Grid Cell Size (m): For grid sampling. Default 0.1m. Smaller grid size results

in slower thinning but more points retained; larger grid size results in faster thinning but fewer points retained.

Export Format: Supports saving the clipped point cloud as HPC, Las1.2, Las1.3, Las1.4, and E57.

Load to Current View:If checked, the saved point cloud will be automatically loaded into the current view.

Unload Original Point Cloud:If checked, the selected original point cloud file(s) will be automatically unloaded upon successful save.

Merge into a single file: If more than one point cloud is selected for clipping, checking this option merges the clipped results into a single point cloud file.

2.3.6 Inspection

2.3.6.1 Accuracy

Function Description:

For point clouds, it can perform automatic elevation matching, manual control point marking, matching point marking, planar matching, automatically calculate point cloud planar/elevation RMS errors, maximum deviation values, etc., generate statistical reports, and accurately locate error distribution.

Operation Steps:

1. Click Basic → Inspection → Accuracy to open the Accuracy Check interface.

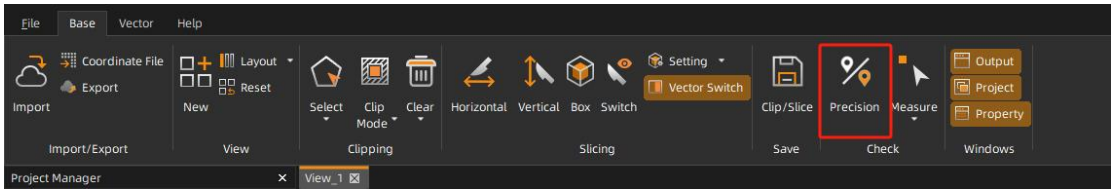


Figure: Precision

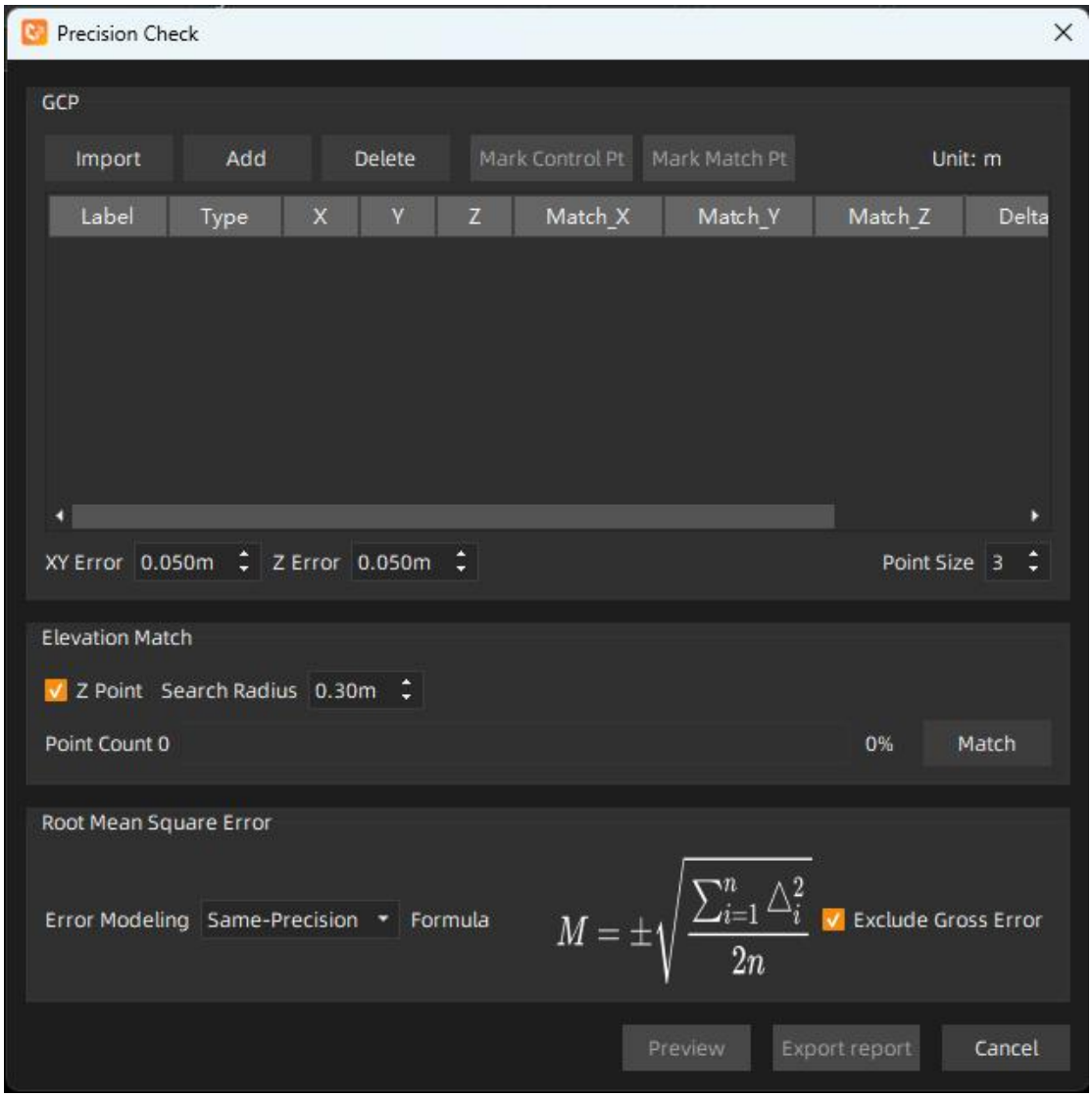


Figure: Precision Check Interface

2. Click "Import" and select a coordinate file (supports .dat, .txt, .csv). After opening, adjust data columns in the Import Coordinate File interface to ens ure X and Y columns have data, then click OK to import the coordinate dat a.

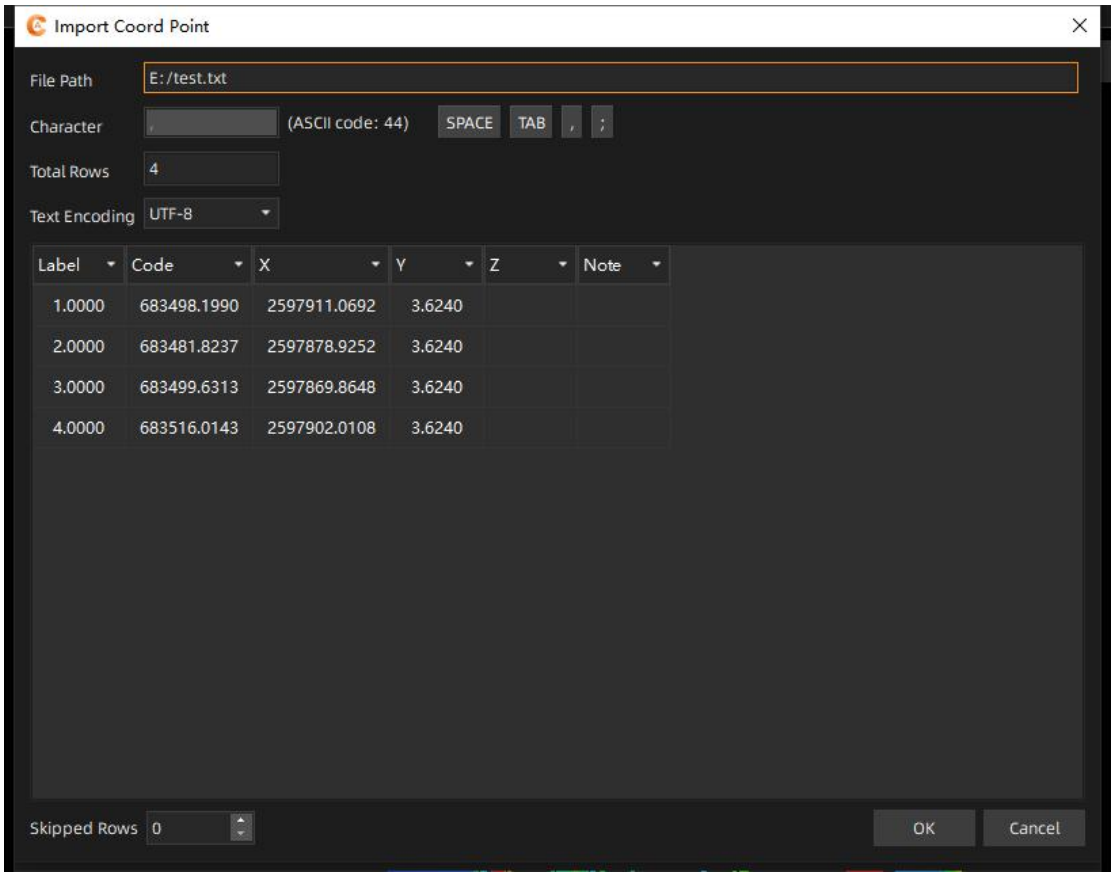


Figure: Precision Coordinate Import

3. Click the "Add" button in the Accuracy Check interface to add an empty row to the accuracy check list. Double-click to manually enter known points.

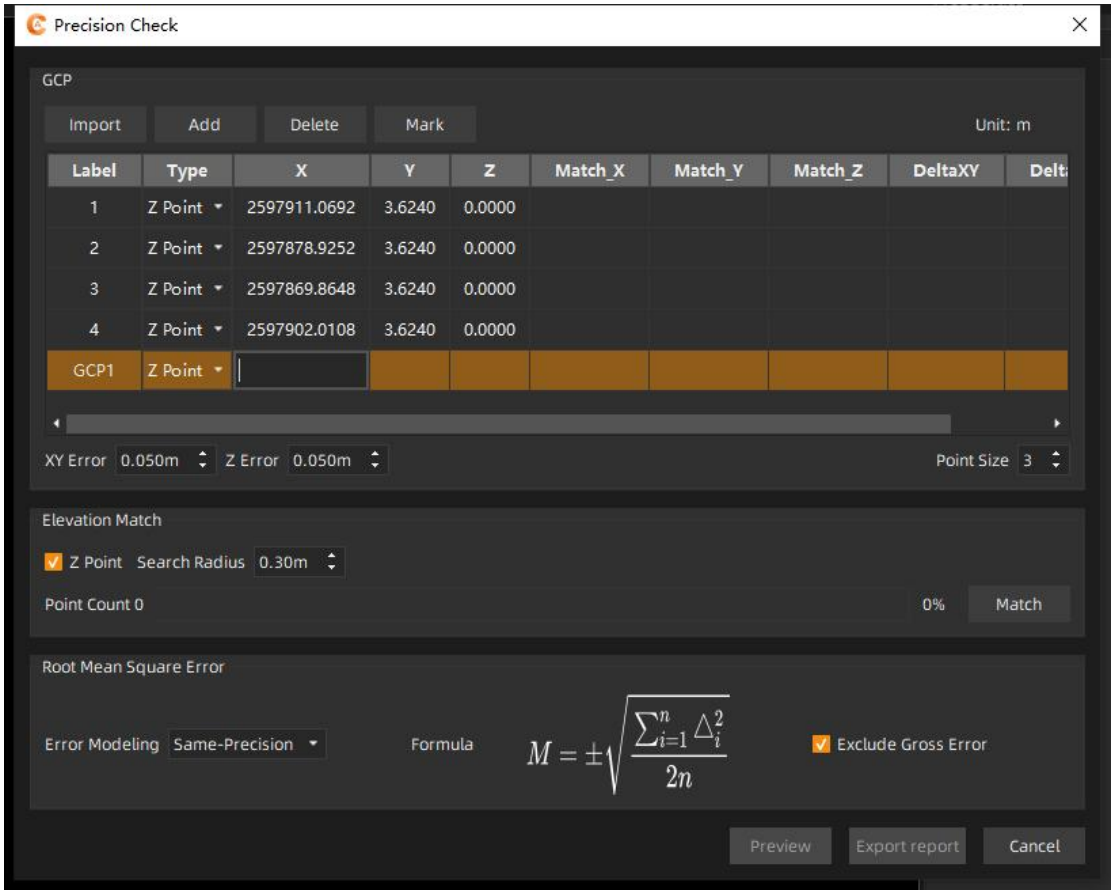


Figure: Manually Enter Known Points

4. After data import or manual entry, positioning tags appear in the view. In the coordinate data list, double-click to modify point name, type, X, Y, Z, Match_X, Match_Y, Match_Z values.

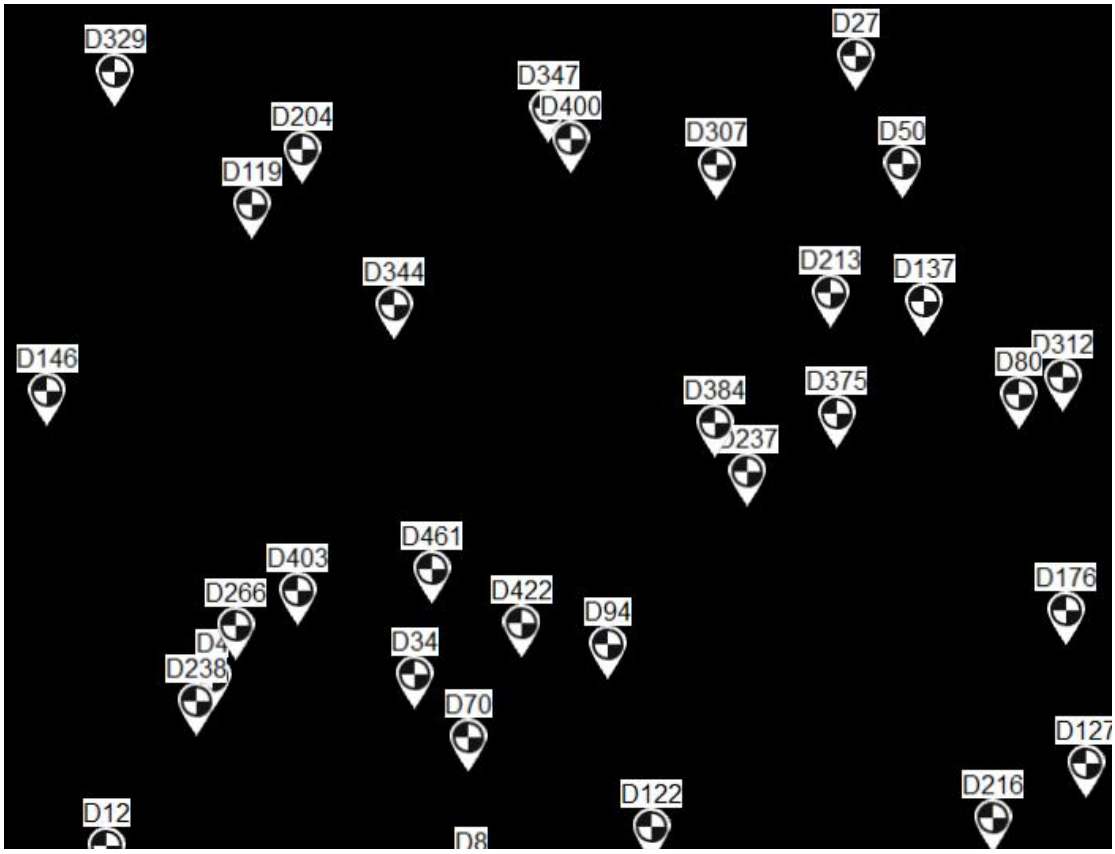


Figure: Label

5. Point types:

Elevation Point (only elevation accuracy check), Planar Point (only planar acc uracy check),

Planar & Elevation Point (both).



Figure: Point Types

6. Set error limits via "Planar RMS Limit" and "Elevation RMS Limit" input b oxes.

7. In the automatic matching section, check the Elevation Point option, set the neighborhood radius, and click Match. Matching results show DeltaZ val ues. Colors indicate within limit (no background), outside limit but within d

ouble limit (orange background), beyond double limit (red background).

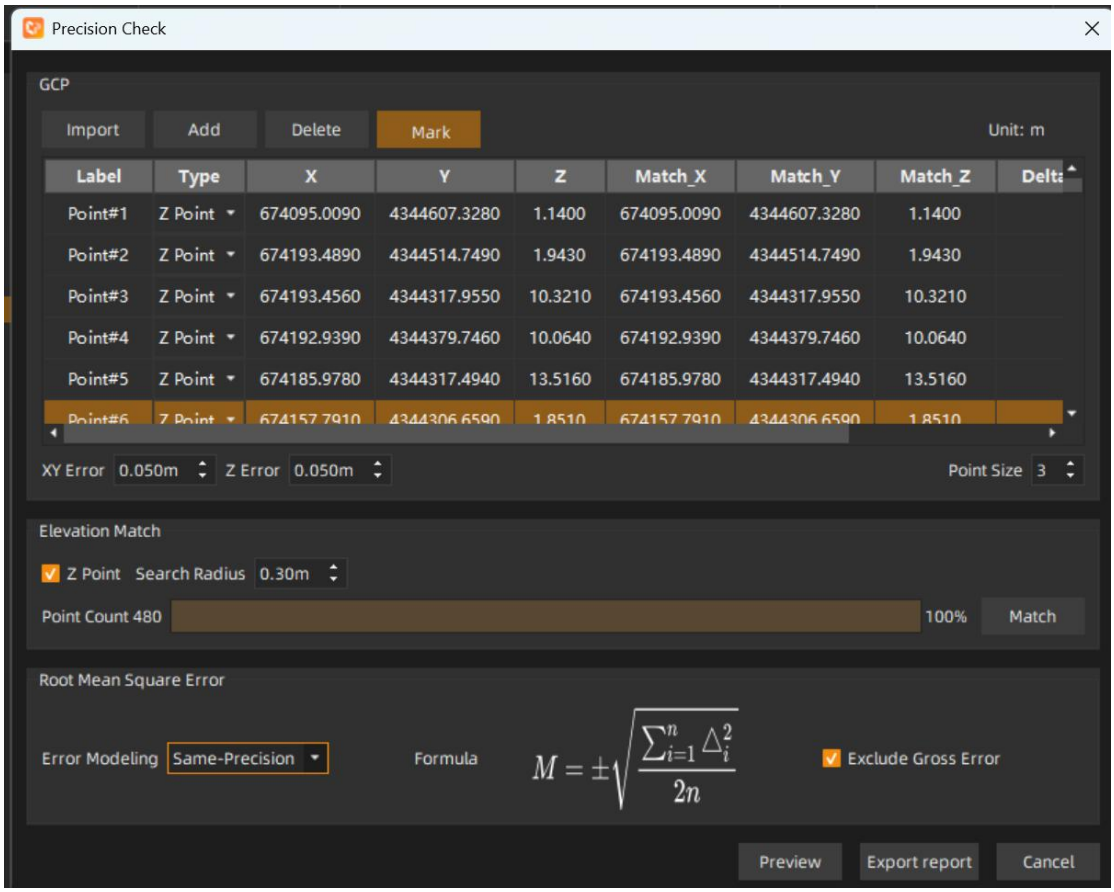


Figure: Within Limit

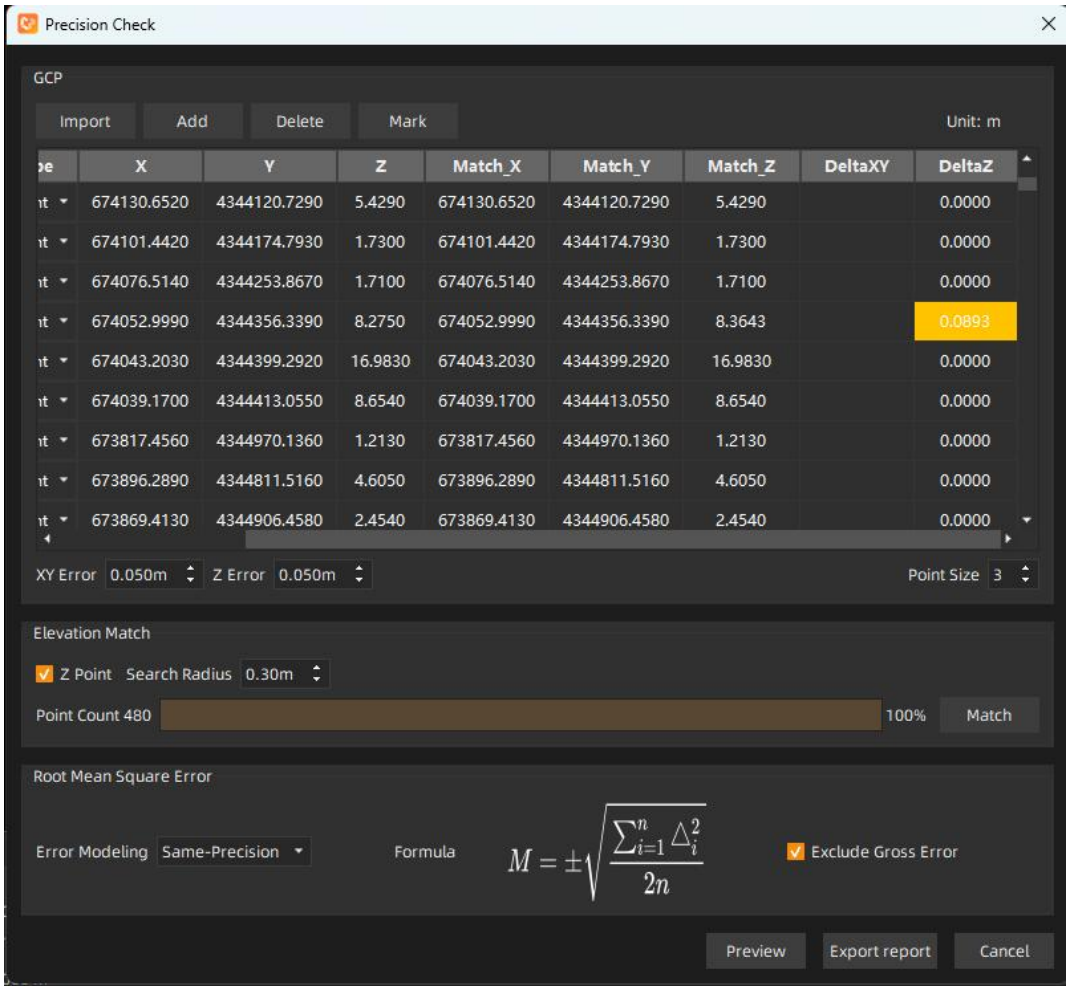


Figure: Outside Limit, Within Twice the Limit

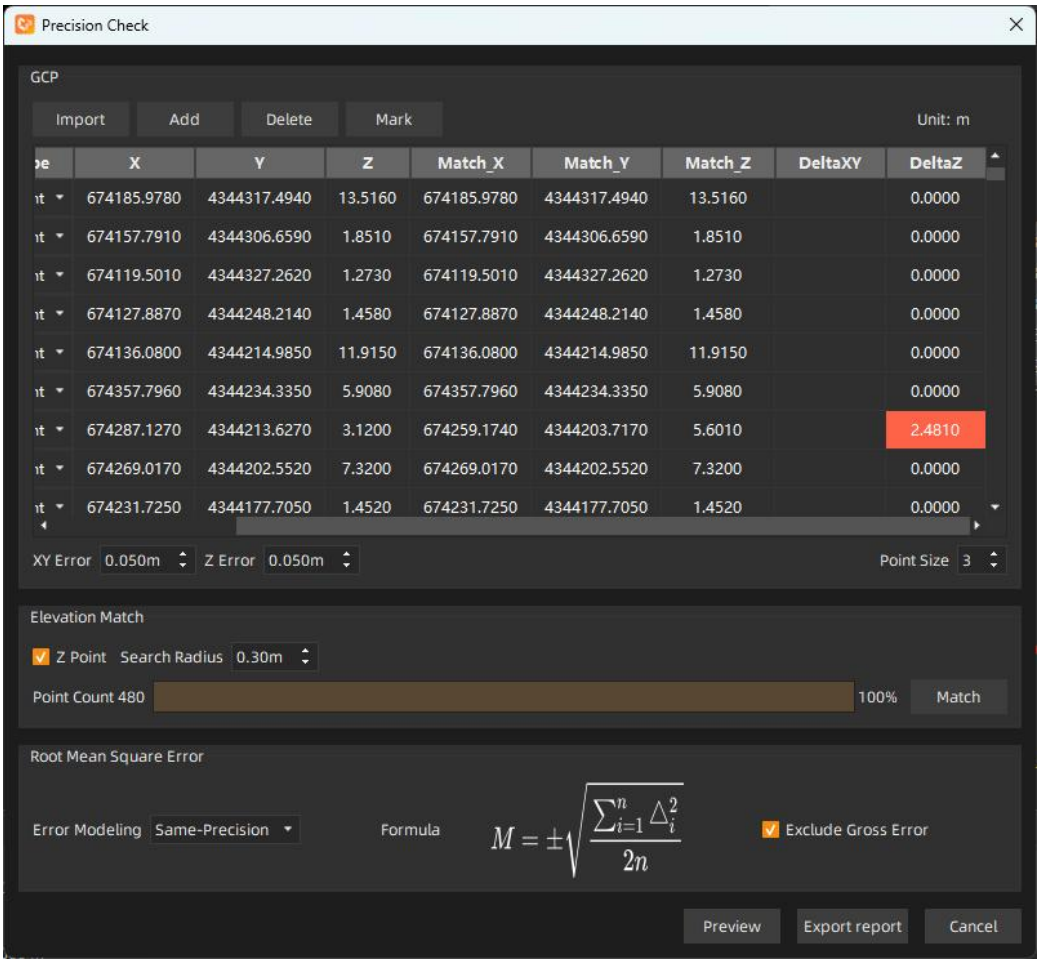


Figure: Outside Twice the Limit

8. In the RMS section, you can modify the calculation method and choose whether to eliminate gross errors. Calculation methods: Same Precision Det ection, Higher Precision Detection, Arithmetic Mean Detection.

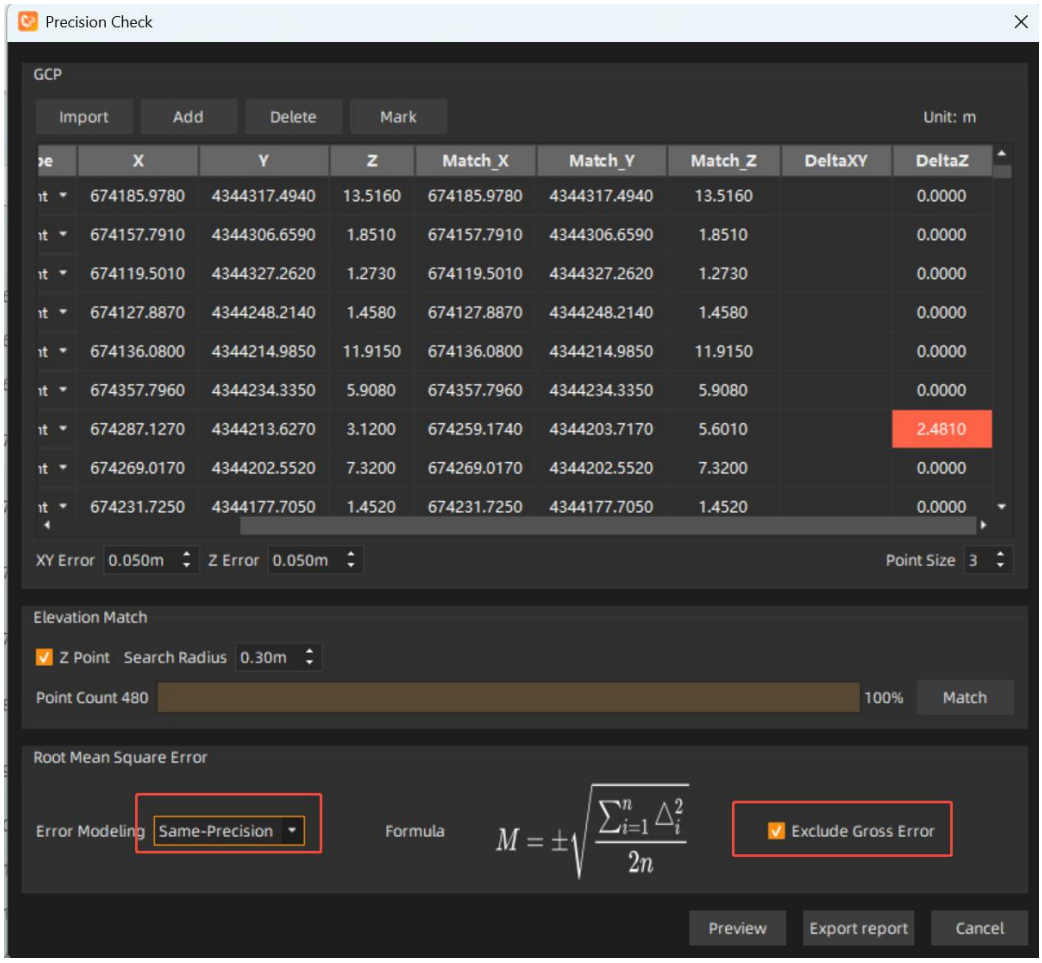


Figure: RMSE

9. After accuracy check, you can preview or export a PDF accuracy report.

10. Select any data row to use the "Mark Control Point" function. The picke d X, Y, Z values will be filled into the current row's X, Y, Z.

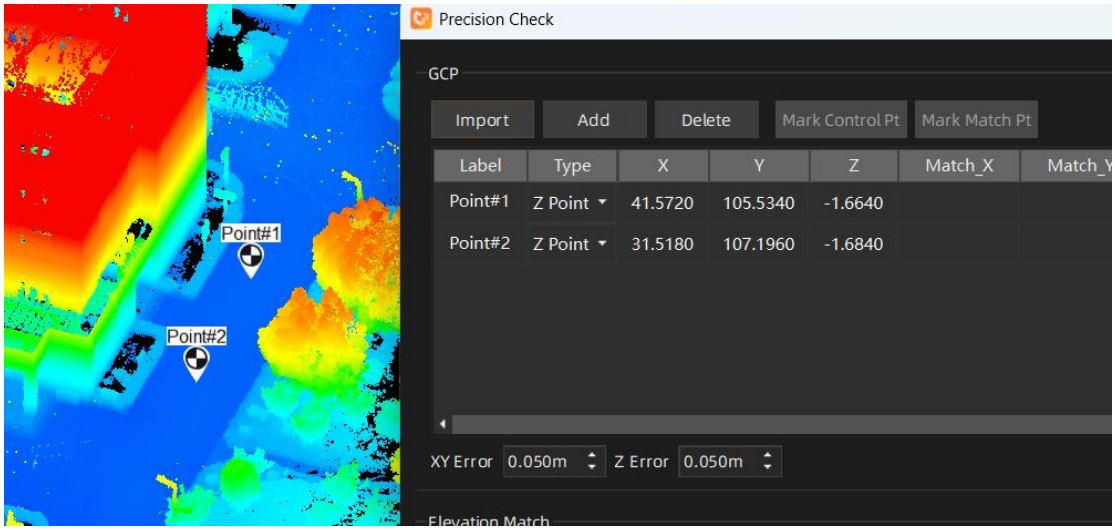


Figure:preview

11. Select any data row to use the "Mark Matching Point" function. The picked Match_X, Match_Y, Match_Z values will be filled into the current row's Match_X, Match_Y, Match_Z.

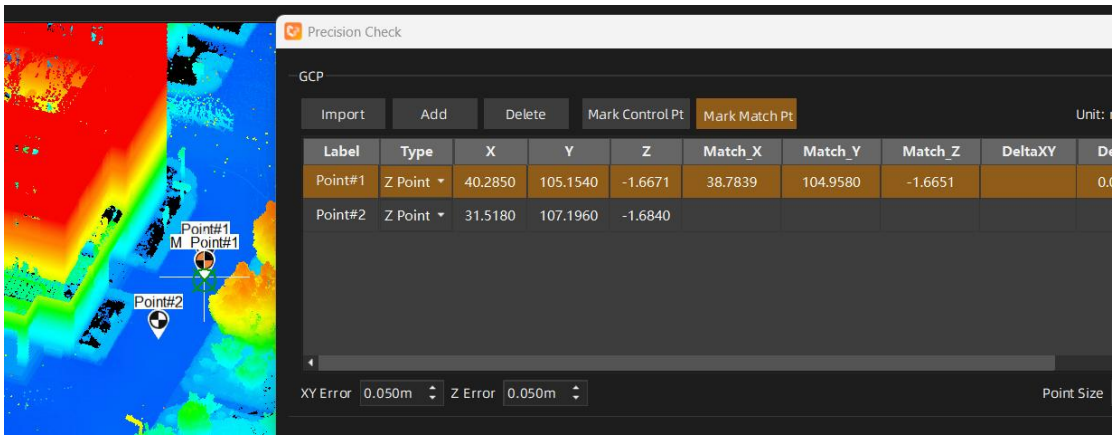


Figure:preview

2.3.6.2 Measurement

This section introduces measurement functions: Point, Length, Area, Angle, and Density.

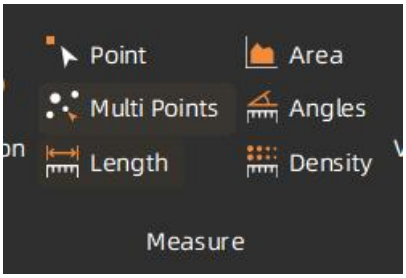


Figure:Measurement

2.3.6.2.1 Point

Function Description:

Left-click to select a point on the point cloud in the view window to query its coordinates, intensity, time, class, etc. If no point cloud is snapped, displays the coordinates of the clicked location.

Operation Steps:

1. Click Basic → Measurement → Point to enter point measurement mode.
2. Left-click on a point cloud point in the view window. An info box displays XYZ coordinates, intensity, time, class, RGB color, etc., and also outputs to the output window.

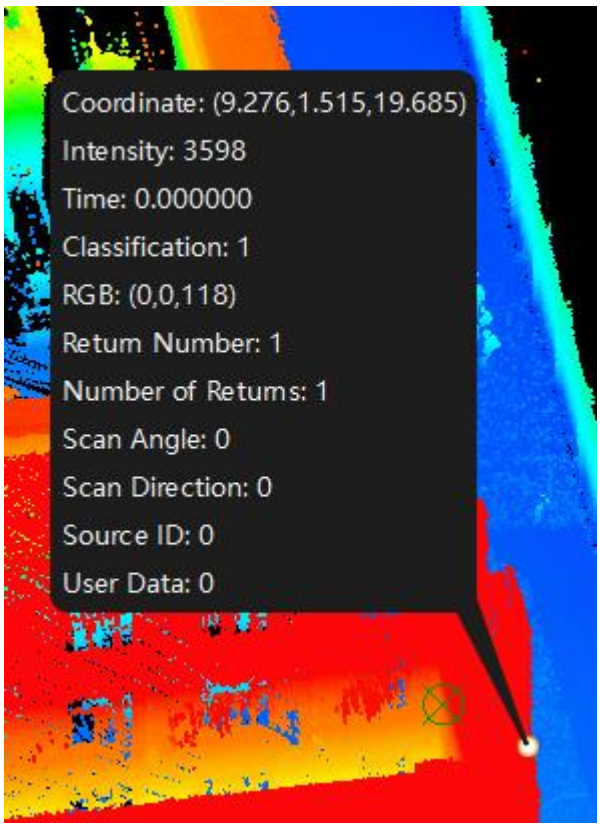


Figure: Point Measurement

3. Left-click on a blank area or loaded vector, DEM, imagery, OSGB model. If no point cloud is snapped, only the coordinates of the clicked location are displayed.

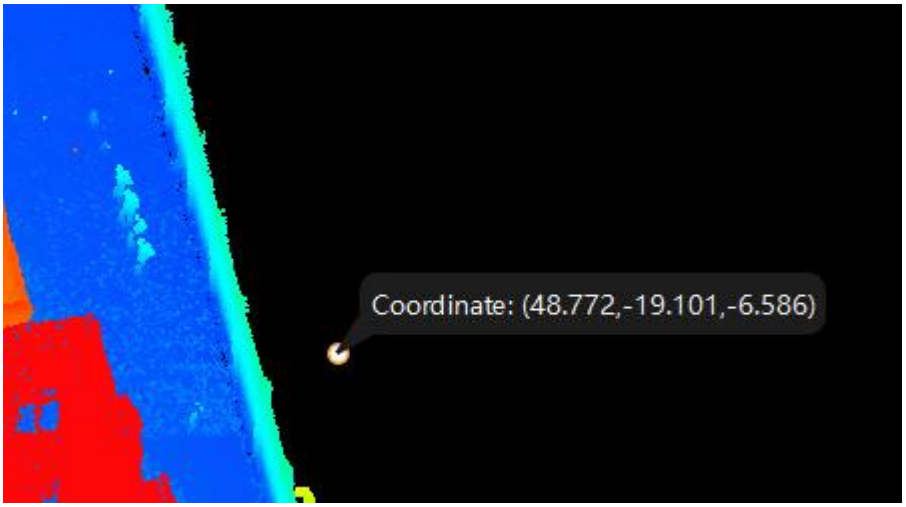


Figure: Point Measurement

Note:

When the point cloud is sparse, it may be difficult to select a point. In this case, you can zoom in on the point cloud before selecting a point for query.

2.3.6.2.2 Length

Function Description:

The length measurement tool uses mouse clicks to query the 2D and 3D distances between two points.

Operation Steps:

1. Click Basic → Measurement → Length to enter length measurement mode.
2. Left-click sequentially to select multiple points in the view window. A solid line appears between two points indicating the 2D distance. Two dashed lines (horizontal and vertical) in the vertical plane of the line indicate the horizontal distance and height difference.

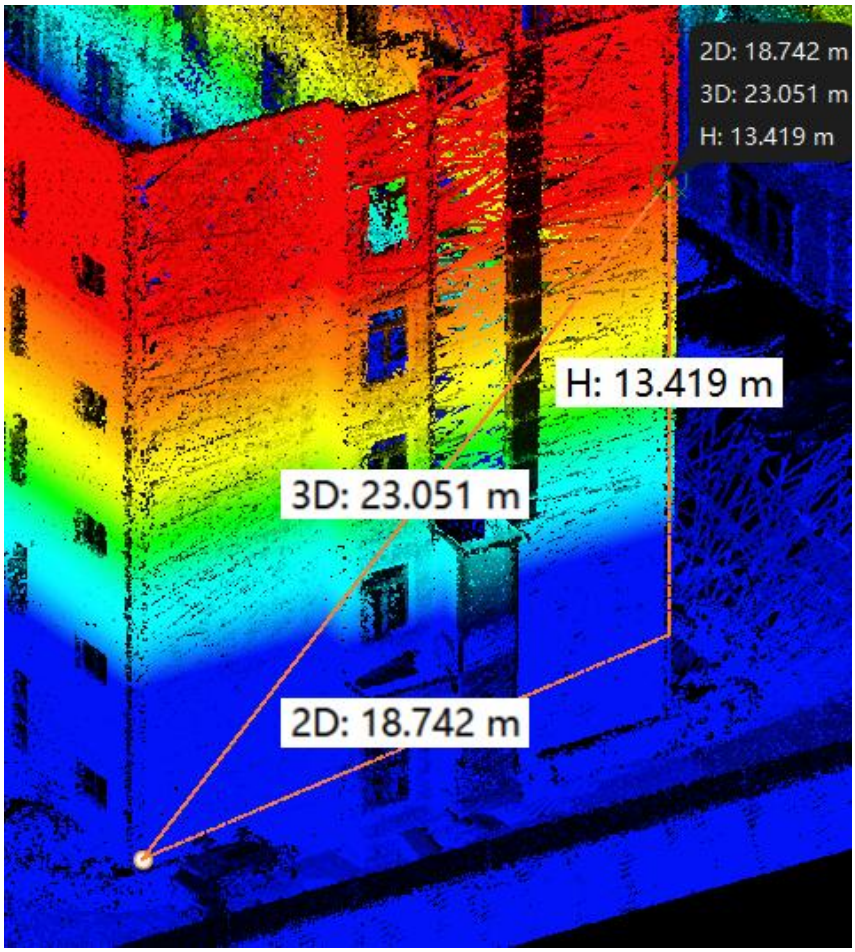


Figure: Length Measurement

2.3.6.2.3 Area

Function Description:

The area measurement function calculates the projected area within a drawn polygon.

Operation Steps:

1. Click Basic → Measurement → Area to enter area measurement mode.
2. Left-click to select the corners of the polygon. The projected area within the enclosed area is displayed in real time. Double-click or right-click to confirm, and an area label appears.



Figure: Area Measurement

Note:

Area measurement requires selecting at least three points to calculate the area

2.3.6.2.4 Angle

Function Description:

The angle measurement function calculates the angle of a polyline by selec ting three points.

Operation Steps:

1. Click Basic → Measurement → Angle to enter angle measurement mode.
2. Left-click to select three points to draw a polyline, and the angle of the polyline is displayed.



Figure: Angle Measurement

Note:

Angle measurement requires selecting at least three points to calculate the angle of the intersection in the selected region.

2.3.6.2.5 Density

Function Description:

Calculates point density by determining the average number of points per s quare meter. Point density is an important indicator of point cloud data qu ality.

Operation Steps:

1. Click Basic → Measurement → Density to enter point density measureme nt command.
2. By default, calculates and displays point density per square meter. You c an also enter a square side length, left-click a point to calculate density wit hin that range.
3. Click the close button in the upper right corner of the point density to

end and exit the point density measurement command.

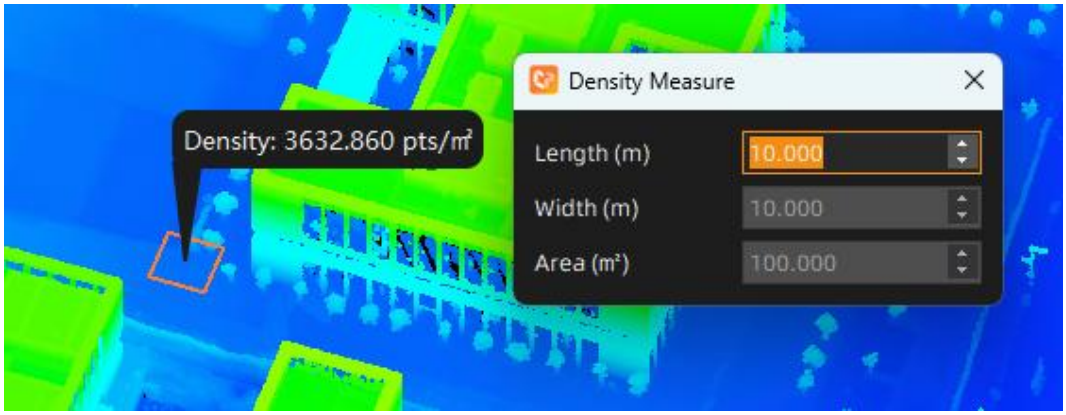


Figure: Density Measuremen

2.3.6.2.6 Multi-Point Selection

Function Description:

Obtains information for multiple points and exports it as a text file.

Operation Steps:

1. Click Basic → Measurement → Multi-Point Selection to enter the comman d.
2. Default is point selection mode. Click anywhere in the view to generate a label and add the point's coordinates to the list with a default name.
3. Right-click to change selection mode to "Two-line Intersection" or "Three-point Circle Center".
4. After selecting points, click Export, set file name and save path. File can be saved as *.csv, *.txt, *.dat, *.xyz, *.asc.

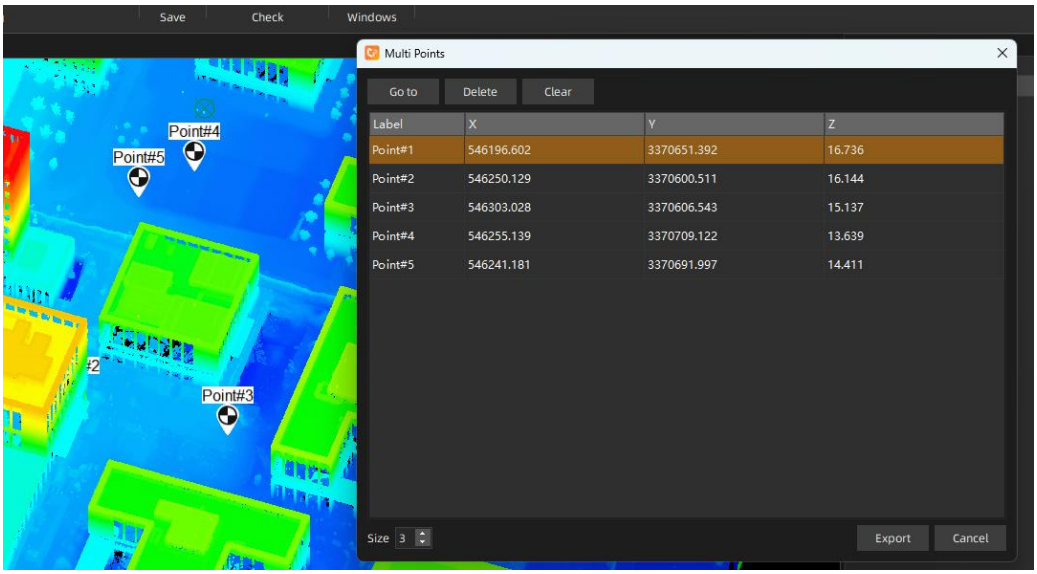


Figure: Multi Points

2.3.6.2.7 Profile Analysis

Function Description:

Selects points to generate a vertical profile.

Operation Steps:

1. Load point cloud file.
2. Click Basic → Profile Analysis to open the profile view.

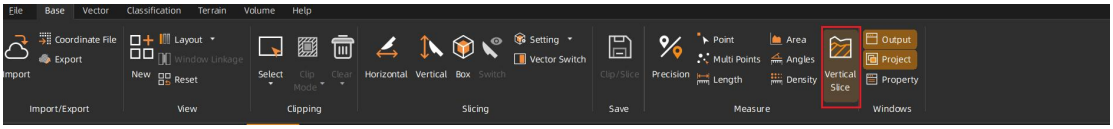


Figure: Profile Analysis Button Location

3. In the 3D view, click three points to draw a rectangle as the data range for profile analysis.

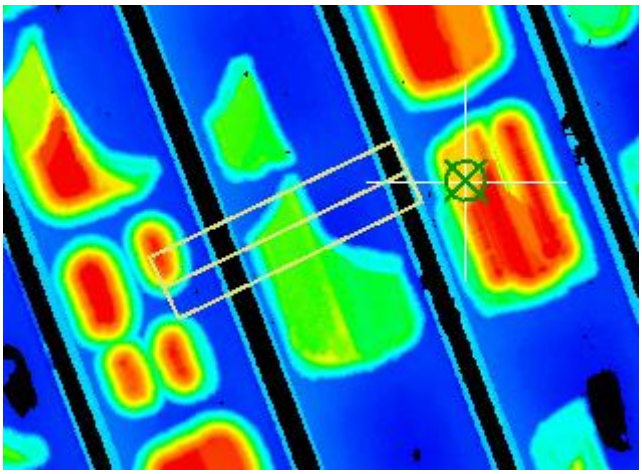


Figure: Draw the profile analysis range

4. After drawing the profile range, the point cloud data within the profile a ppears in the profile view.

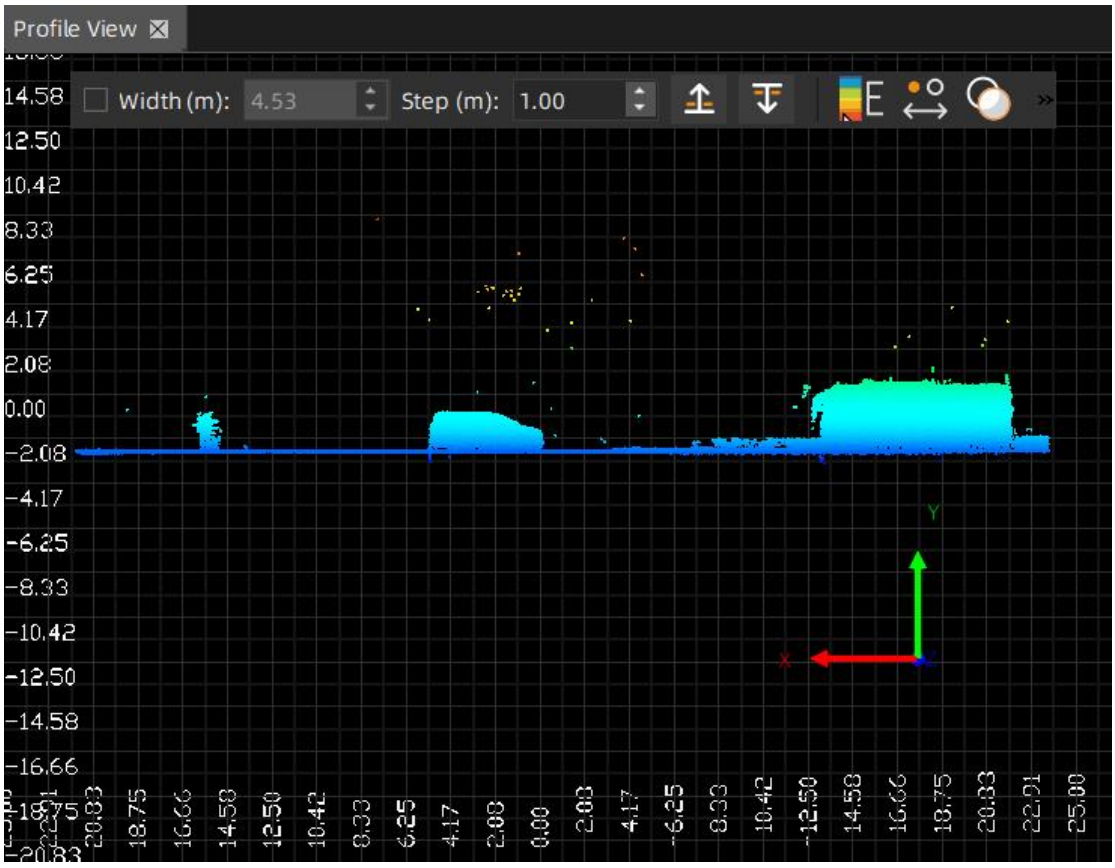


Figure: Profile View

5. In the profile view, you can perform point, area, length, angle, and densi ty measurements.

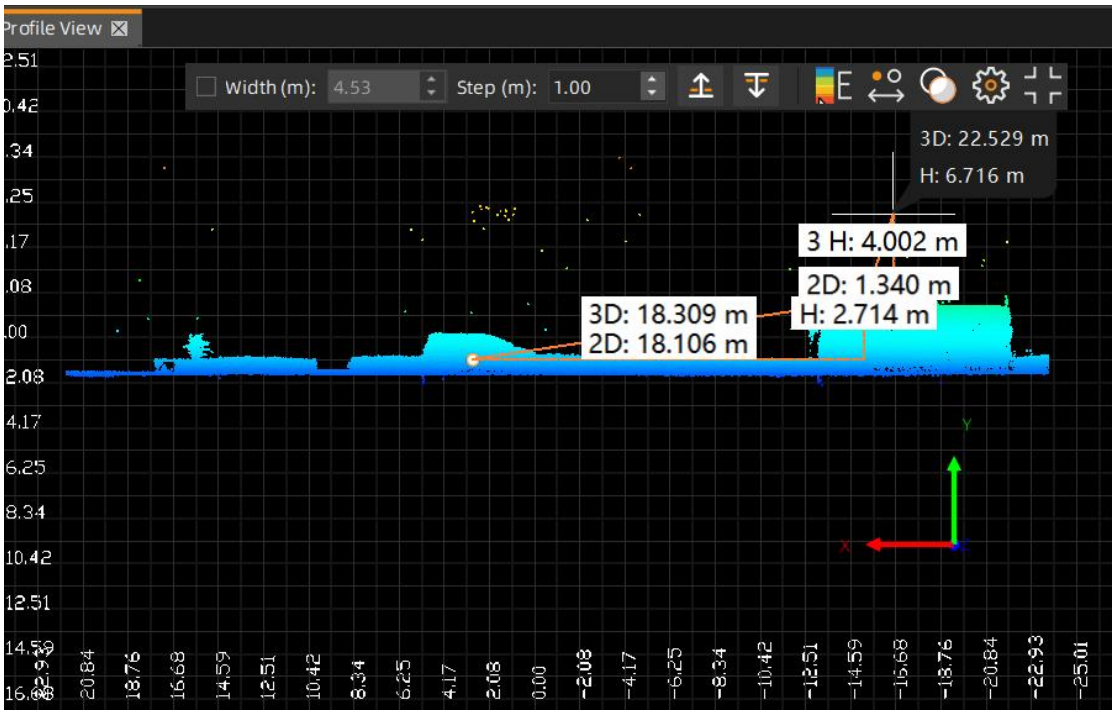


Figure: Profile Length Measurement

6. While the profile view exists, you can click in the 3D view to draw a new profile range at any time.

7. In the toolbar at the top of the profile view, the first control allows checking "Width". When checked, subsequent drawn vector ranges will have the set width.



Figure: Profile Width

8. The step size parameter controls the movement length for the Up/Down move functions.

9. The Up/Down move functions move the profile range in the specified direction by the step size each time.

2.3.7 Window

This section mainly introduces window display. Users can freely choose to show or hide certain windows.



Figure: Window Display

2.3.7.1 Output Window

Function Description:

Prompts key operation steps during processing and displays processing results. Click Basic → Output Window to show or hide the output window.

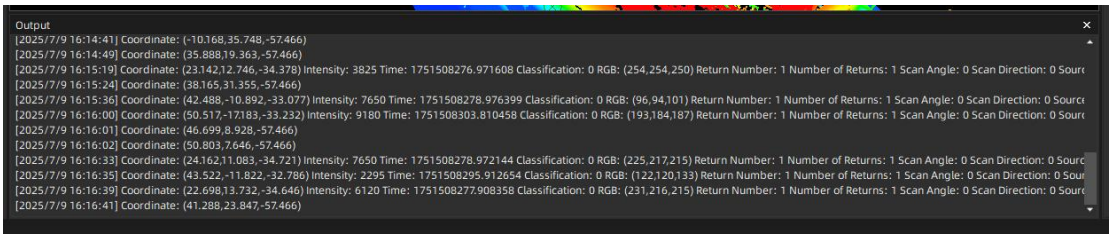


Figure: Output Window

Operation Steps:

1. The output window is highlighted by default.
2. Click Basic → Output Window to unhighlight and hide the output window. Click again to highlight and show the output window.

2.3.7.1.1 Single/Multiple Selection

Function Description:

Selects information in the output window, highlighting it.

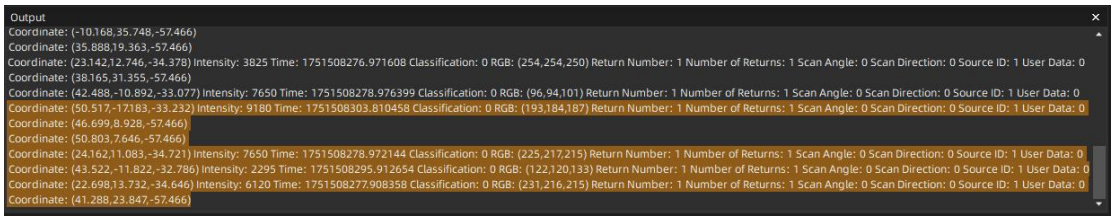


Figure: Selecting Information in Output Window

Operation Steps:

1. Left-click in the output window to select a row of information; the selected row is highlighted.
2. Left-click and drag up or down to select multiple rows; selected rows are highlighted.
3. Left-click a row, then hold Shift and select another row to select a range; selected rows are highlighted.

2.3.7.1.2 Copy

Function Description:

Copies selected information in the output window to the clipboard.

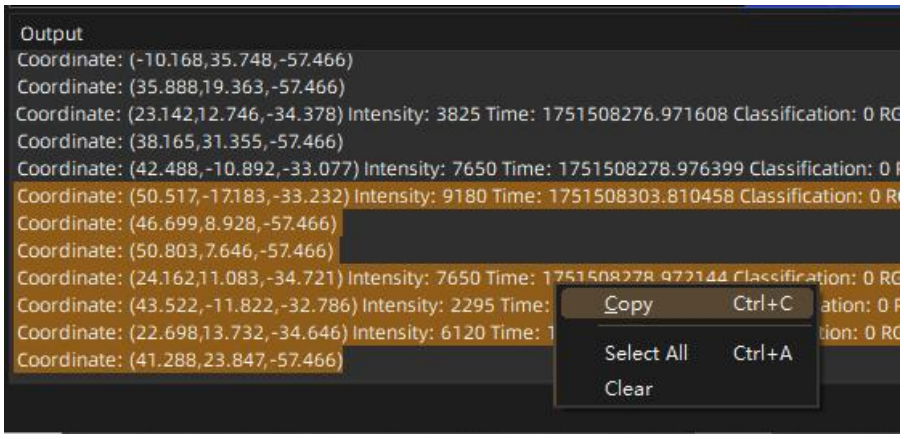


Figure: Copying Information in Output Window

Operation Steps:

1. After selecting information in the output window, right-click and choose "Copy", or use Ctrl+C.

2.3.7.1.3 Select All

Function Description:

Selects all information in the output window, highlighting it.

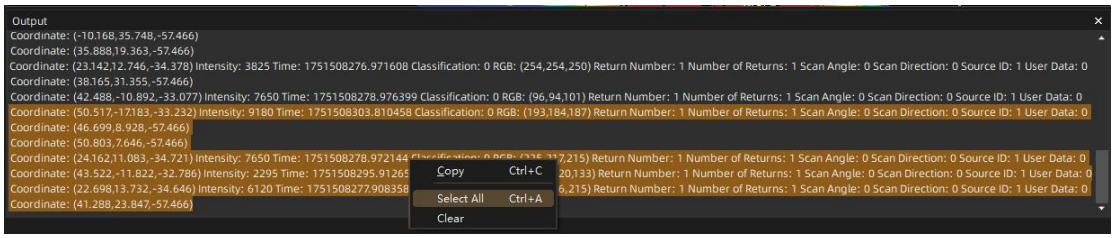


Figure: Selecting All Information in Output Window

Operation Steps:

1. Right-click in the output window and choose "Select All", or use Ctrl+A. A ll information is highlighted.

2.3.7.1.4 Clear

Function Description:

Clears all information in the output window.

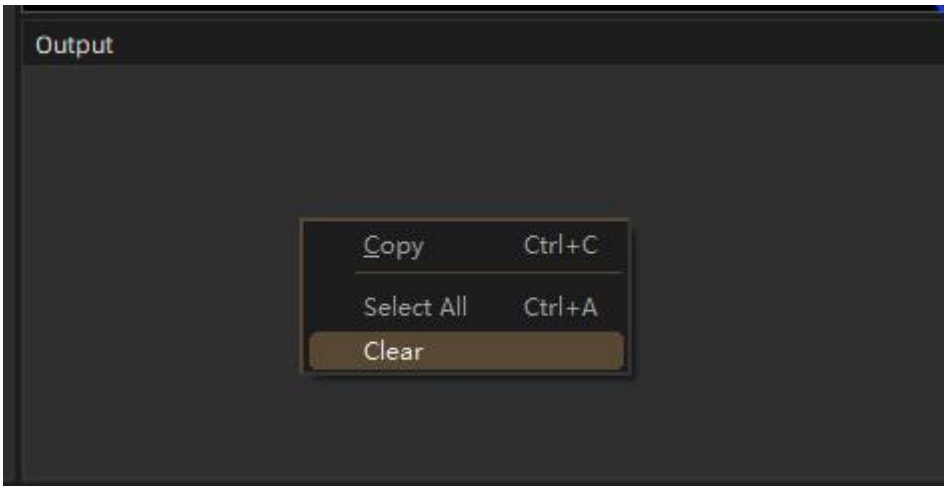


Figure: Clearing Information in Output Window

Operation Steps:

1. Right-click in the output window and choose "Clear". All information is cl eared.

2.3.7.2 Project Manager

Function Description:

Click Basic → Project Manager to show or hide the Project Manager panel.

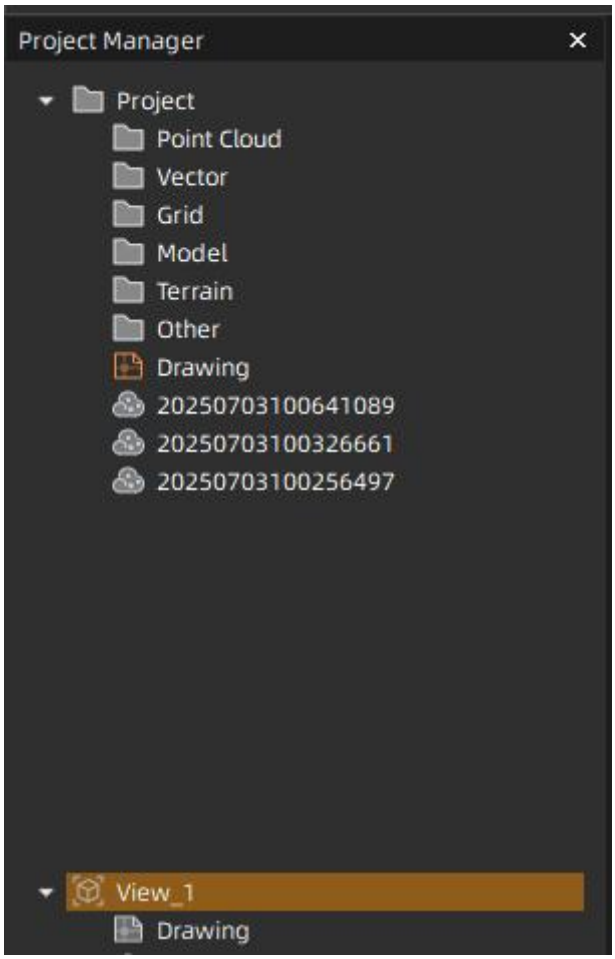


Figure: Project Management

Operation Steps:

1. Project Manager is highlighted by default.
2. Click Basic → Project Manager to unhighlight and hide the Project Manag

er panel. Click again to highlight and show the Project Manager panel.

2.3.7.2.1 Data Management Panel

Function Description:

The Data Management panel is used to manage vector, point cloud, DEM, i magery, and OSGB data.

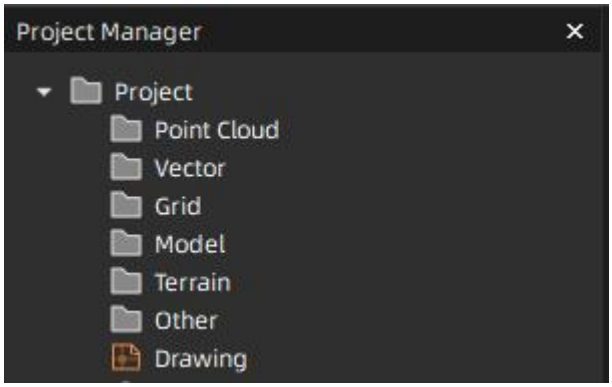


Figure: Data Management Panel

2.3.7.2.1.1 Open Vector

Function Description:

Loads vectors in dxf, dwg format.

Operation Steps:

1. Right-click on the Vector node under Project, select "Open Vector".

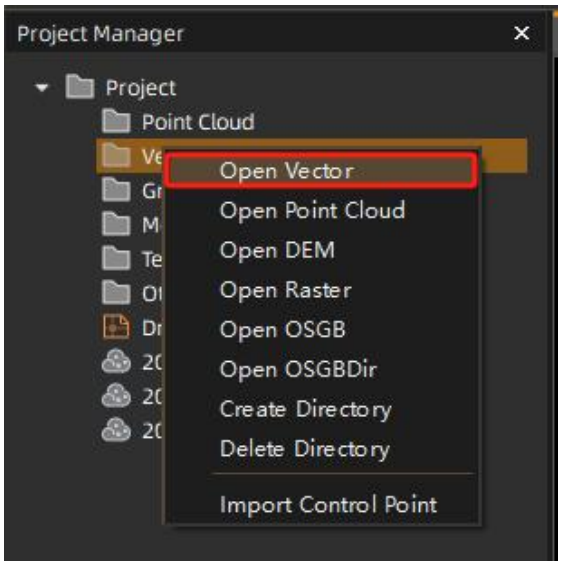


Figure: Right-Click to Open Vector in Folder

2. A vector data selection dialog box will pop up. Select the path of the vector data in dxf or dwg format, click "Open" to load the vector data into the view. Meanwhile, the vector data is mounted under the vector folder node, and it is in an inactive state by default (the icon on the left of the vector data is not highlighted).

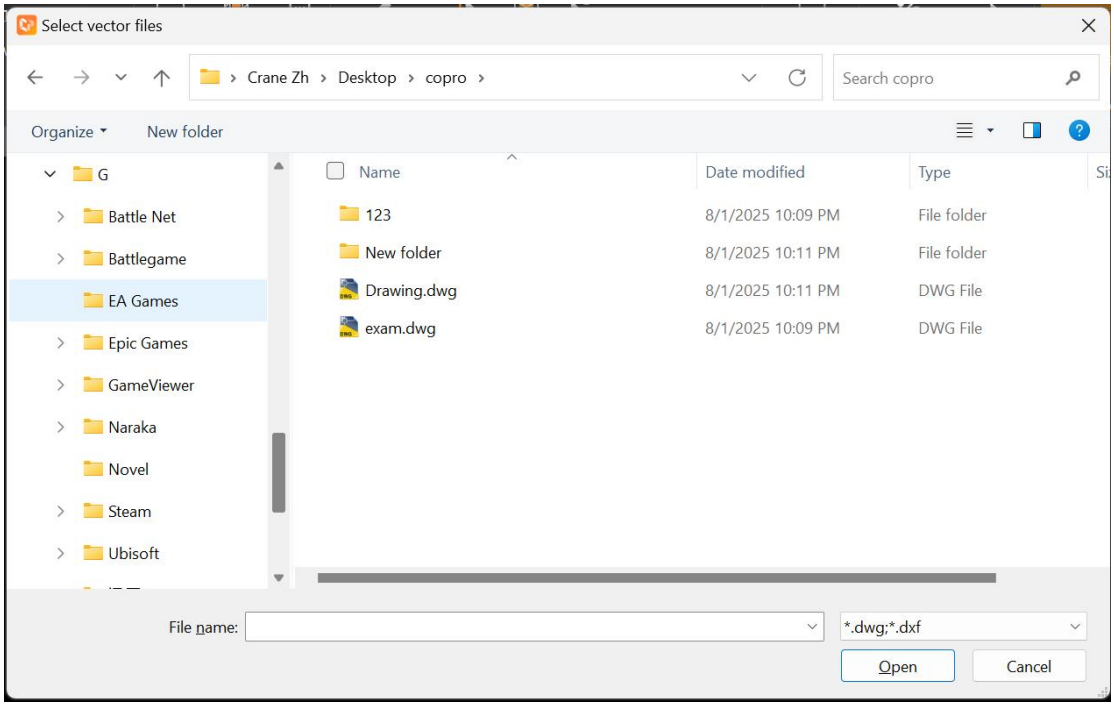


Figure: Vector Selection Dialog Box

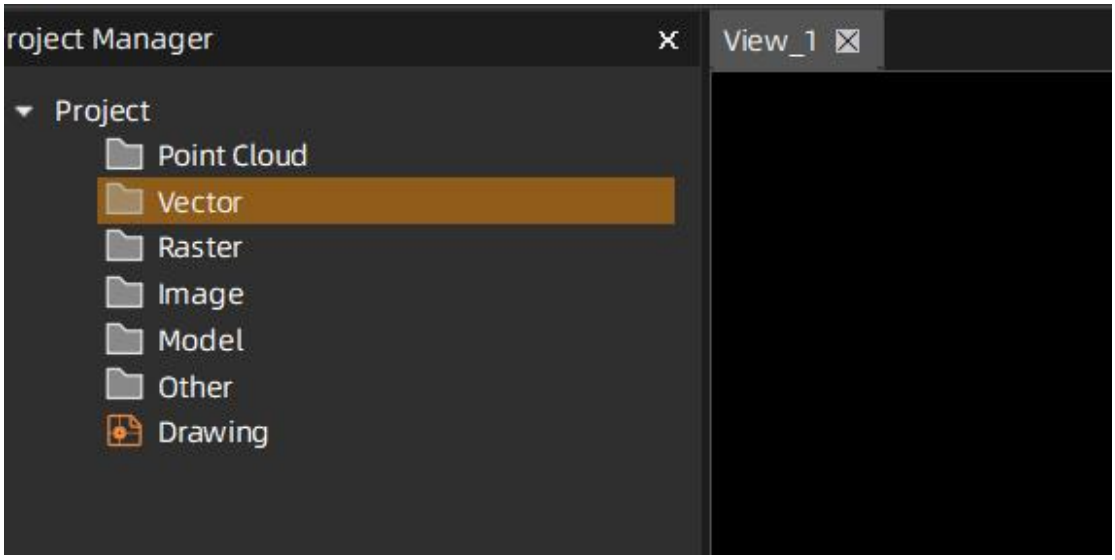


Figure: Load Vector Data

2.3.7.2.1.2 Open Point Cloud

Function Description:

Loads point clouds in las, laz, hpc, codata, e57, ptx, asc, txt, csv, dat, xyz formats.

Operation Steps:

1. Right-click on the Point Cloud node under Project, select "Open Point Cloud".

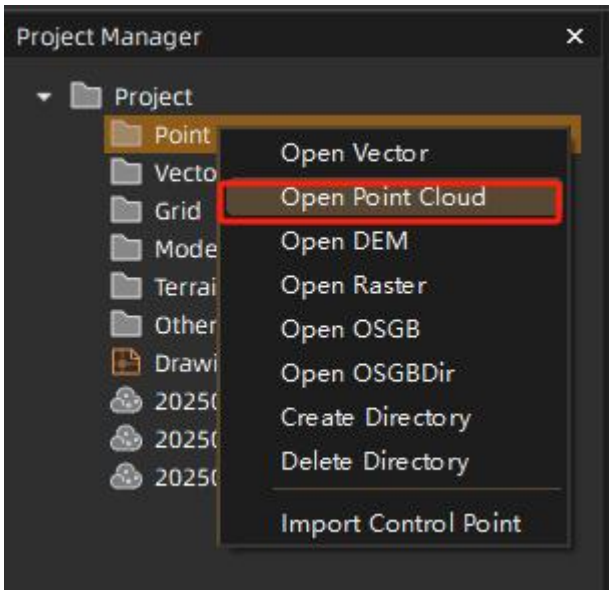


Figure: Project Management to Open Point Cloud

2. Select point cloud data in las, codata, laz, hpc, e57, ptx format. The point cloud is loaded into the view and attached under the Point Cloud node.

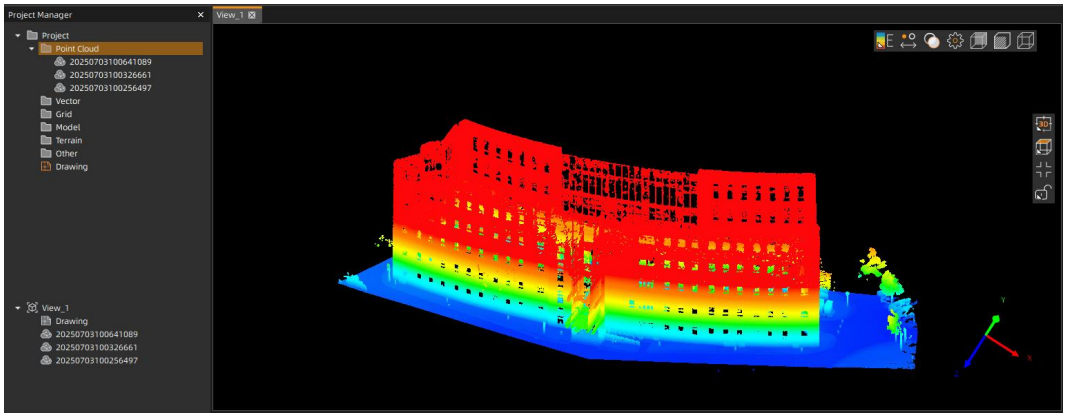


Figure: Loading Point Cloud Data

3. After selecting point clouds in asc, txt, csv, dat, and xyz formats, the software will display a point cloud number conversion interface. In the point cloud format conversion interface, you can modify the header to set the corresponding attributes for each column, or skip the header content directly by skipping the number of rows. Click on the application to apply the current settings to the currently opened point cloud file, and then perform point cloud conversion and loading; If you click 'Apply All', the current settings

will be applied to the selected text format point cloud file, and all of them will be converted and loaded.



Figure: Text Point Cloud Format Conversion

2.3.7.2.1.3 Open DEM

Function Description:

Loads DEM data in tif, tiff, img format.

Operation Steps:

1. Right-click on the Raster node under Project, select "Open DEM".

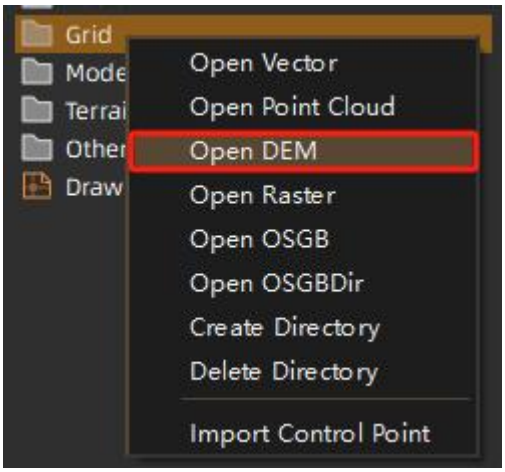


Figure: Open DEM

2. Select DEM data in tif, tiff, img format. The DEM is loaded into the view and attached under the Raster node.

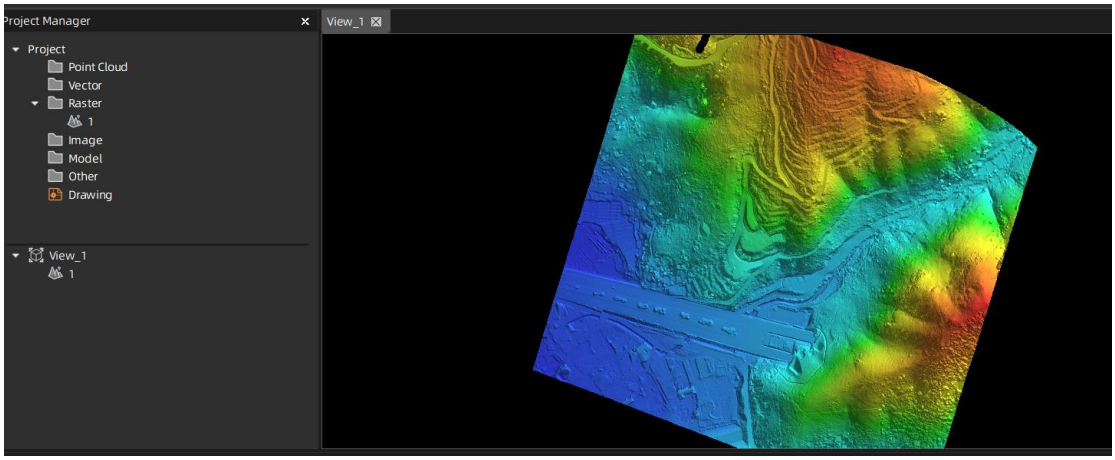


Figure: Load DEM Data

2.3.7.2.1.4 Open Imagery

Function Description:

Loads imagery data in tif, jpg, img format.

Operation Steps:

1. Right-click on the Raster node under Project, select "Open Imagery".

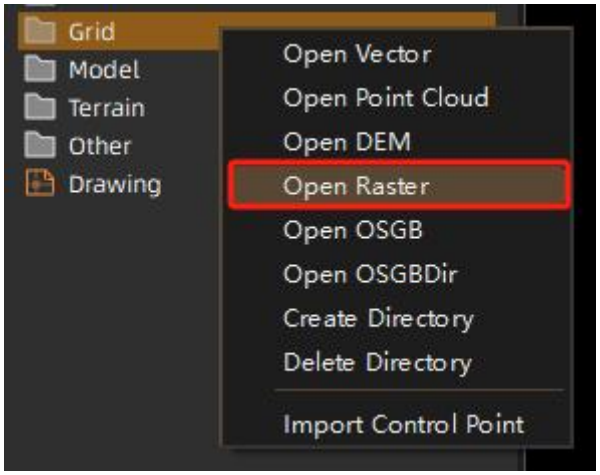


Figure: Open Image

2. Select imagery data in tif, jpg, img format. The imagery is loaded into t he view and attached under the Raster node.

2.3.7.2.1.5 Open OSGB Model

Function Description:

Loads OSGB format model data.

Operation Steps:

1. Right-click on the Model node under Project, select "Open OSGB Model".

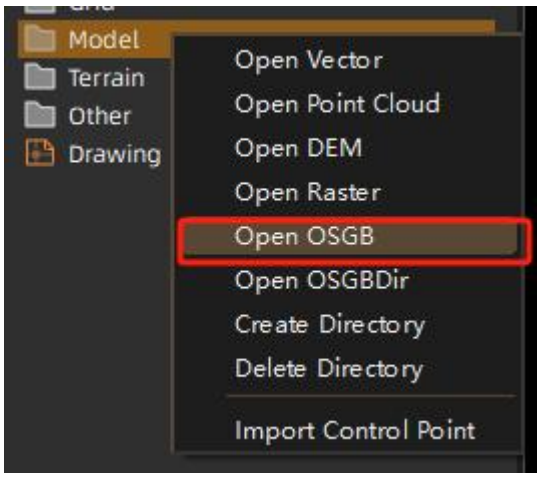


Figure: Open OSGB Model

2. Select OSGB format data. The OSGB model data is loaded into the view.

2.3.7.2.1.6 Open OSGB Folder

Function Description:

Loads an OSGB model folder.

Operation Steps:

1. Right-click on the Model node under Project, select "Open OSGB Folder".

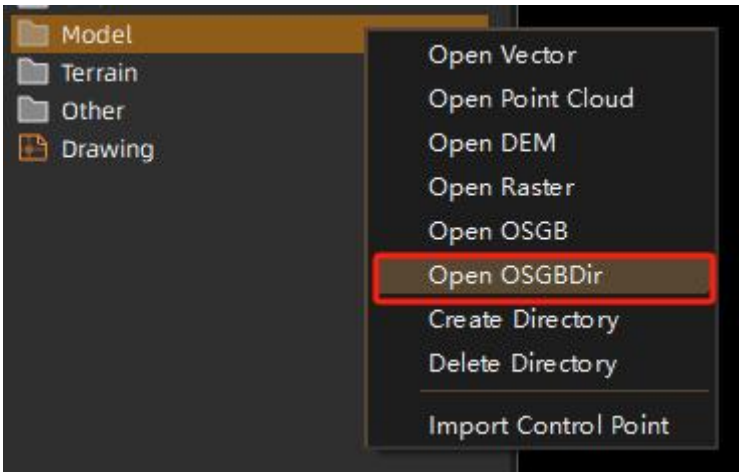


Figure: Open OSGB Folder

2. Select an OSGB folder. The OSGB model data is loaded into the view.

2.3.7.2.1.7 New Folder

Function Description:

Creates a new folder in the Project Manager.

Operation Steps:

1. Right-click on an existing folder (Point Cloud/Vector/Raster/Model/Panorama/Other) and select "New Folder" to create a subfolder under it.

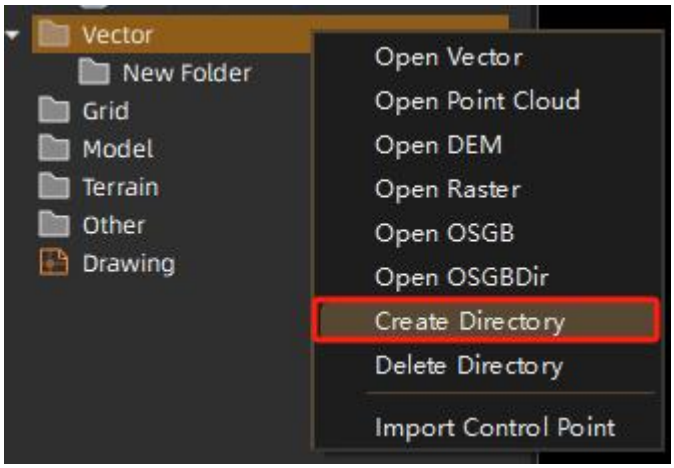


Figure: Create New Folder

2. Right-click on a blank area in the data panel and select "New Folder" to create a new folder at the root level, parallel to existing folders.

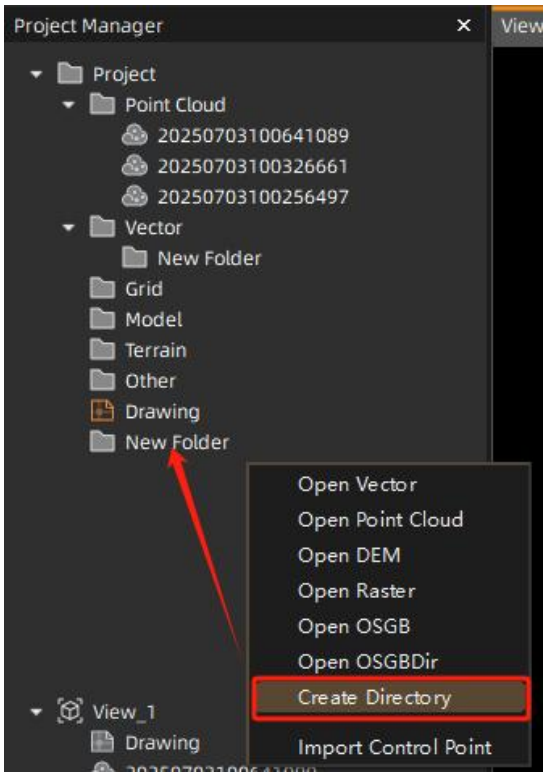


Figure: Create New First-Class Directory

2.3.7.2.1.8 Rename

Function Description:

Renames a folder.

Operation Steps:

1. Double-click the folder to rename, enter the new name, and press Enter or click elsewhere to confirm.

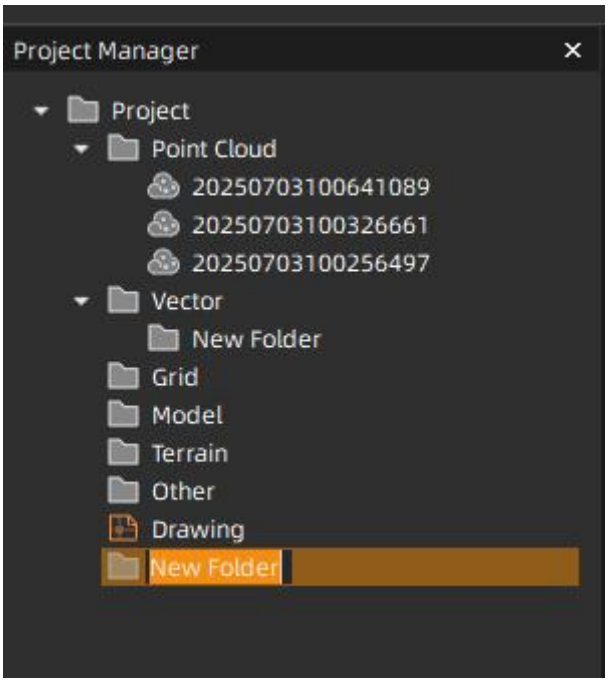


Figure: Rename

2.3.7.2.1.9 Delete Folder

Function Description:

Deletes a folder and its data from the Project Manager node and view.

Operation Steps:

1. Right-click on the folder (Point Cloud/Vector/Raster/Model/Panorama/Other) and select "Delete Folder". If the folder contains data, confirm the prompt to delete the folder and its data, and remove them from the view window.

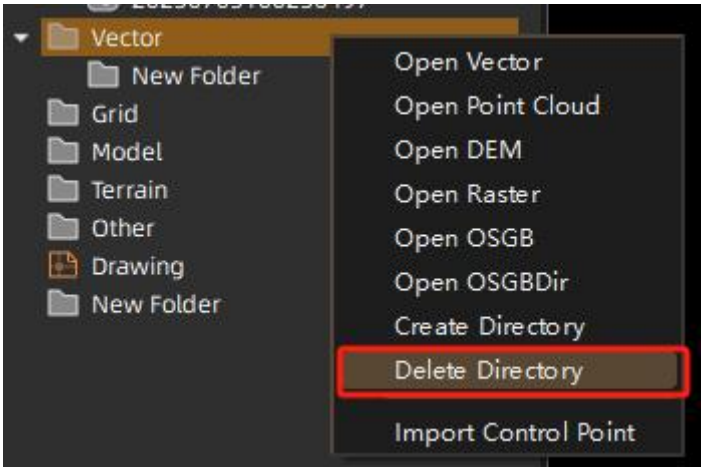


Figure: Delete Folder

2.3.7.2.1.10 Import Coordinate Fil

Function Description:

Loads coordinate data in dat, csv, txt format into the currently active drawi ng and displays it in the view.

Operation Steps:

1. Right-click on a folder in Project Manager → Import Coordinate File, sele ct the coordinate file, and click Open. The Import Coordinate File dialog bo x appears.

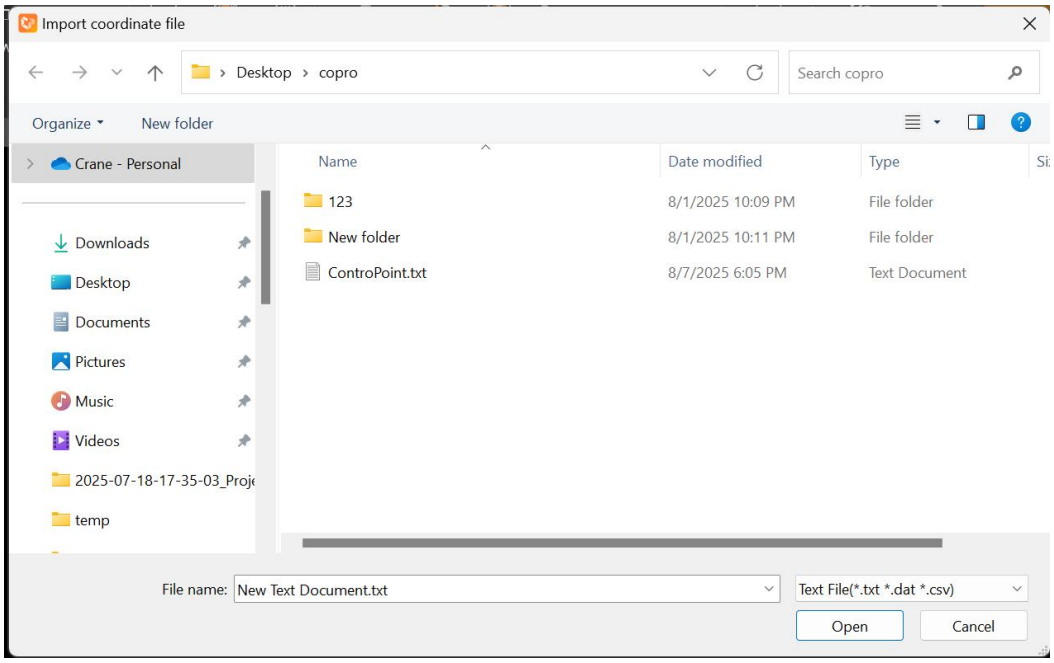


Figure: Open Coordinate File

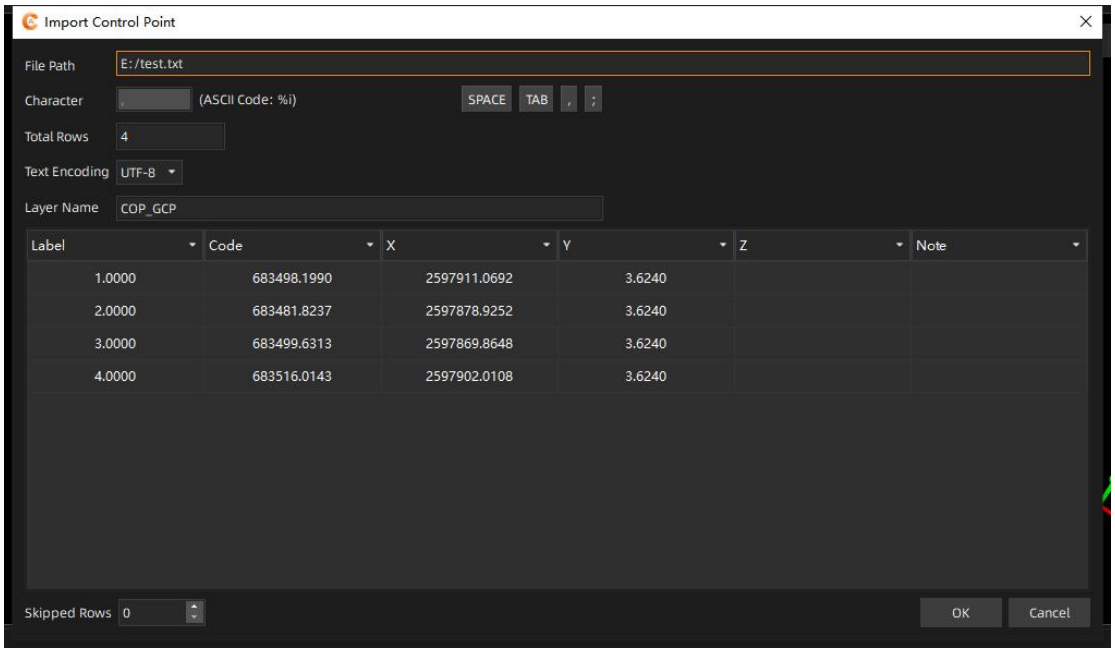


Figure: Import Coordinate File Dialog Box

2. In the dialog, make settings so that both X and Y columns have data, th en click OK. The coordinate file is imported into the current active drawing and displayed in the view.

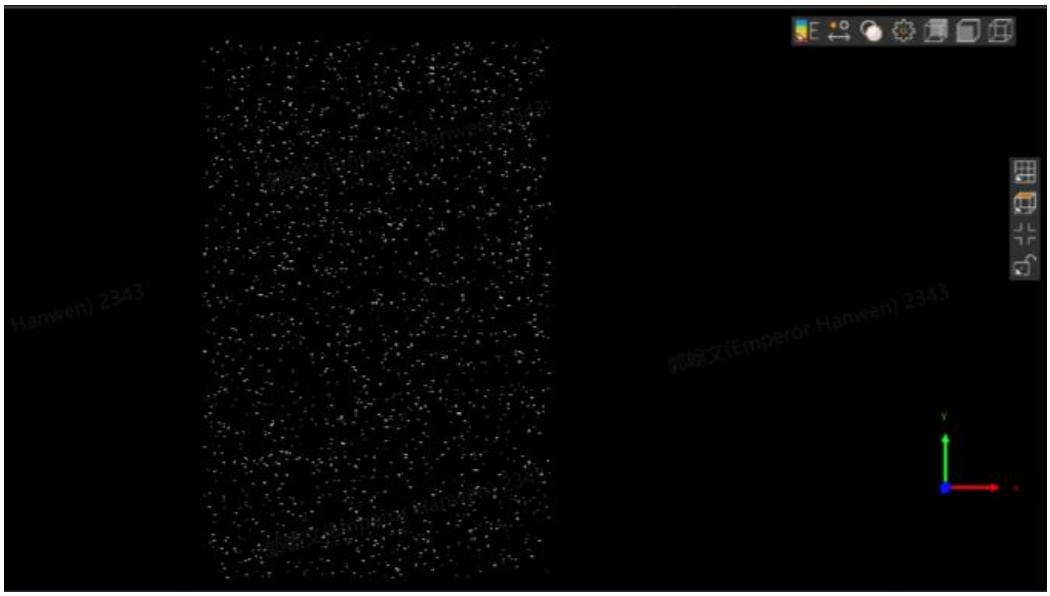


Figure: Coordinate File Display Effect

2.3.7.2.1.11 Blank Area Right-Click Menu

Function Description:

Right-clicking in a blank area of the Project Manager allows loading vectors, point clouds, DEM, imagery, OSGB, coordinate files, or creating folders.

Operation Steps:

1. Right-click in a blank area of the data panel. A menu appears allowing you to load vectors, point clouds, DEM, imagery, OSGB models, coordinate files, or create a new folder. Loaded data or new folders are attached at the bottom of the project tree.

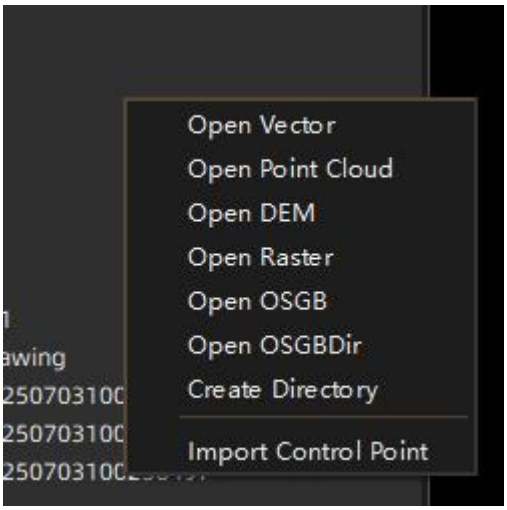


Figure: Right-Click Menu in Blank Area

2.3.7.2.1.12 Drag-and-Drop to Open Data

Function Description:

Drag point cloud, vector, DEM, imagery, OSGB data into the view window o r data management panel to load them. Dragging las, codata, laz point clo uds will automatically convert them to hpc.

Operation Steps:

1. Select one or more point cloud, vector, DEM, imagery, OSGB model, or OSGB folder data files. Hold the left mouse button and drag them into the view/data management panel.
2. Release the mouse button to load and display the dragged data.

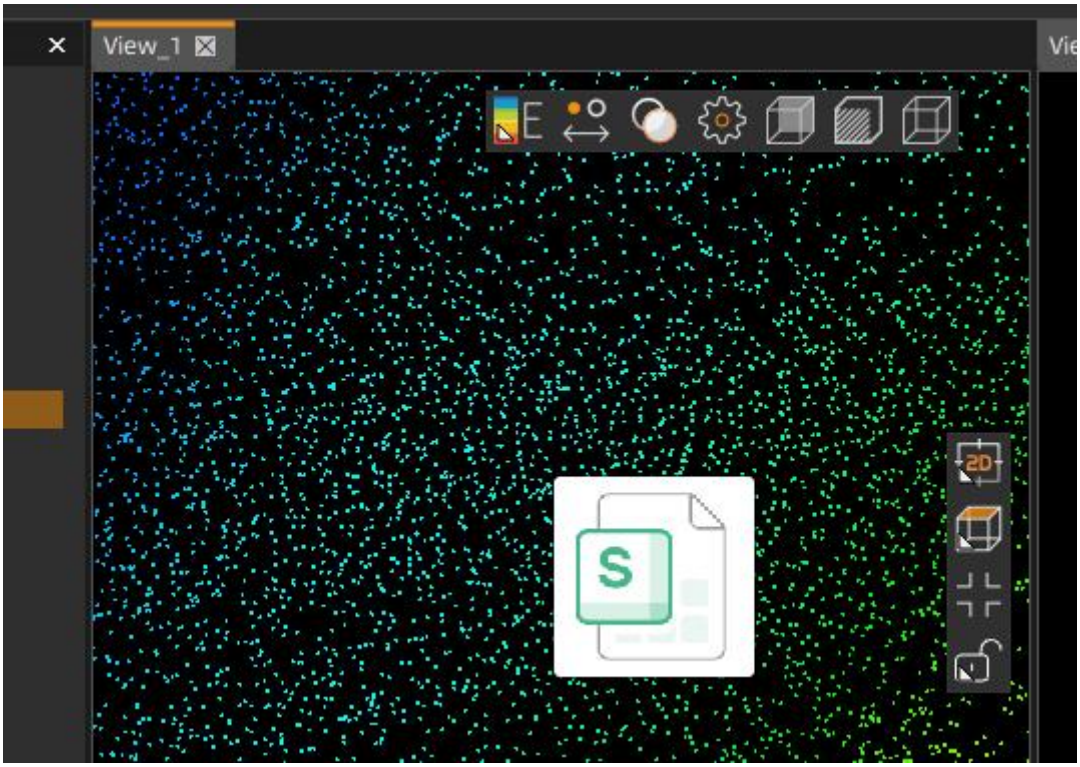


Figure: Dragging Data to View Window

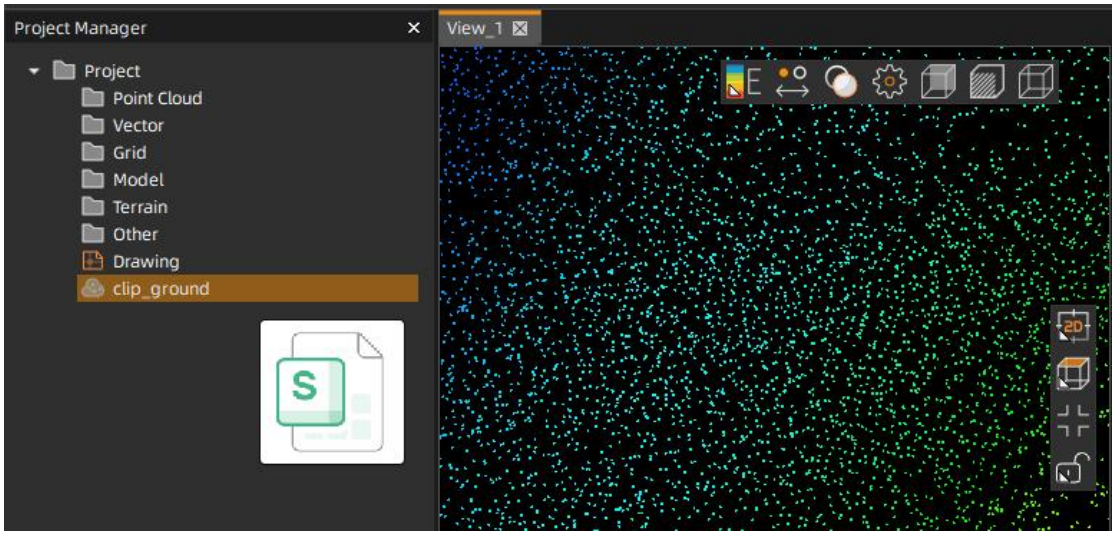


Figure: Dragging Data to project Management Panel

2.3.7.2.1.13 Close

Function Description:

Removes data from the Project Manager node and view.

Operation Steps:

1. Select data in the data panel, right-click, and choose "Close". The data is removed from the Project Manager node and view.

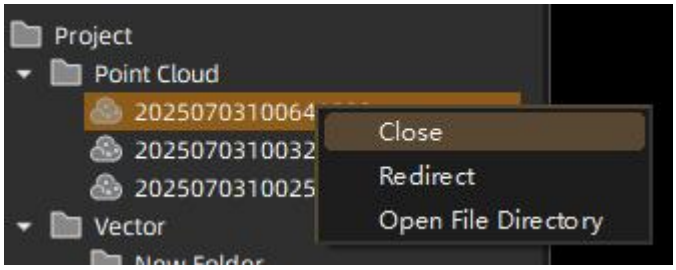


Figure: Close Data

2.3.7.2.1.14 Redirect

Function Description:

Re-selects the data path without changing the node name.

Operation Steps:

1. Select data in the data panel, right-click, and choose "Redirect". In the file dialog, select the new data path.

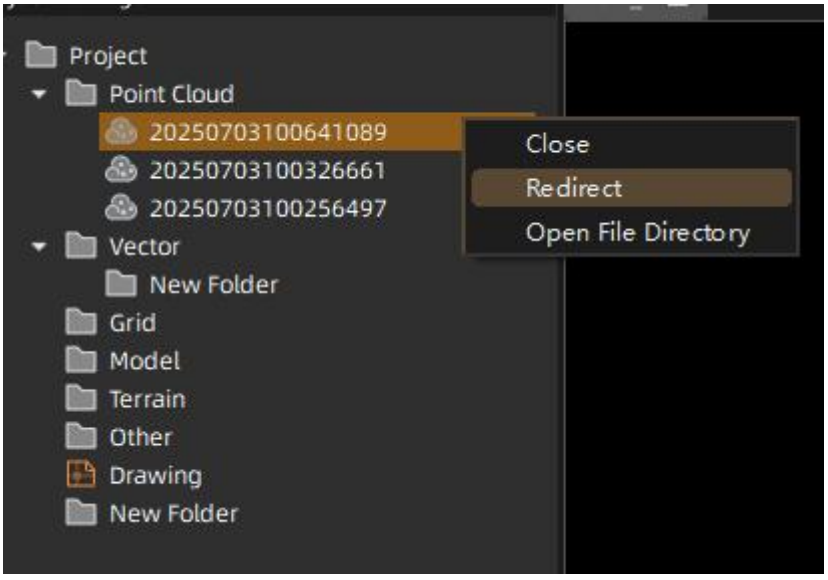


Figure: Redirect

2.3.7.2.1.15 Open Folder

Function Description:

Opens the file explorer at the storage directory of the data file.

Operation Steps:

1. Select data in the data panel, right-click, and choose "Open Folder". The Windows file explorer opens at the data's directory.

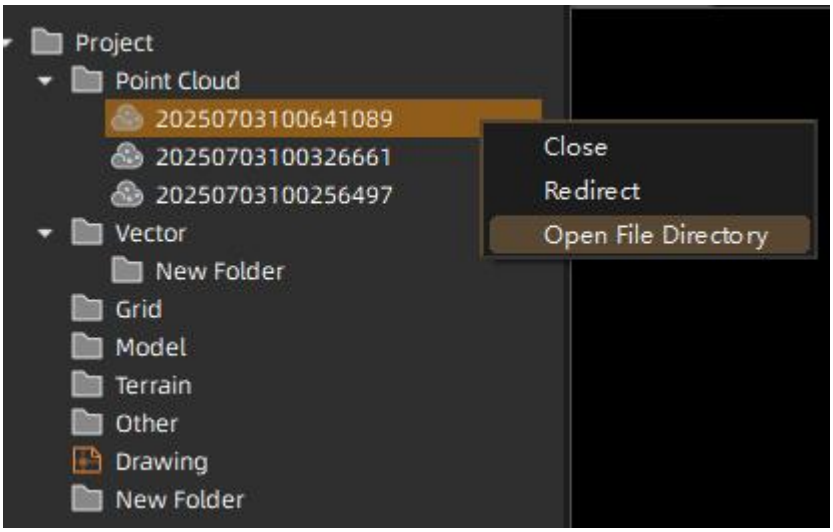


Figure: Open Folder

2.3.7.2.1.16 Activate Drawing

Function Description:

Activates a drawing.

Operation Steps:

1. Load vector data.

2. Right-click and choose "Activate Drawing" to make the vector data active and editable.

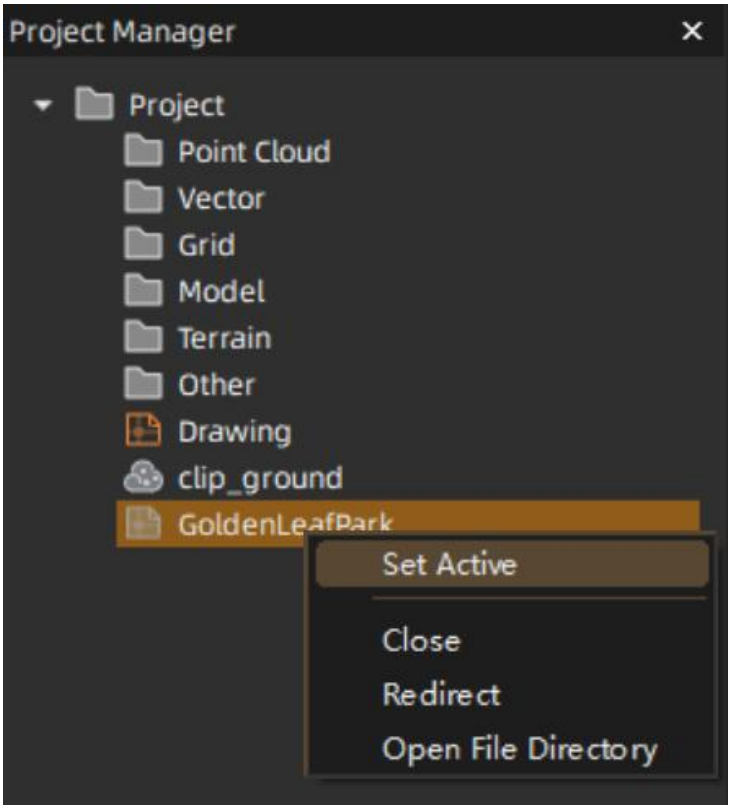


Figure: Activate Drawing

2.3.7.2.2 View Management Panel

2.3.7.2.2.1 Close

Function Description:

Closes the selected view(s) and the data within them, but the data remains in the data panel and can be dragged to other views.

Operation Steps:

1. In the View panel, select one or more displayed views, right-click, and choose "Close" to close them.



Figure: Close View

2.3.7.2.2.2 Center

Function Description:

Centers the selected data in the view.

Operation Steps:

1. In the View panel, select one or more displayed data items, right-click, a nd choose "Center". The selected data is centered in the view.

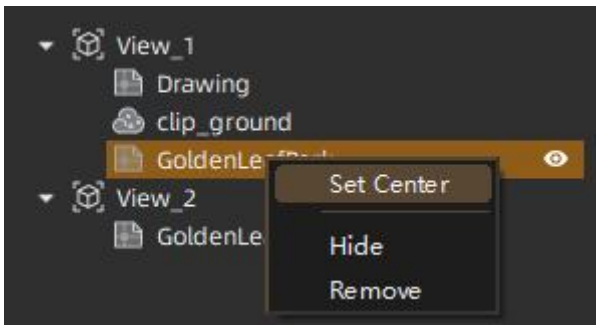


Figure: Center Display Data

2.3.7.2.2.3 Hide

Function Description:

Hides displayed data in the view.

Operation Steps:

1. In the View panel, select one or more displayed data items, right-click, a nd choose "Hide", or click the small eye icon next to them.

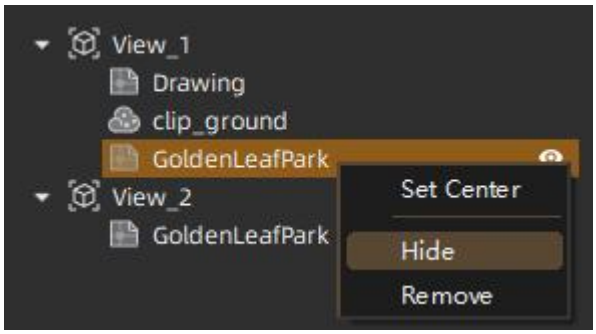


Figure: Hide Data

2.3.7.2.2.4 Show

Function Description:

Shows hidden data in the view.

Operation Steps:

1. In the View panel, select one or more hidden data items, right-click, and choose "Show", or click the small eye icon.

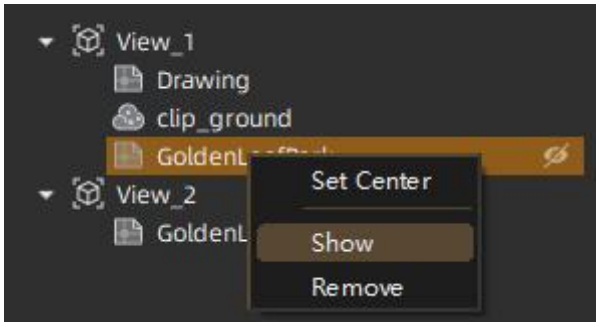


Figure: Show Data

2.3.7.2.2.5 Remove

Function Description:

Removes one or more data items from the view.

Operation Steps:

1. In the View panel, select one or more displayed data items, right-click, and choose "Remove".

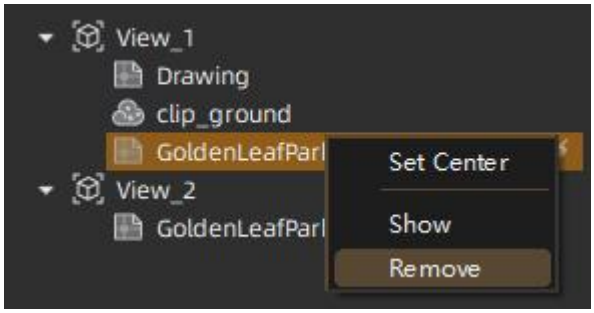


Figure: Remove Data

Note: Data is only removed from the view and not from the software.

2.3.7.3 Properties Panel

Function Description:

When vectors are selected, the Properties panel allows viewing or modifying common property information of the selected vectors. Click Basic → Properties Panel to show or hide the Properties panel.

2.3.7.3.1 Point

Function Description:

When only point elements are selected, the Properties panel displays the properties of the selected points.

Operation Steps:

1. In the view, select one or more point elements. Their information appears in the Properties panel.

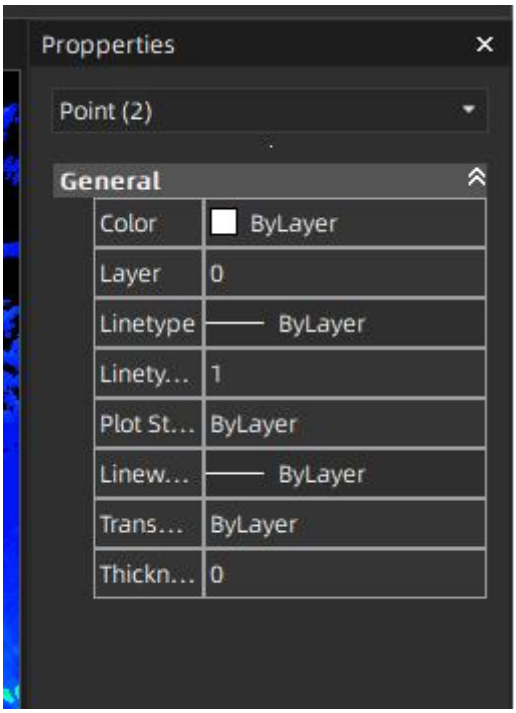


Figure: Point Information in Property Panel

2. In the Properties panel, you can adjust properties such as color, layer, linetype, linetype scale, lineweight, and transparency via dropdowns.

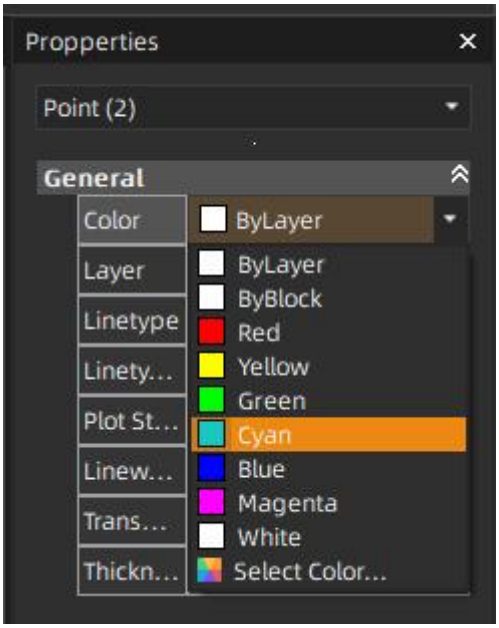


Figure: Modify Point Information via Drop-down in Property Panel

3. You can also input values for linetype scale and thickness.

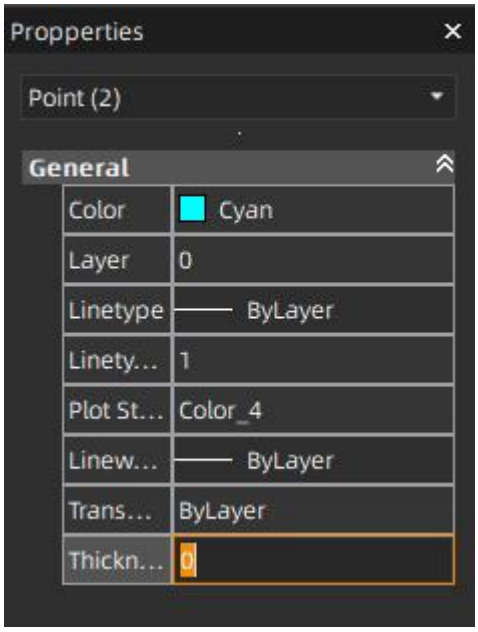


Figure: Modify Point Information via Input in Property Panel

2.3.7.3.2 Line

Function Description:

When only line features are selected the properties of the selected lines ap pear in the Properties panel

Operation Steps:

1. In the view select one or more line features Information about the selec ted lines appears in the Properties panel.

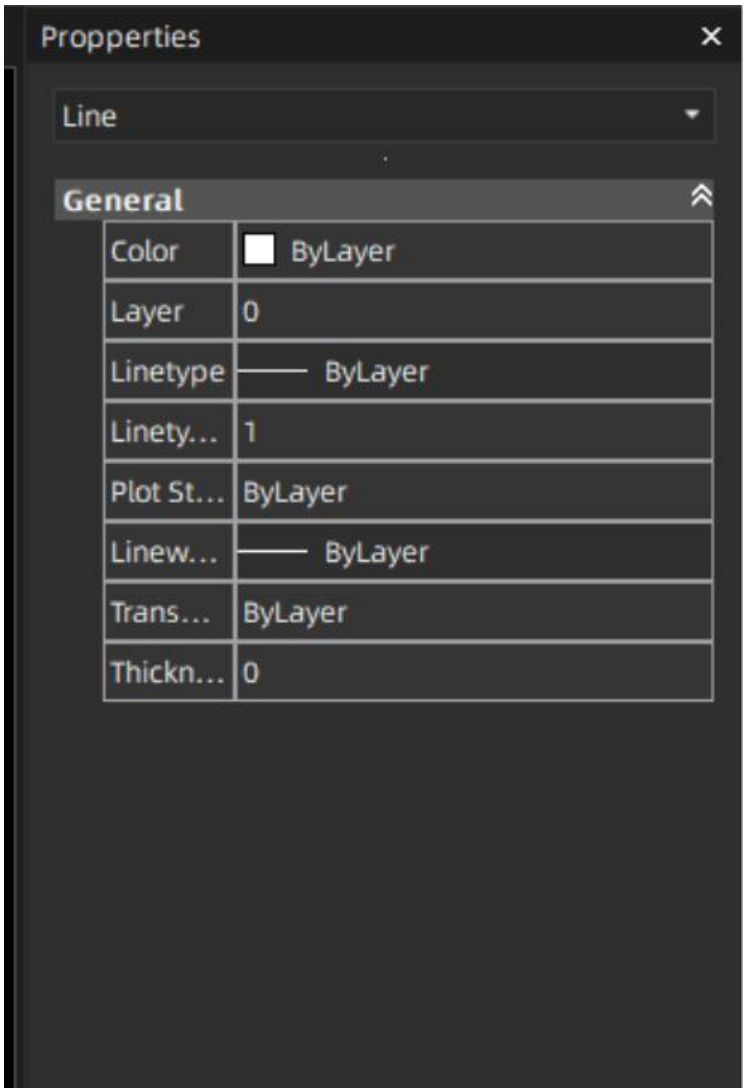


Figure: Line Information in Property Panel

2. In the Properties panel you can adjust the line s Color Layer Linetype Li netype Scale Lineweight and Transparency properties via dropdown selectio ns.

3. In the Properties panel you can adjust the line s Linetype Scale and Thic kness properties by entering values.

2.3.7.3.3 Polyline

Function Description:

When only polyline features are selected, the properties of the selected pol ylines appear in the Properties panel.

Operation Steps:

1. In the view, select one or more polyline features. Information about the selected polylines appears in the Properties panel.

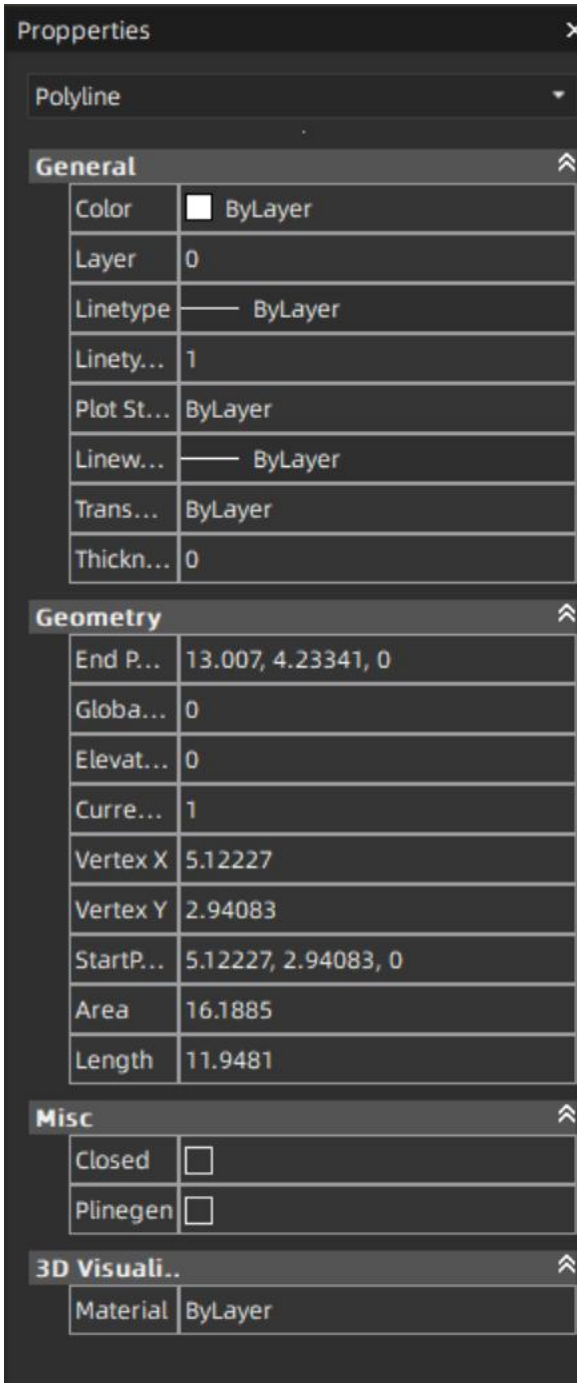


Figure: Selected Polyline

2. In the Properties panel, you can adjust the polyline's Color, Layer, Linetype, Linetype Scale, Lineweight, and Transparency properties via dropdown selections.

3. In the Properties panel, you can adjust the polyline's Linetype Scale, Thickness, Vertex ID, and Elevation properties by entering values.

4. In the Properties panel, you can modify the Closed option's dropdown to control the closed state of the selected polyline.

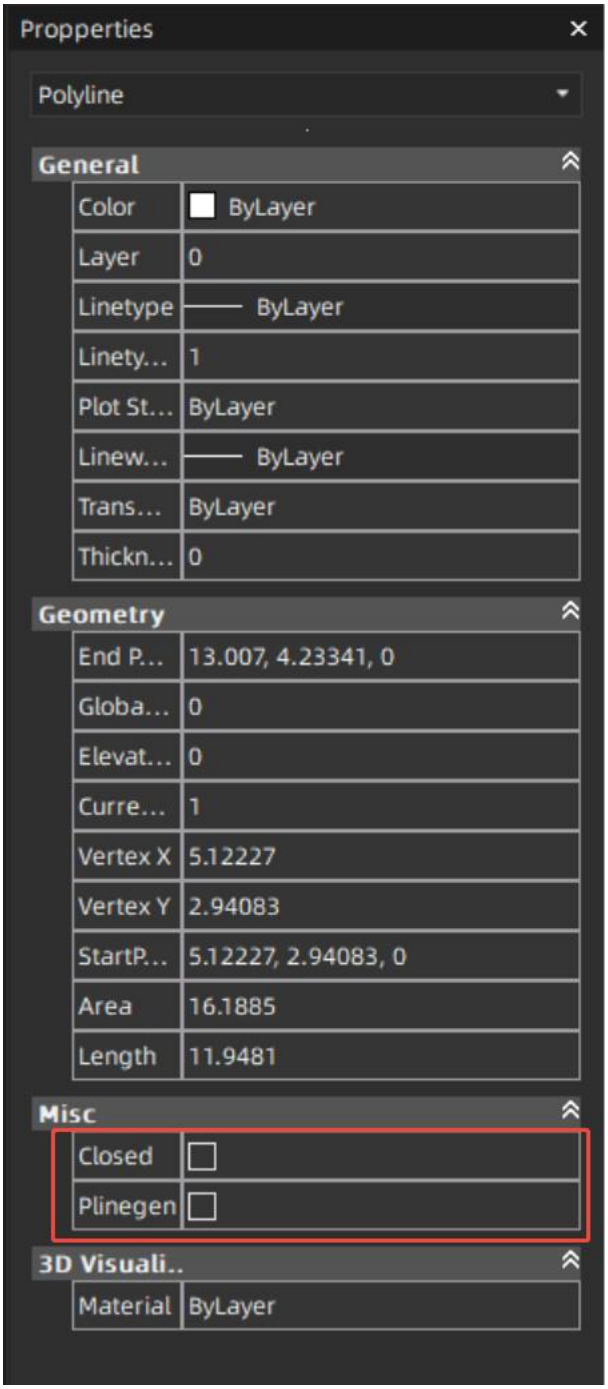


Figure: Check Options in Property Panel

2.3.7.3.4 3D Polyline

Function Description:

When only 3D polyline features are selected, the properties of the selected

3D polylines appear in the Properties panel.

Operation Steps:

1. In the view, select one or more 3D polyline features. Information about the selected 3D polylines appears in the Properties panel.

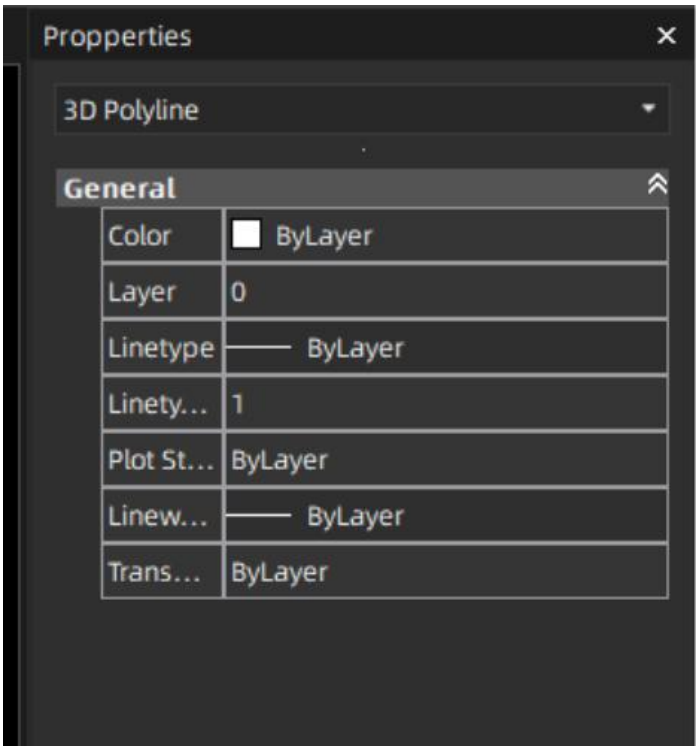


Figure: Selected 3D Polyline

2. In the Properties panel, you can adjust the 3D polyline's Color, Layer, Linetype, Linetype Scale, Lineweight, and Transparency properties via dropdown selections.

3. In the Properties panel, you can adjust the 3D polyline's Linetype Scale and Thickness properties by entering values.

2.3.7.3.5 Circle

Function Description:

When only circle features are selected, the properties of the selected circles appear in the Properties panel.

Operation Steps:

1. In the view, select one or more circles. Information about the selected circles appears in the Properties panel.

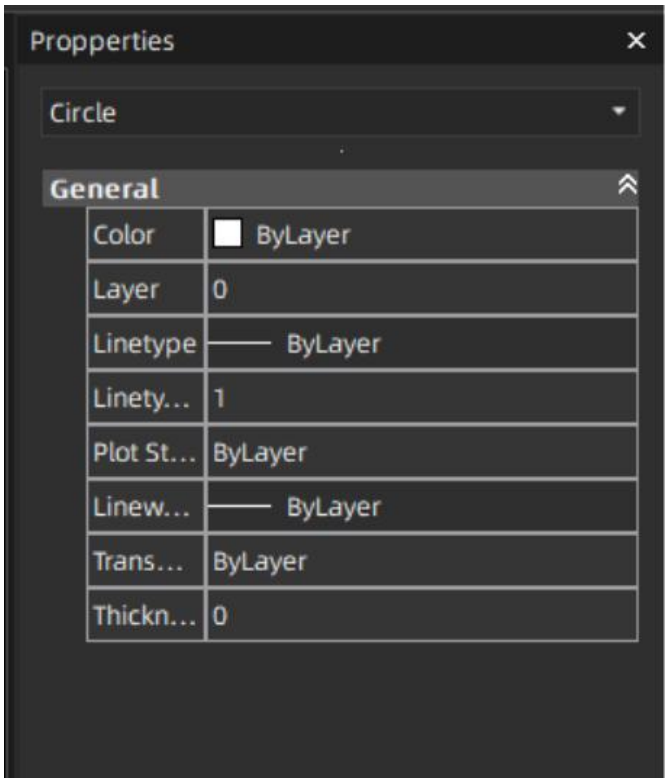


Figure: Selected Circle

2. In the Properties panel, you can adjust the circle's Color, Layer, Linetype, Linetype Scale, Lineweight, and Transparency properties via dropdown selections.

3. In the Properties panel, you can adjust the circle's Linetype Scale and Thickness properties by entering values.

2.3.7.3.6 Arc

Function Description:

When only arc features are selected, the properties of the selected arcs ap pear in the Properties panel.

Operation Steps:

1. In the view, select one or more arcs. Information about the selected arc s appears in the Properties panel.

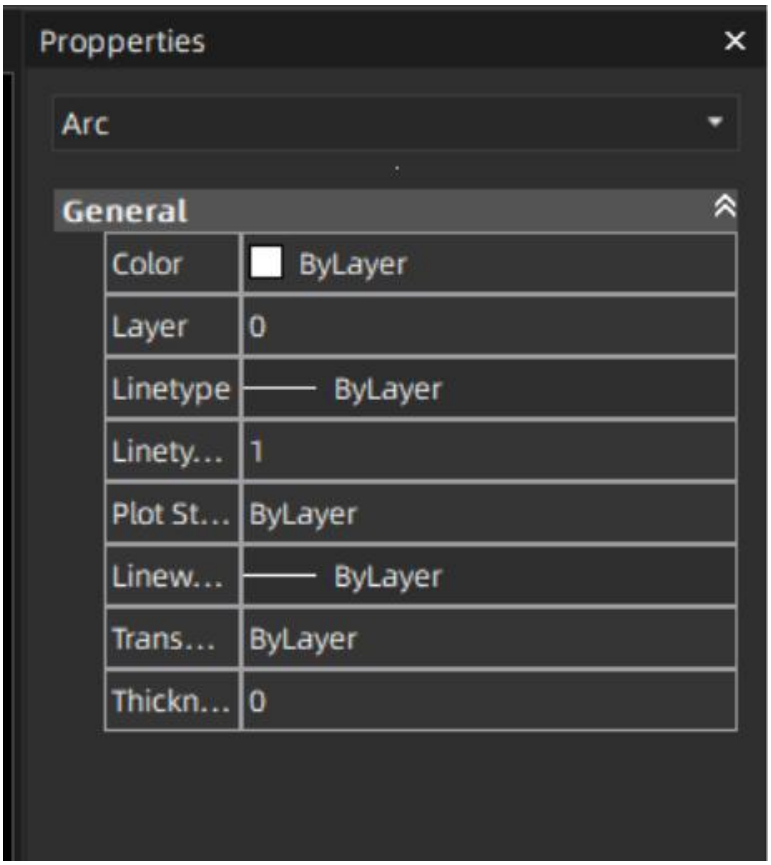


Figure: Selected Arc

2. In the Properties panel, you can adjust the arc's Color, Layer, Linetype, L inetype Scale, Lineweight, and Transparency properties via dropdown selecti ons.

3. In the Properties panel, you can adjust the arc's Linetype Scale and Thic kness properties by entering values.

2.3.7.3.7 Spline Curve

Function Description:

When only spline curve features are selected, the properties of the selected spline curves appear in the Properties panel.

Operation Steps:

1. In the view, select one or more spline curves. Information about the selected spline curves appears in the Properties panel.

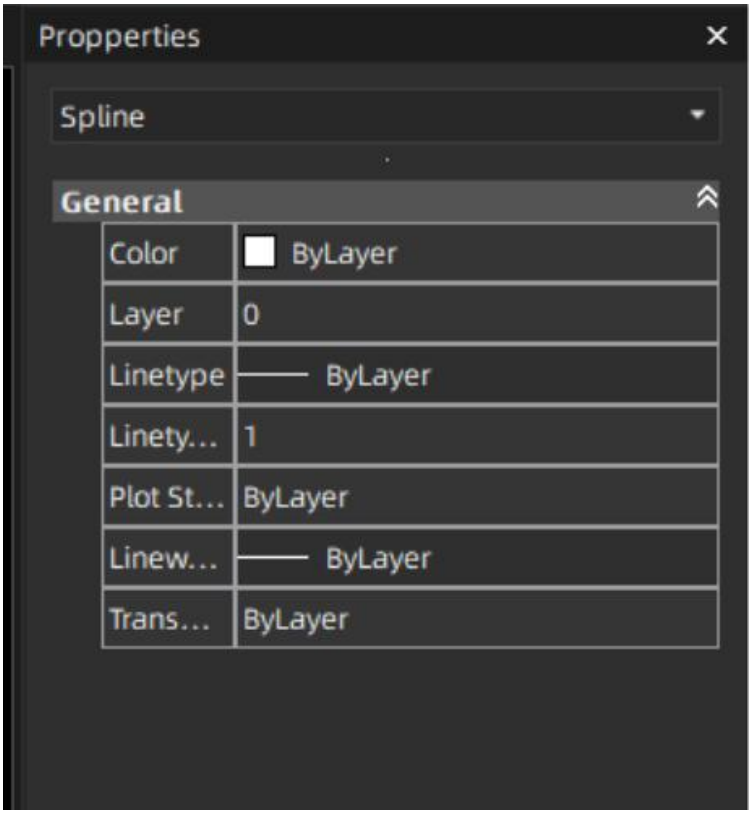


Figure: Selected Spline Curve

2. In the Properties panel, you can adjust the spline curve's Color, Layer, Linetype, Linetype Scale, Lineweight, and Transparency properties via dropdown selections.

3. In the Properties panel, you can adjust the spline curve's Linetype Scale

and Thickness properties by entering values.

2.3.7.3.8 Hatch Pattern

Function Description:

When only hatch pattern features are selected, the properties of the select ed hatch patterns appear in the Properties panel.

Operation Steps:

1. In the view, select one or more hatch patterns. Information about the se lected hatch patterns appears in the Properties panel.

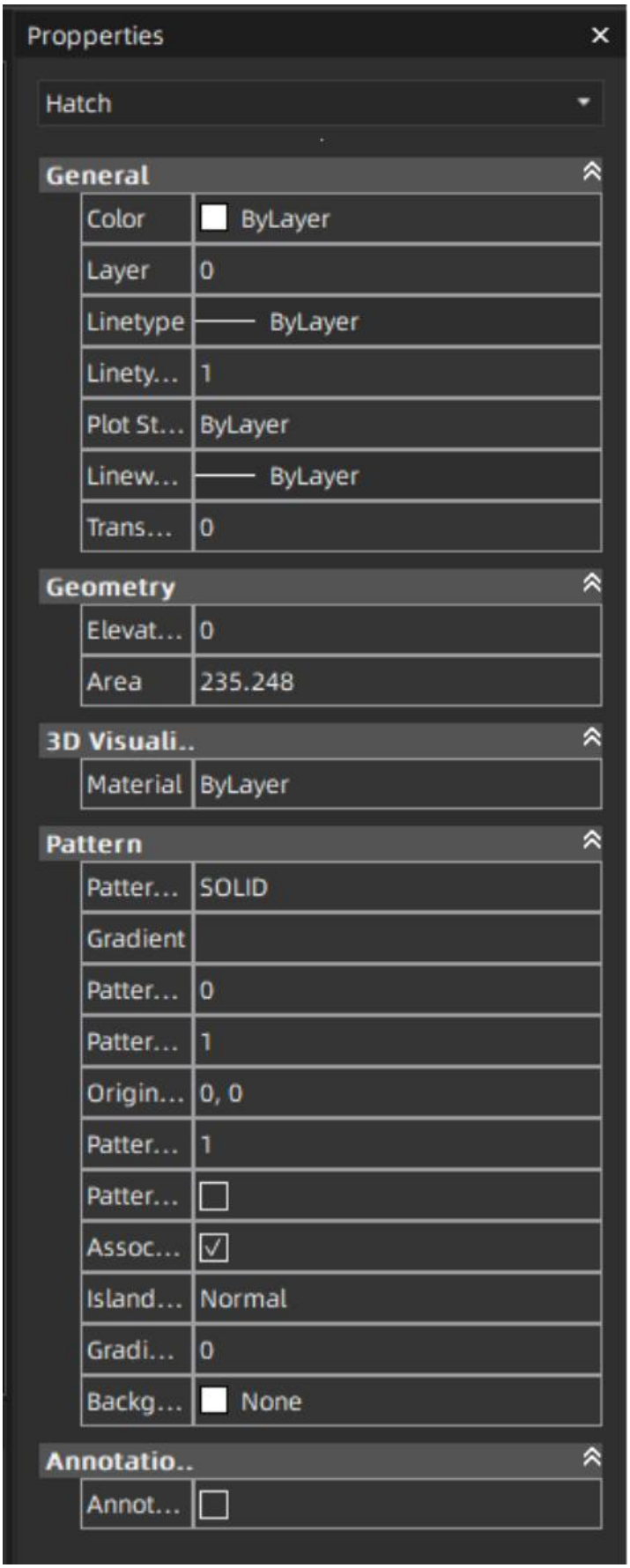


Figure: Selected Pattern Fill

2. In the Properties panel, you can adjust the hatch pattern's Color, Layer, Linetype, Linetype Scale, Lineweight, Transparency, and Background Color properties via dropdown selections.

3. In the Properties panel, you can adjust the hatch pattern's Hatch Scale, Angle, Scale, Origin X, Origin Y, and Elevation properties by entering values.

2.3.7.3.9 Text

Function Description:

When only text features are selected, the properties of the selected text appear in the Properties panel.

Operation Steps:

1. In the view, select one or more text items. Information about the selected text appears in the Properties panel.

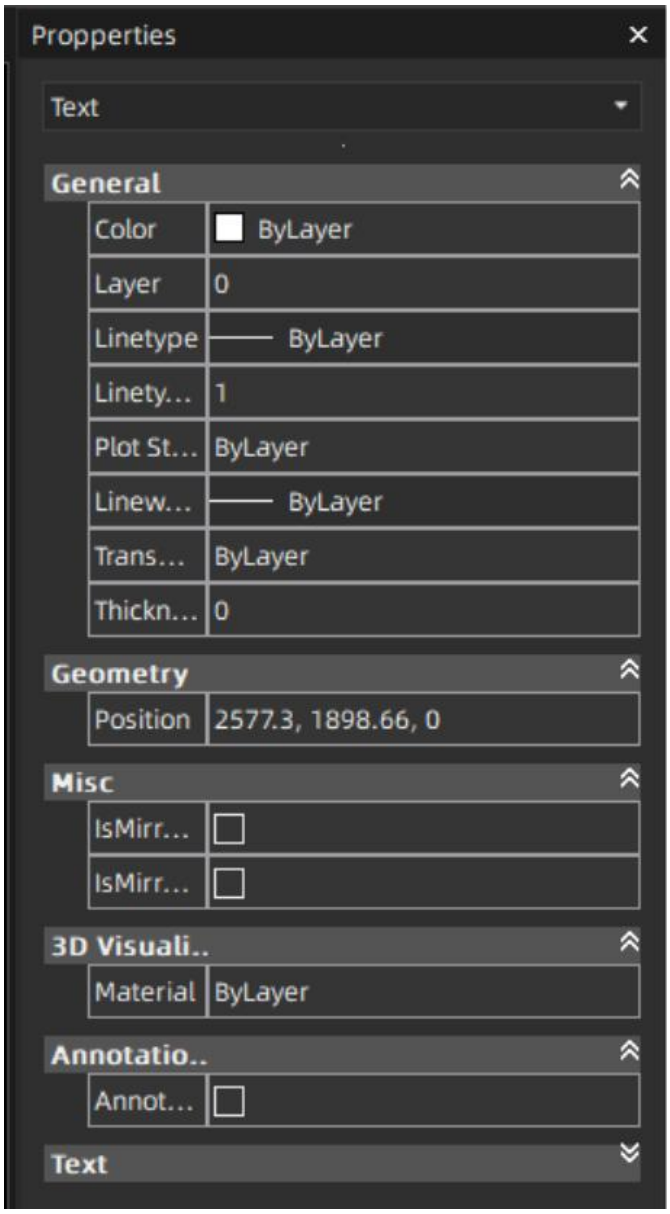


Figure: Selected Text



Figure: Selected Text2

2. In the Properties panel, you can adjust the text's Color, Layer, Linetype, Linetype Scale, Lineweight, Transparency, Style, and Justify properties via dr opdown selections.

3. In the Properties panel, you can adjust the text's Thickness, Height, Rotation, Width Factor, and Oblique Angle properties by entering values.

4. In the Properties panel, you can modify the Upside Down and Backwards function states by checking or unchecking the options.

2.3.7.3.10 Multiline Text

Function Description:

When only multiline text features are selected, the properties of the selected multiline text appear in the Properties panel.

Operation Steps:

1. In the view, select one or more multiline text items. Information about the selected multiline text appears in the Properties panel.

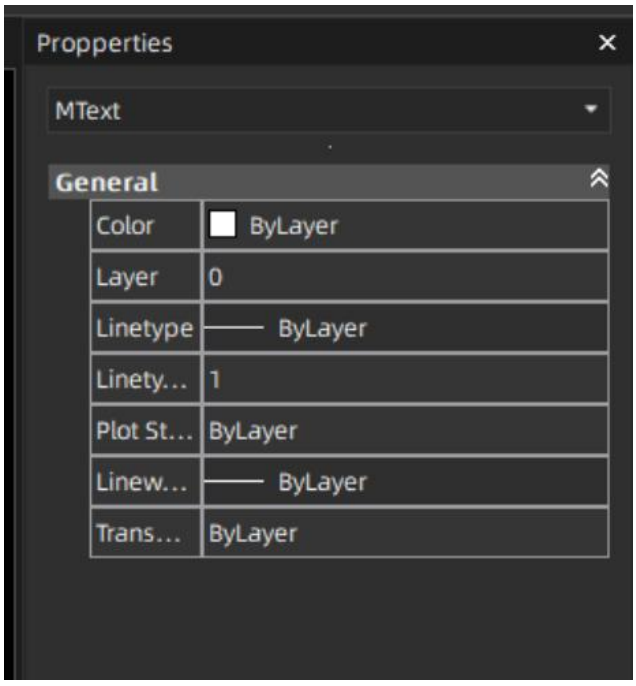


Figure: Selected Multiline Text

2. In the Properties panel, you can adjust the multiline text's Color, Layer,

Linetype, Linetype Scale, Lineweight, Transparency, Direction, Justify, Line Spacing Style, and Columns properties via dropdown selections.

3. In the Properties panel, you can adjust the text's Height, Rotation, Line Spacing Factor, Line Spacing Distance, X Coordinate, Y Coordinate, and Z Coordinate properties by entering values.

4. In the Properties panel, you can modify the Background Mask and Text Frame function states by checking or unchecking the options.

2.3.7.3.11 Aligned Dimension

Function Description:

When only aligned dimension features are selected, the properties of the selected aligned dimensions appear in the Properties panel.

Operation Steps:

1. In the view, select one or more aligned dimensions. Information about the selected aligned dimensions appears in the Properties panel.

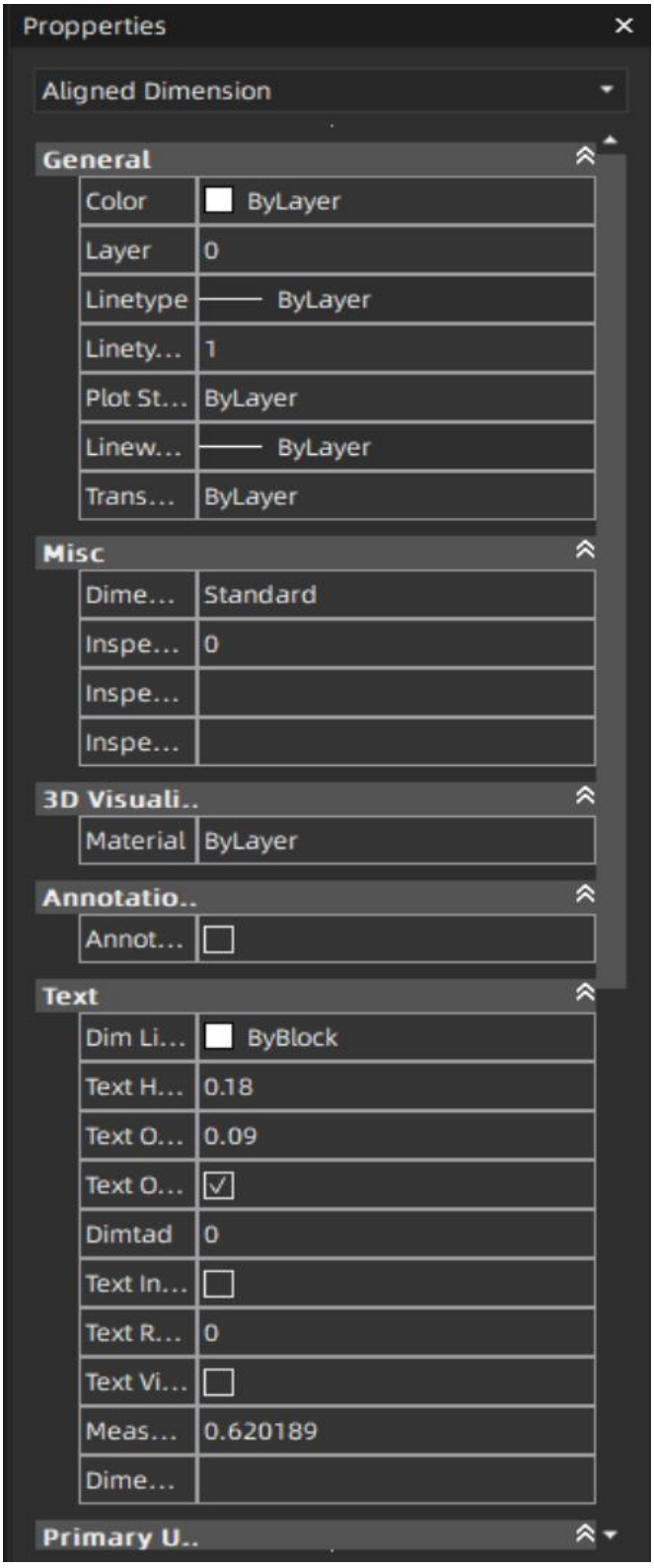


Figure: Selected Aligned Dimension 1

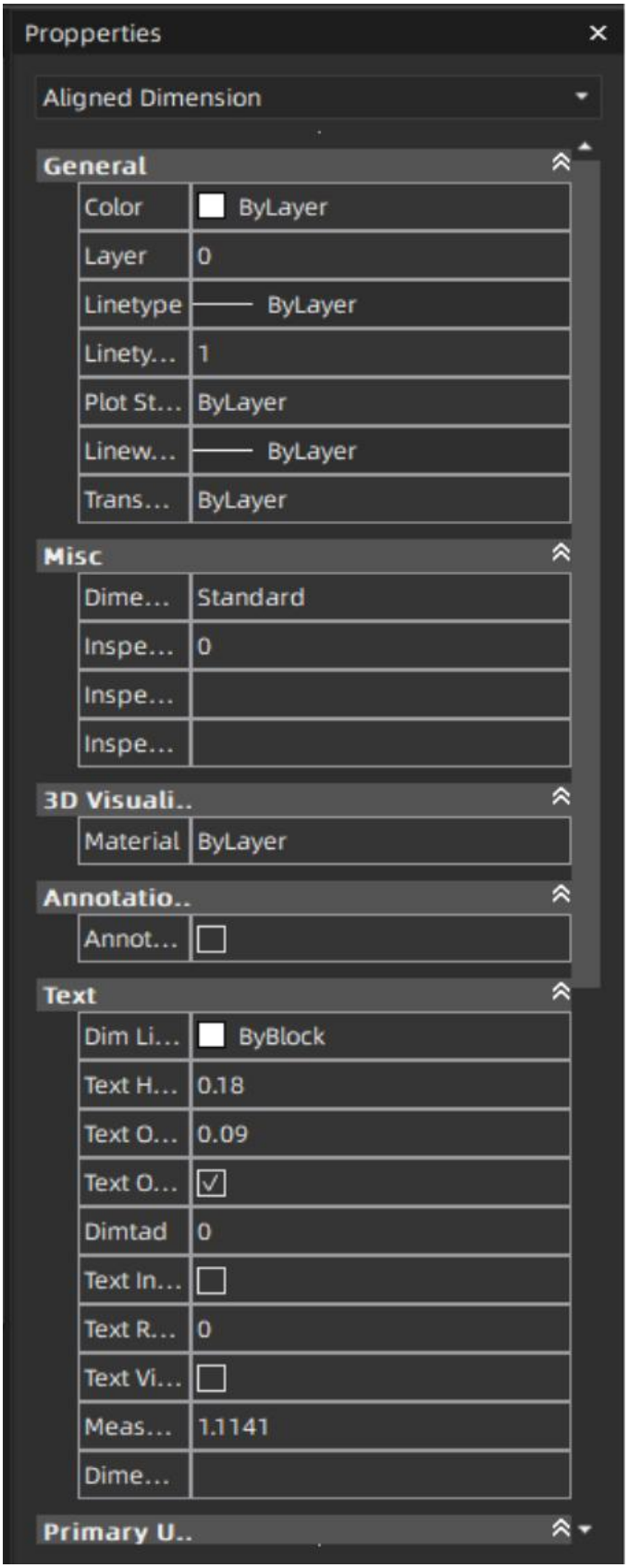


Figure: Selected Aligned Dimension 2

2. In the Properties panel, you can adjust the aligned dimension's Color, La

yer, Linetype, Linetype Scale, Lineweight, Transparency, Dimension Line Color, Dimension Line Style, and Text Color properties via dropdown selections.

3. In the Properties panel, you can adjust the aligned dimension's Dimension Line Text, Text/Line Spacing, Measurement, Linetype Scale, Separator, Prefix, Suffix, Multileader, Taper Dimension, Dimension Precision, Dimension Scale, Dimension Scale (duplicate), Move Dimension, Shape Check, Label Check, Inspection Rate, Set Text Height, and Extension Length properties by entering values.

4. In the Properties panel, you can modify the Arrow/Line Spacing, Text/Arrow Spacing, Text Reverse, and Dimension function states by checking or unchecking the options.

2.3.7.3.12 Block Reference

Function Description:

When only block reference features are selected, the properties of the selected block references appear in the Properties panel.

Operation Steps:

1. In the view, select one or more aligned dimensions. Information about the selected block references appears in the Properties panel.



Figure Selected Block Reference

2. In the Properties panel, you can adjust the block reference's Color, Layer, Linetype, Linetype Scale, Lineweight, and Transparency properties via drop down selections.

3. In the Properties panel, you can adjust the block reference's X Coordinate, Y Coordinate, Z Coordinate, X Scale, Y Scale, Z Scale, and Rotation prope

rties by entering values.

2.4 Vector Module

2.4.1Drawing

2.4.1.1 New Drawing

Function Description:

Creates a new drawing in dwg or dxf format.

Operation Steps:

2.4.1.2 Click Vector -> Drawing -> New. The New Drawing dialog box appears.

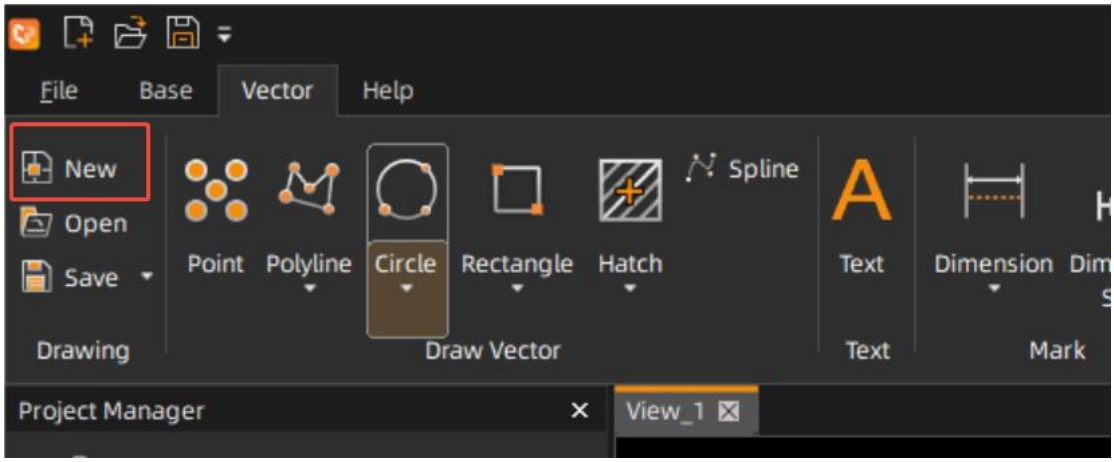
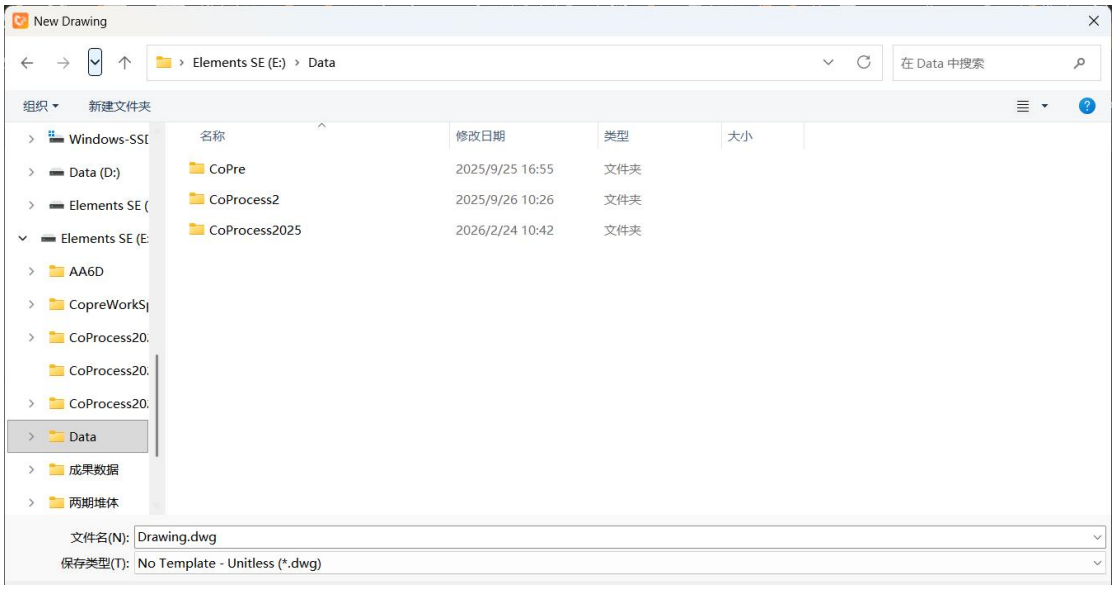


Figure: New Drawing



New Drawing Dialog Box

4 Choose the save path for the new drawing. Enter the name fo r the new drawing next to "File name".

Select the drawing template from the "Save as type" dropdown options. Options include: "No template - no units - (*.dwg)", "No template - metric (M) - (*.dwg)", "No template - imperial (I) - (*.dwg)", "DWG Template (*.dwg)". The default selection is "No template - no units - (*.dwg)".

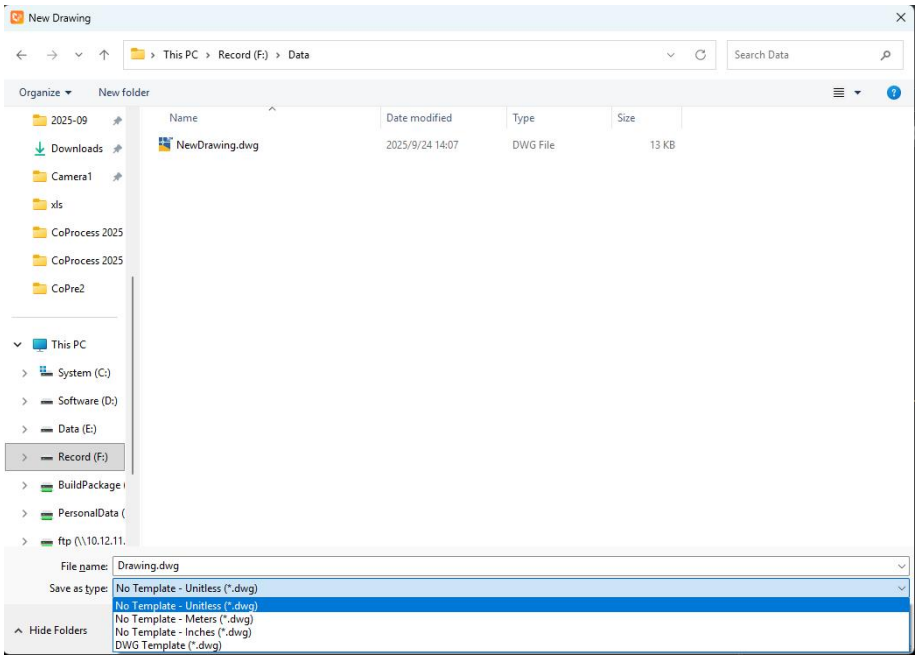


Figure: Drawing Template

5 Click "Save". The successfully created drawing is loaded into "Project Management" by default and is inactive by default.

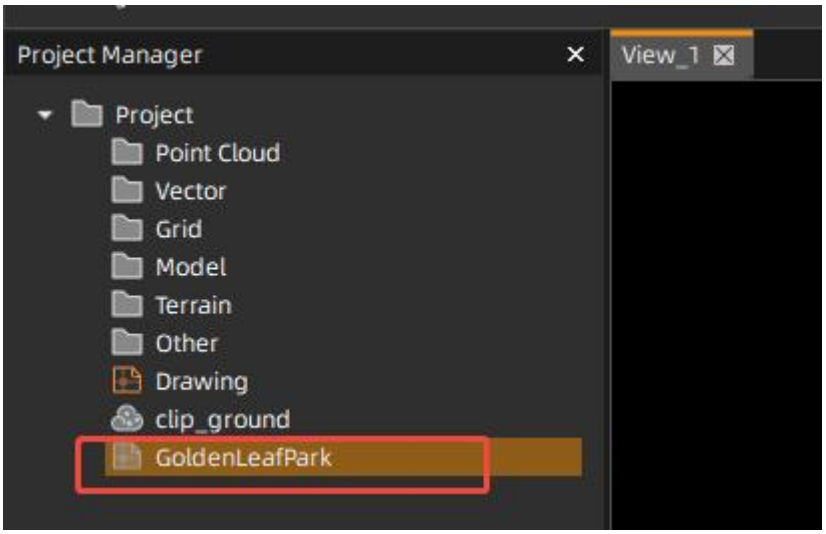


Figure: Project Management

Save Types:

No template - no units - (*.dwg): The drawing is in an imperial environment, unitless.

No template - metric (M) - (*.dwg): The drawing is in a metric environment, unit: meter.

No template - imperial (I) - (*.dwg): The drawing is in an imperial environment, unit: inch.

DWG Template (*.dwg): Requires selecting a drawing in dwg format. It will copy all contents of the selected drawing and use its template.

2.4.1.3 Open Drawing

Function Description:

Opens a drawing in dwg or dxf format.

Operation Steps:

1. Click Vector -> Drawing -> Open. The Open File dialog box appears.

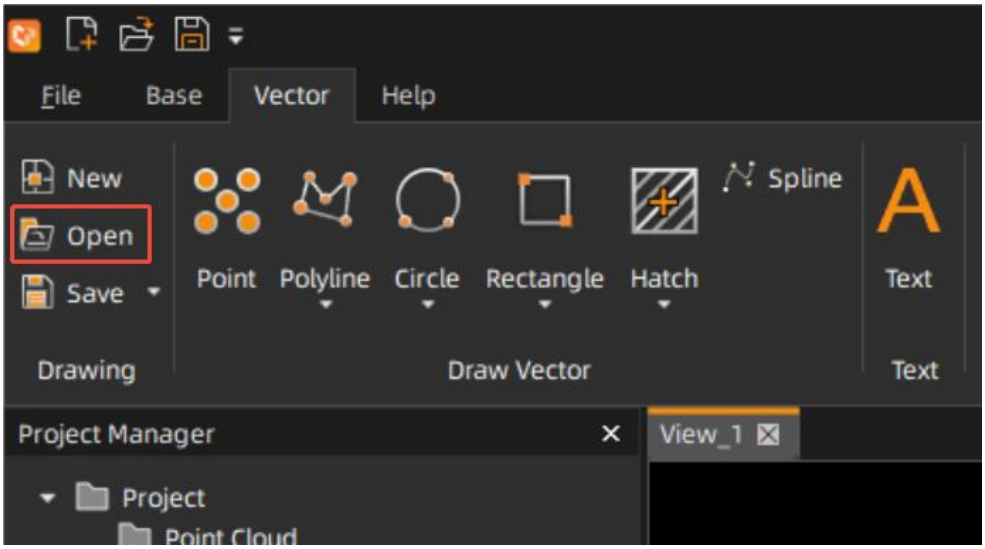


Figure: Open File

2. Select the drawing to open, or directly enter the absolute path of the dr awing in the input box after "". Click "Open" to load the drawing.

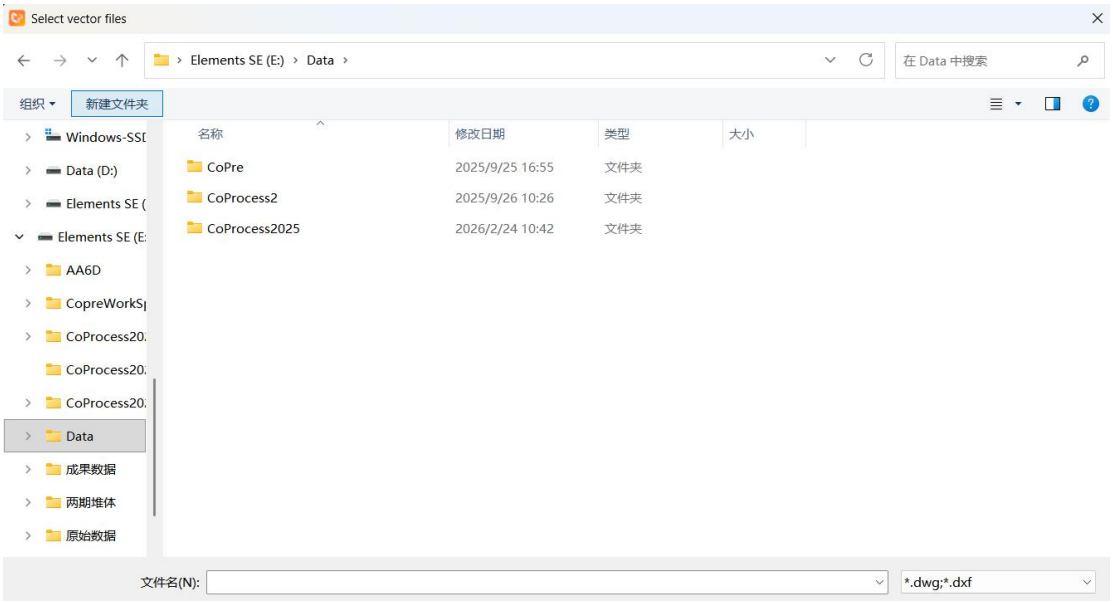


Figure:Open File

3. The successfully opened drawing is loaded into "Project Management" by default and is inactive by default.

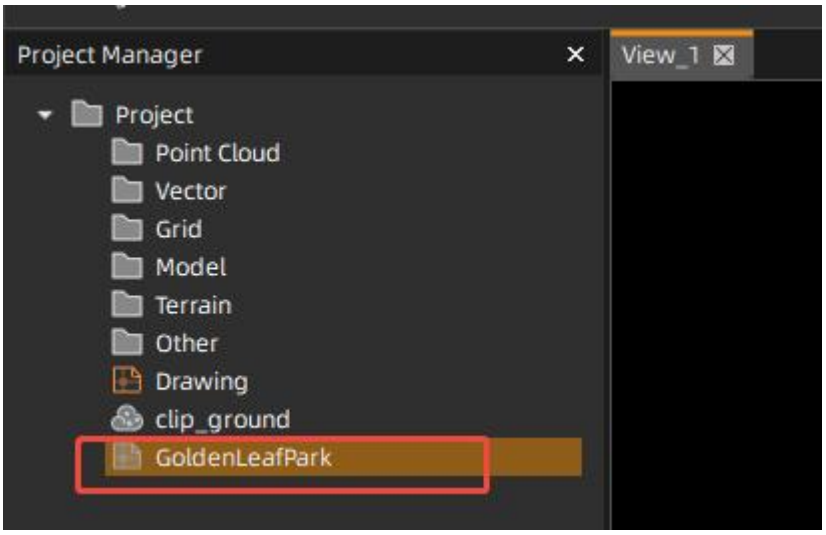


Figure: Project Management

2.4.1.4 Opening Drawings with Unsupported Fonts

Function Description:

Opens a drawing in dwg or dxf format that contains unsupported fonts.

Operation Steps:

1. Click Vector -> Drawing -> Open. The Open File dialog box appears.



Figure: Open Drawing

2. Select a drawing that contains SHX files missing from the software, or directly enter the absolute path of the drawing in the input box after "". Click "Open" to load the drawing.

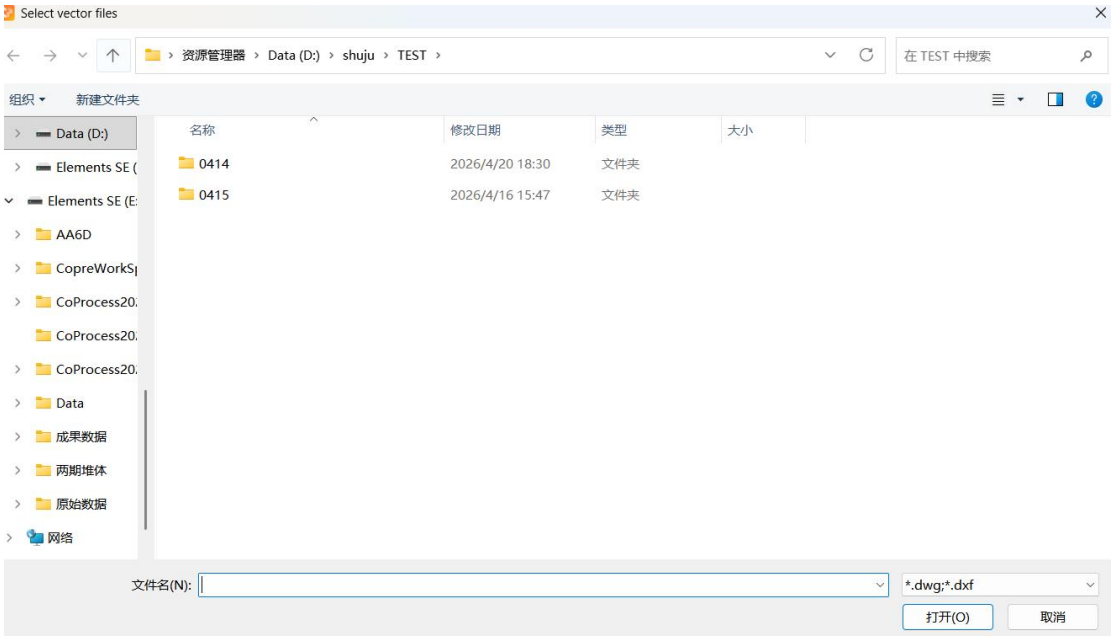


Figure: load the drawing

3. A prompt window indicating missing SHX files appears.

4. Click the "Assign replacement file for each SHX file" button. The Select Replacement Font dialog box appears. Specify a replacement font for each missing font sequentially. The currently replaced font is displayed at the bottom of the dialog box.

5. In the Select Replacement Font interface, clicking the 'X' in the top right corner will proceed without replacing the current missing font, and the next replacement font prompt will appear.

6. In the Missing SHX Files prompt window, click "Ignore missing SHX files and continue" or the 'X' in the top right corner to directly close the window without replacing the missing fonts.

7. Whenever a drawing with missing fonts is reloaded, the "Missing SHX Files" prompt window will appear.

2.4.1.5 Save Drawing

2.4.1.5.1 Save

Function Description:

Saves a drawing in dwg or dxf format.

Operation Steps:

1. If the drawing has a path, click Vector -> Drawing -> Save. The Output window prompts: File D:\TestData\TestDrawing.dwg saved successfully.

After successful saving, a backup drawing file with the extension .bak is generated in the same directory as the drawing. To view the backup file, simply delete the ".bak" extension to load it into the software for viewing or editing.

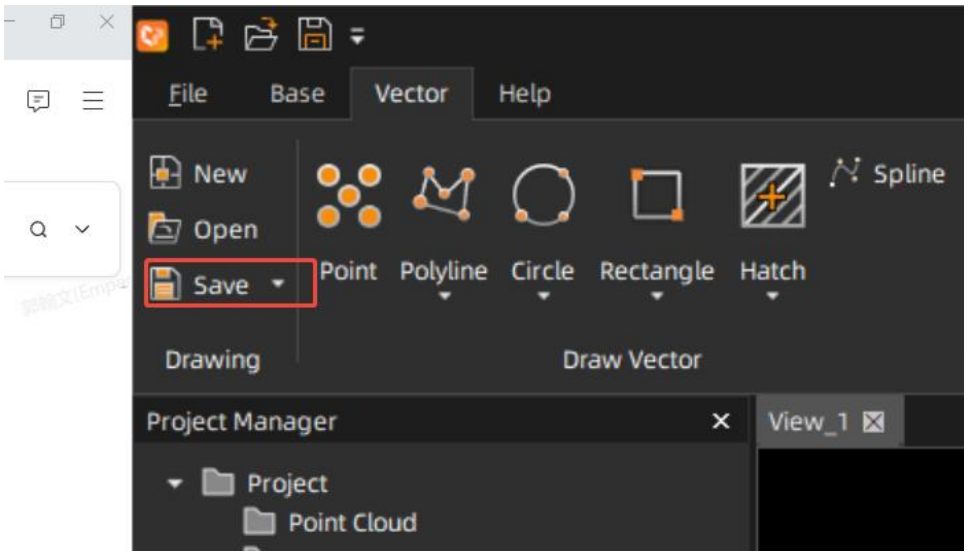


Figure: Save Drawing

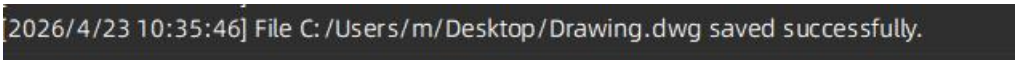


Figure:Save Drawing Prompt Message



Figure: Drawing saving and backup_x0005_

2. If the drawing has not been saved before (e.g., the default drawing "Drawing"), clicking Vector -> Save Drawing will open the Save Drawing dialog box. The default file name is Drawing.dwg. Choose a path, optionally modify the file name, and click Save. The drawing is saved successfully.

After successful saving, a backup drawing file with the extension .bak is generated in the same directory as the drawing. Delete the ".bak" extension to load the backup drawing into the software for viewing or editing.

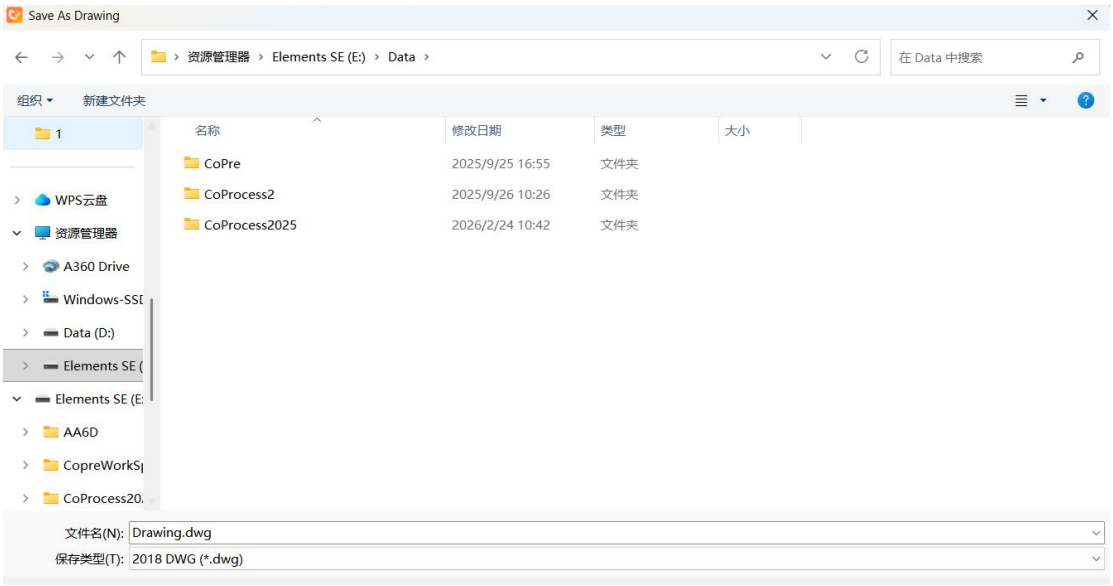
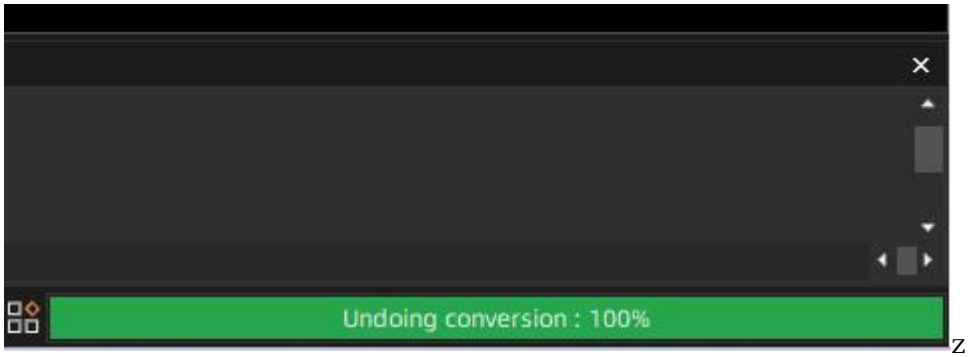


Figure: Drawing saving

3. In a saved drawing or a loaded vector file, after drawing or editing vector features five times, the current active drawing will be saved automatically. During saving, a progress bar appears in the bottom right corner. After successful saving, a save confirmation message is output in the Output window.

If no .bak backup drawing exists in the drawing's directory, the first automatic save will generate a .bak backup file. If a .bak backup file exists, a drawing backup is performed by default every 20 draws or edits. Additionally,

deleting the ".bak" extension allows loading the backup drawing into the so ftware for viewing or editing.



z

Figure: Auto-Save Progress Bar

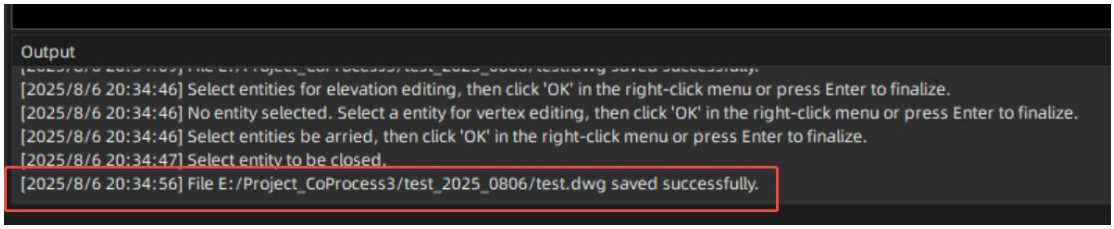


Figure: Auto-Save Prompt

2.4.1.5.2 Save As

Function Description:

Saves the active drawing as a copy with a specified filename and format.

Operation Steps:

1. Click Vector -> Drawing -> Save As. The path save dialog box appears.

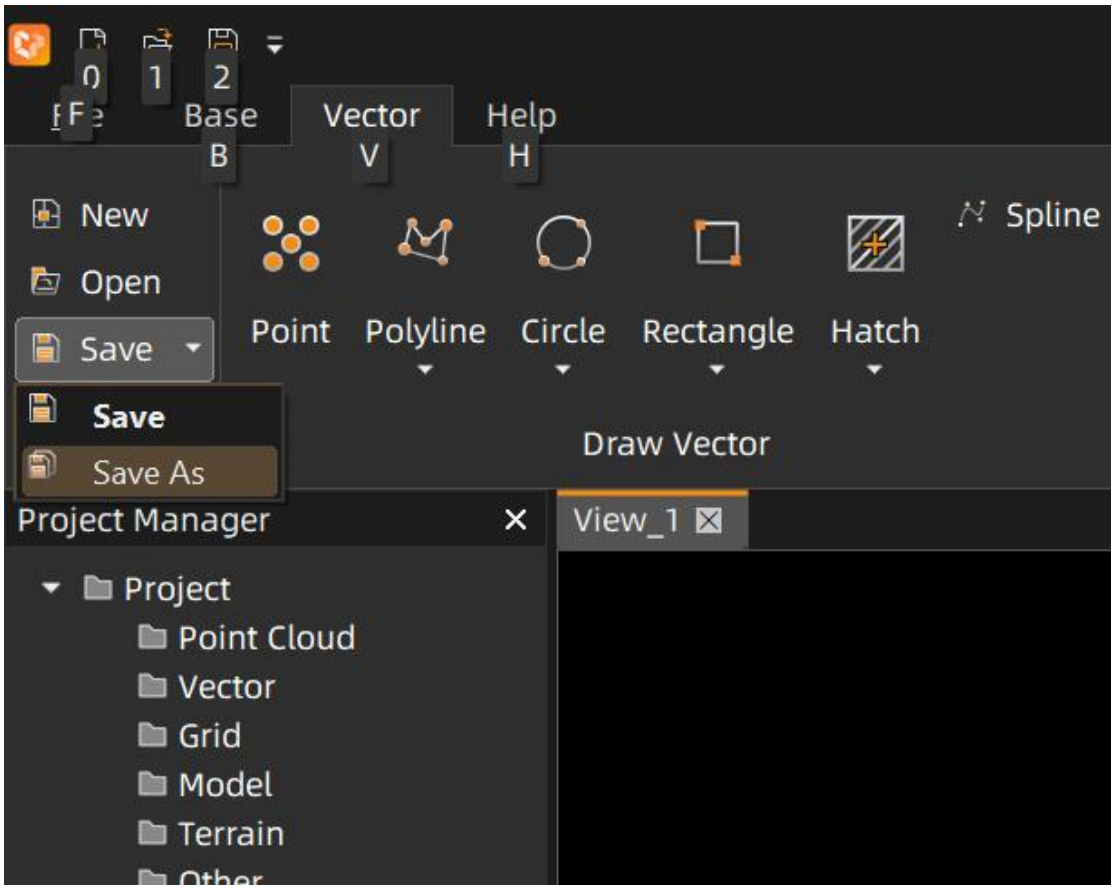


Figure: Save As

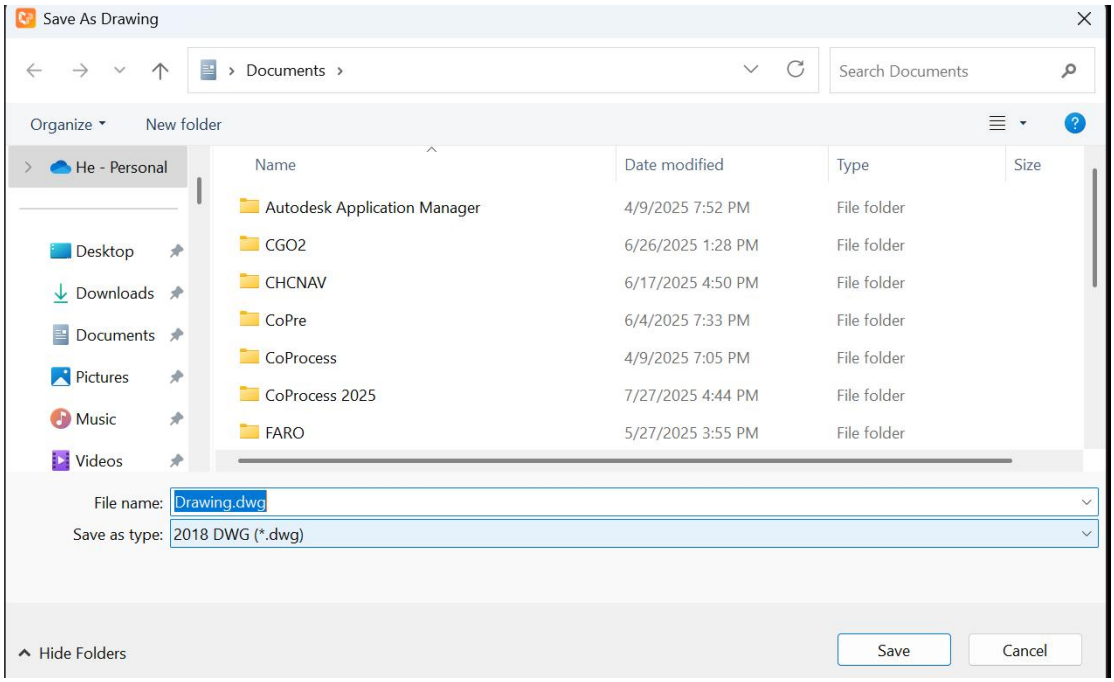


Figure: Saving path dialog box

2. Enter a filename, and select the save format from the "Save as type" dr

opdown. Supports saving as dwg and dxf formats, as shown. The default f ormat is "2018 DWG (*.dwg)".

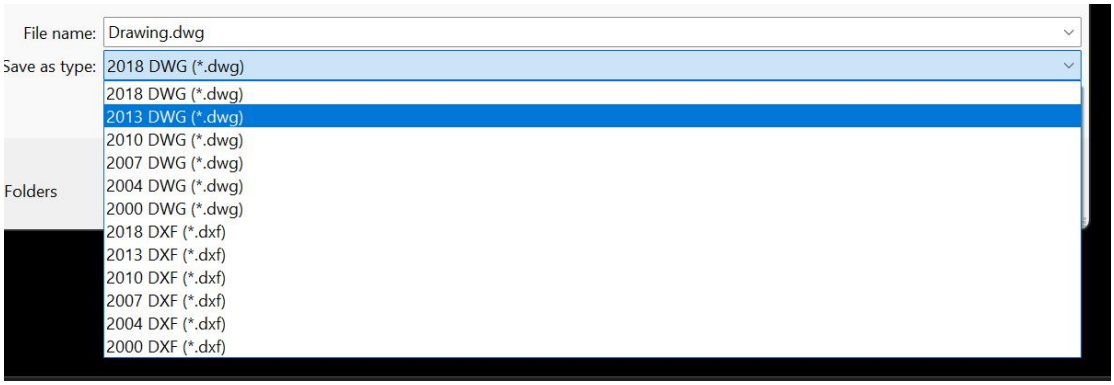


Figure: Save as type

3. Click "Save". The drawing is saved successfully as a copy.

2.4.2 Draw

2.4.2.1 Point

Function Description:

Draws a point in the active drawing.

Operation Steps:

1. Click Vector -> Point.

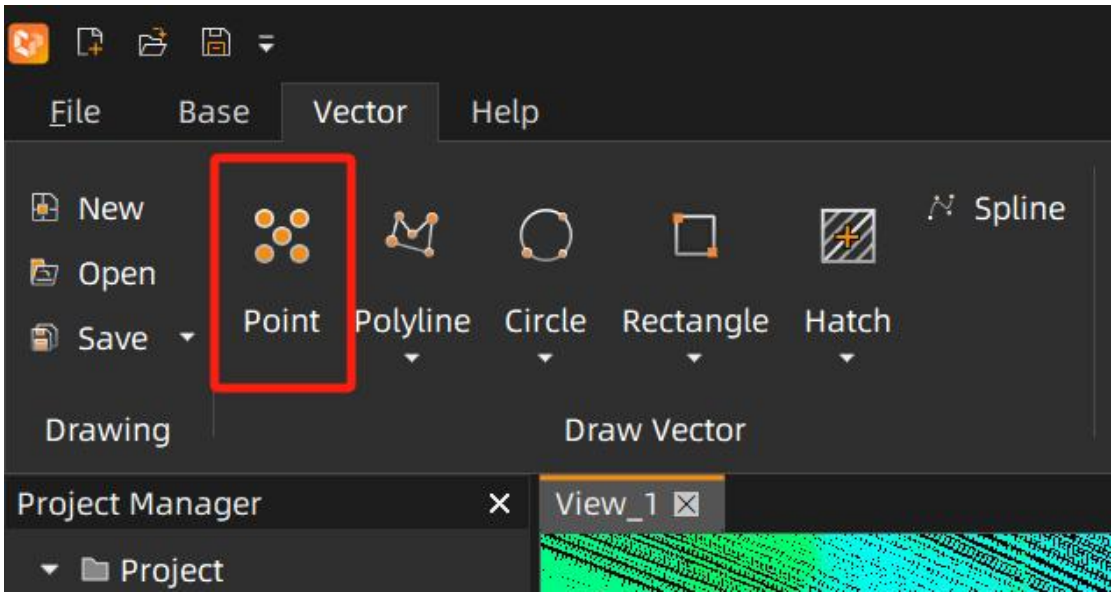


Figure: Point

2. In the view, left-click a point. A point is drawn at the clicked location.

2.4.2.2 Polyline

2.4.2.2.1 Vertex Mode

Function Description:

Draws a polyline in the active drawing by specifying line segment endpoint s.

Operation Steps:

1. Click Vector -> Polyline -> Vertex Mode.

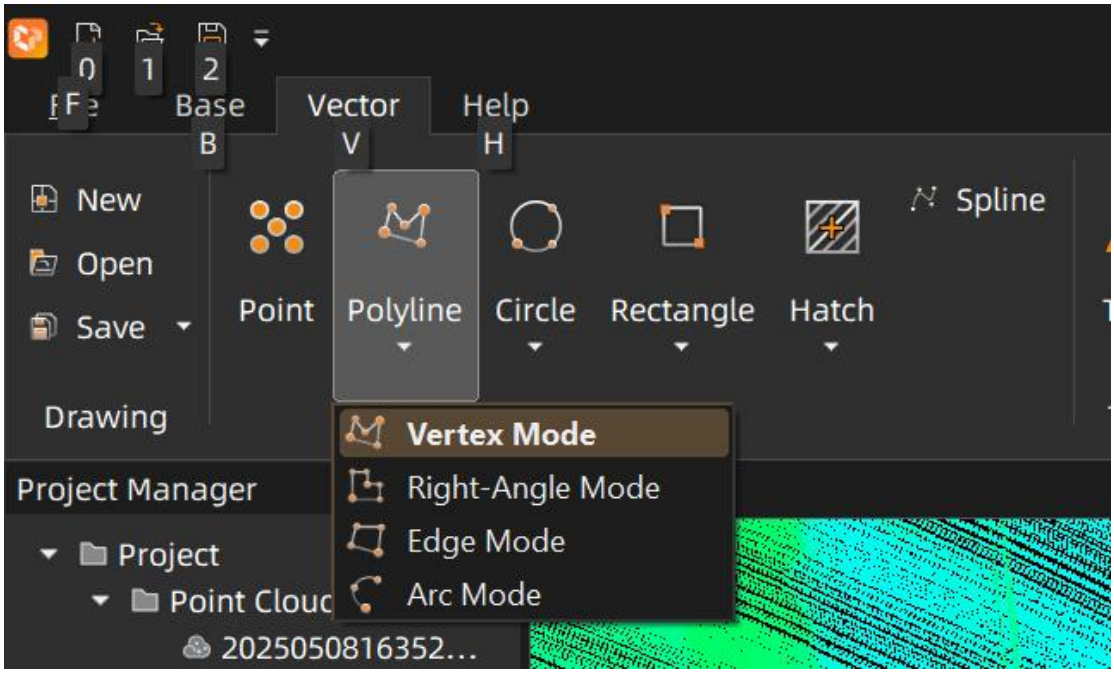


Figure: Vertex Mode

2. In the view, click a point to define the starting point of the polyline.

3. In the view, click to specify the next endpoint. Continue drawing as need ed.

4. In the view, press Enter or right-click and select "Confirm" to finish draw ing the polyline. By default, the drawn polyline is not closed. To draw a clo sed polyline, right-click and select "Close" or use shortcut key C to end dra wing, or right-click and check "Auto Close" to draw a closed polyline.

5. While drawing the polyline, right-click and select "Undo Point" or use sho rtcut key U to cancel the previous point drawn.

6. The default is "2D Drawing", where the vector elevation is always constr ained to the same plane during drawing. To draw to the mouse snap posit ion, right-click and select "3D Drawing".

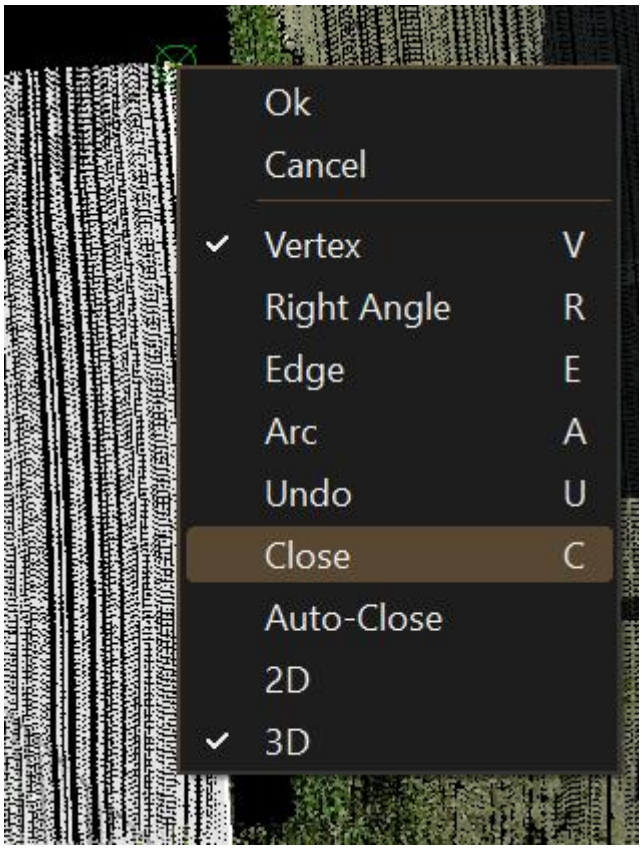


Figure: Right-Click Menu in Vertex Mode

2.4.2.2.2 Right Angle Mode

Function Description:

Draws a polyline in the active drawing by drawing a point to define a segment perpendicular to the previous edge.

Operation Steps:

1. Click Vector -> Polyline -> Right Angle Mode.

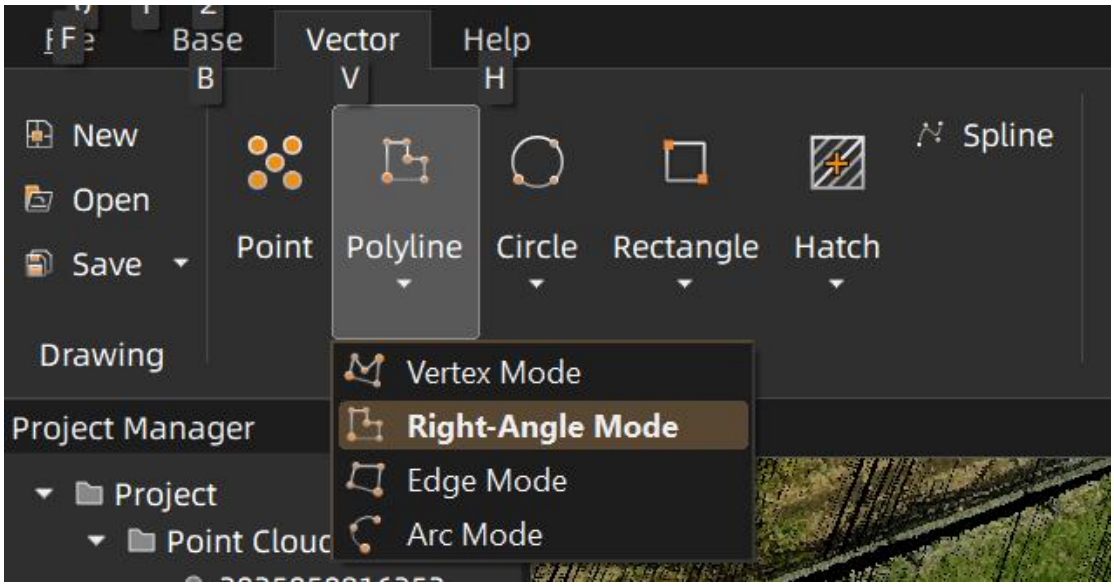


Figure: Right Angle Mode

2. In the view, click two points to define the starting point and the line of the first edge of the polyline.

3. In the view, click a point to define an edge perpendicular to the previous edge. Continue drawing as needed.

4. In the view, press Enter or right-click and select "Confirm" to finish drawing the polyline. By default, the drawn polyline is not closed. To draw a closed polyline, right-click and select "Close" or use shortcut key C to end drawing, or right-click and check "Auto Close" to draw a closed polyline.

5. While drawing the polyline, right-click and select "Undo Point" or use shortcut key U to cancel the previous point drawn.

6. The default is "2D Drawing". In Right Angle Mode, the vector elevation is always constrained to the same plane during drawing for both "2D Drawing" and "3D Drawing".



Figure: Right-Click Menu in Right Angle Mode

Note:

1. When Auto Close is checked: The first point connects perpendicularly to the last edge to close.

2. When Auto Close is not checked: Pressing C or right-clicking "Close" connects the first and last points directly to close.

2.4.2.2.3 By Edge Mode

Function Description:

Draws a polyline in the active drawing by drawing two points to define a li

ne segment intersecting the previous edge.

Operation Steps:

1. Click Vector -> Polyline -> By Edge Mode.

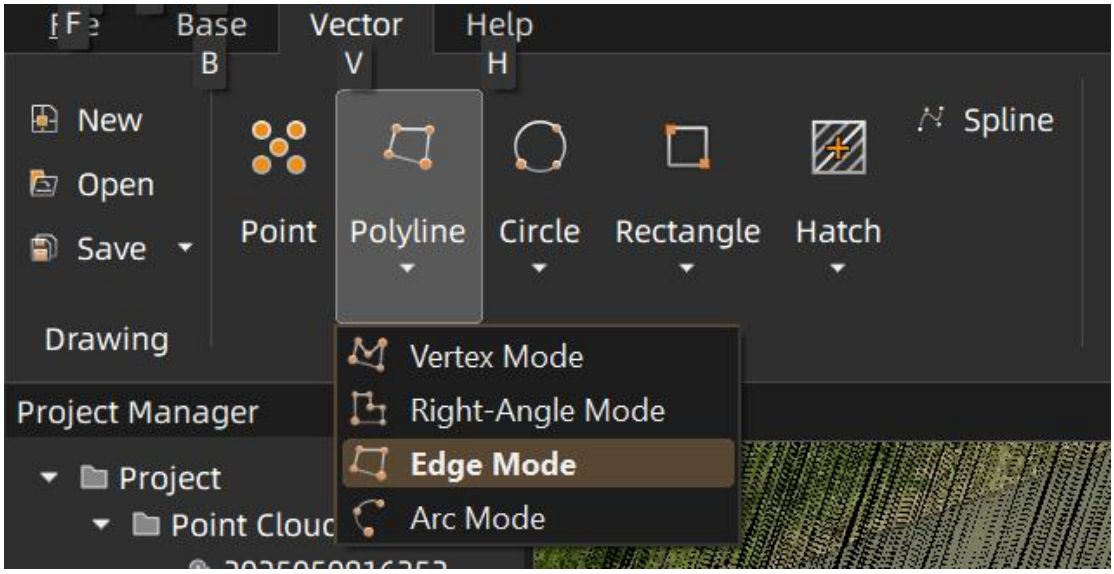


Figure: Edge Mode

2. In the view, click two points to define the first edge of the polyline.

3. In the view, click a point. This point and the current mouse position determine the line intersecting the previous edge. After clicking another point at the mouse position, the line defined by the two clicked points intersects the previous edge. Continue drawing as needed.

4. In the view, press Enter or right-click and select "Confirm" to finish drawing the polyline. By default, the drawn polyline is not closed. To draw a closed polyline, right-click and select "Close" or use shortcut key C to end drawing, or right-click and check "Auto Close" to draw a closed polyline.

5. While drawing the polyline, right-click and select "Undo Point" or use shortcut key U to cancel the previous point drawn.

6. The default is "2D Drawing". In By Edge Mode, the vector elevation is always constrained to the same plane during drawing for both "2D Drawing" and "3D Drawing".

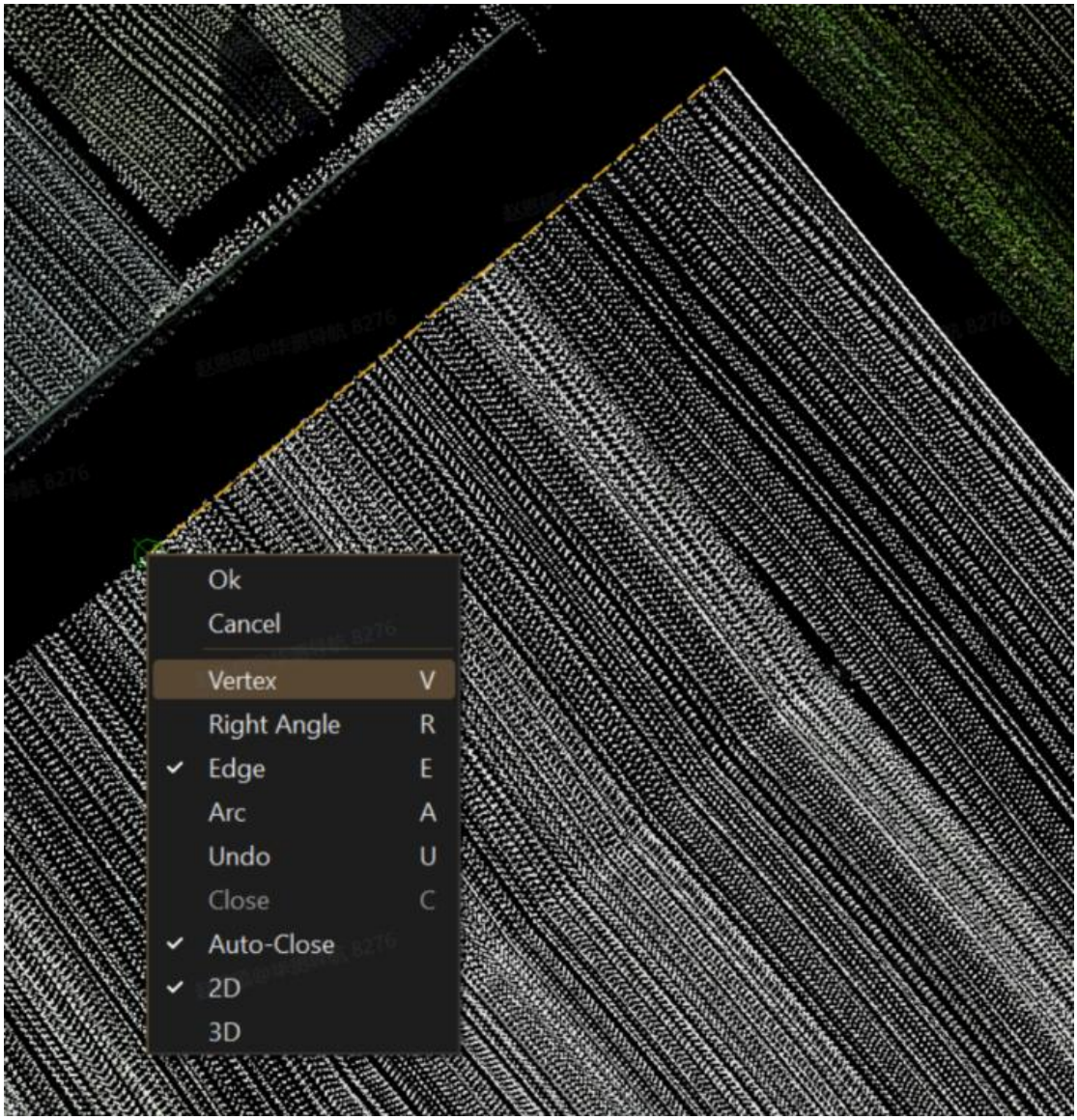


Figure: Right-Click Menu in Edge Mode

Note:

1. When Auto Close is checked: The last edge intersects the first edge to close. If the first edge and the last edge are parallel, the first and last points are connected directly to close.

2. When Auto Close is not checked: Pressing C or right-clicking "Close" con

nects the first and last points directly to close.

2.4.2.2.4 Arc Mode

Function Description:

Draws a polyline in the active drawing by drawing three points to define a n arc.

Operation Steps:

1. Click Vector -> Polyline -> Arc Mode.

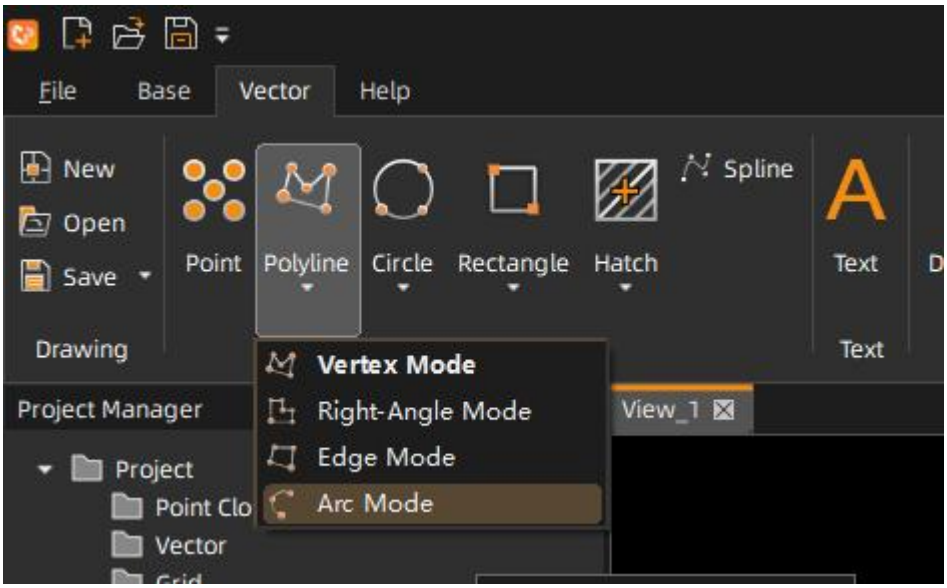


Figure: Arc Mode

2. In the view, click a point to define the start point of the arc.

3. In the view, click a point to define the end point of the arc.

4. In the view, click a point to define the direction and size of the arc. Con tinue drawing as needed. When continuing, the end point of the previous a rc serves as the start point.

5. In the view, press Enter or right-click and select "Confirm" to finish draw ing the polyline. By default, the drawn polyline is not closed. To draw a clo

sed polyline, right-click and select "Close" to end drawing, or right-click and check "Auto Close" to draw a closed polyline.

6. While drawing the polyline, right-click and select "Undo Point" or use shortcut key U to cancel the previous point drawn.

7. The default is "2D Drawing". The drawn arc is a true arc, and the vector elevation is always constrained to the same plane during drawing. To draw to the mouse snap position, right-click and select "3D Drawing". When drawing the start and end points, they snap to the mouse position. The drawn arc is then not a true arc but a 3D polyline composed of multiple line segments forming an arc. The elevation of the intermediate arc segments is interpolated from the elevations of the arc's start and end points.

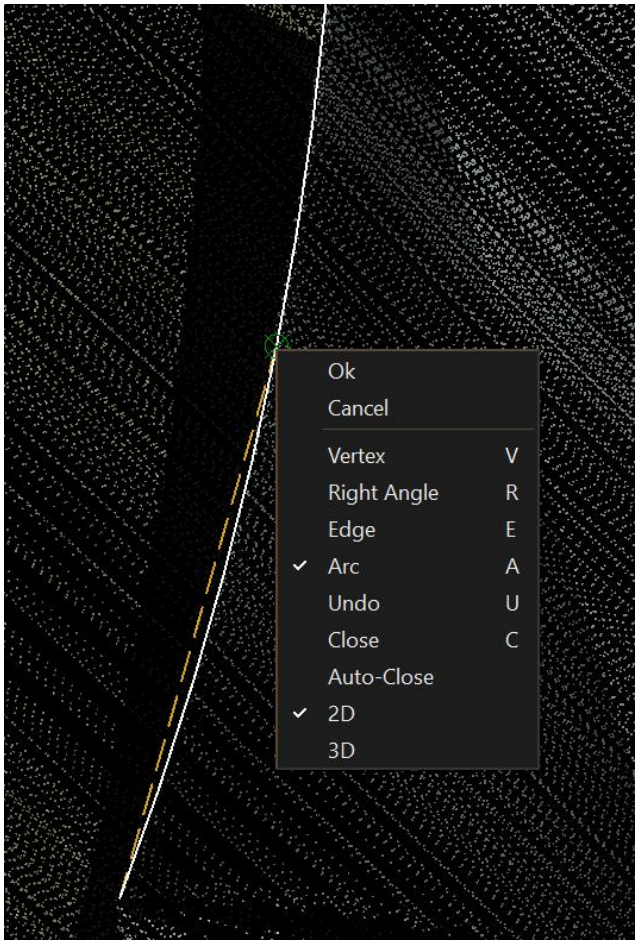


Figure: Right-Click Menu in Arc Mode

2.4.2.2.5 Drawing Mode Switching

Polyline drawing supports switching between different interaction modes while drawing. The switching effects among the four modes "Vertex Mode, Right Angle Mode, By Edge Mode, Arc Mode" are detailed below.

Vertex to Right Angle:

If you switch to Right Angle Mode after drawing one point in Vertex Mode, the first point serves as the first point for defining the first edge in Right Angle Mode, and you can continue drawing in Right Angle Mode. If you switch to Right Angle Mode after drawing more than two points in Vertex Mode, a perpendicular line is drawn through the last vertex, which serves as the first edge in Right Angle Mode. Continue drawing in Right Angle Mode.

Auto Close checked: The first vertex connects perpendicularly to the last edge to close.

Auto Close unchecked: All resulting edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

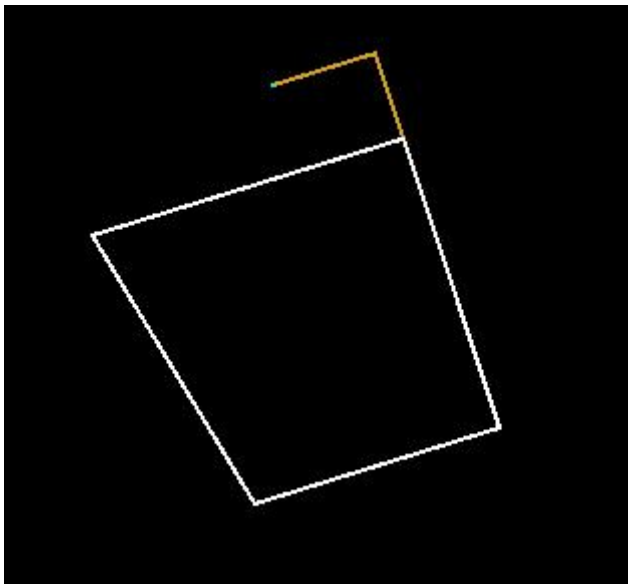


Figure: Vertex to Right Angle - Auto-Close Checked

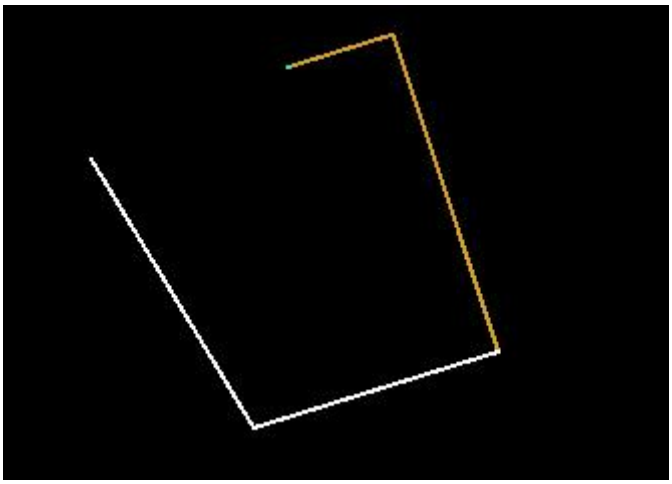


Figure: Vertex to Right Angle - Auto-Close Unchecked

Vertex to By Edge:

If you switch to By Edge Mode while drawing in Vertex Mode, the last poin t becomes the first point in By Edge Mode. Continue drawing in By Edge Mode.

Auto Close checked: When the last edge is defined by clicking two points, the first and last points connect directly to close. When the last edge is d efined by clicking one point, the extension line from the first point to the l ast point intersects the last edge to close.

Auto Close unchecked: All resulting edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

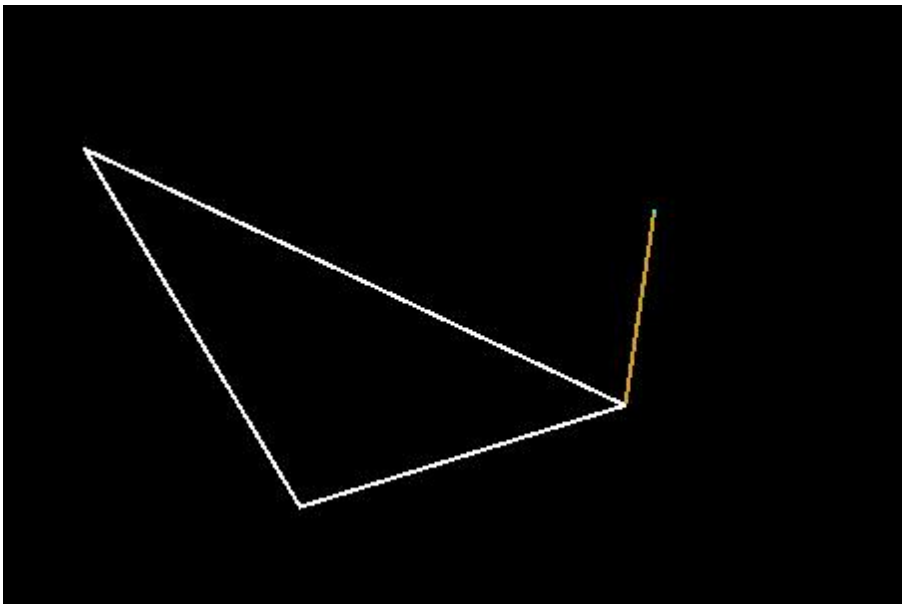


Figure: Vertex to Edge - Auto-Close Checked

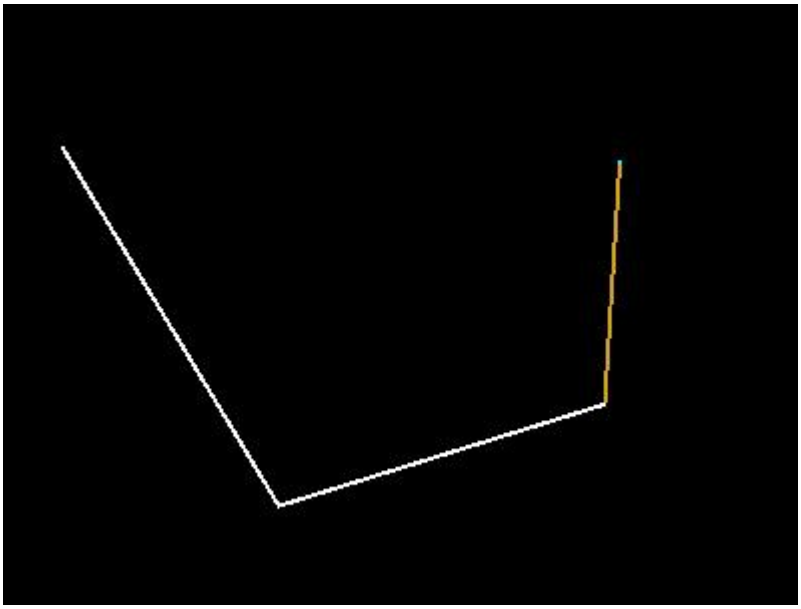


Figure: Vertex to Edge - Auto-Close Unchecked

Vertex to Arc:

If you switch to Arc Mode while drawing in Vertex Mode, the last point bec omes the start point of the arc. Continue drawing in Arc Mode.

Auto Close checked: The first vertex connects directly to the end point of the last arc to close.

Auto Close unchecked: All edges and confirmed arcs are retained. If you press C or right-click Close, the first and last points connect directly to clos e.

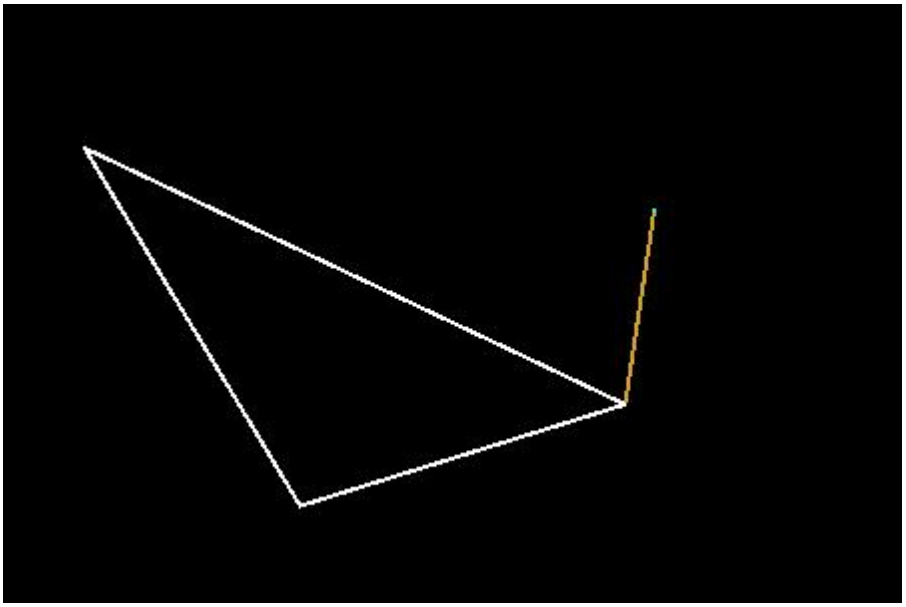


Figure: Vertex to Arc - Auto-Close Checked

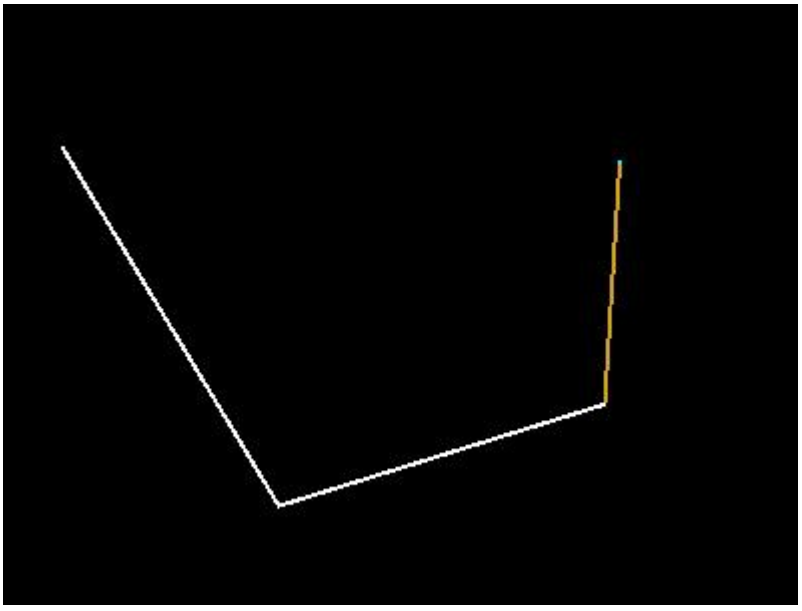


Figure: Vertex to Arc - Auto-Close Unchecked

Right Angle to Vertex:

If you switch to Vertex Mode after drawing one point in Right Angle Mode, the drawn vectors are cleared. If you switch to Vertex Mode after drawing more than two points in Right Angle Mode, all edges are retained. The first drawn point is projected onto the last edge. Continue drawing in Vertex Mode.

Auto Close checked: The first and last points connect directly to close.

Auto Close unchecked: All edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

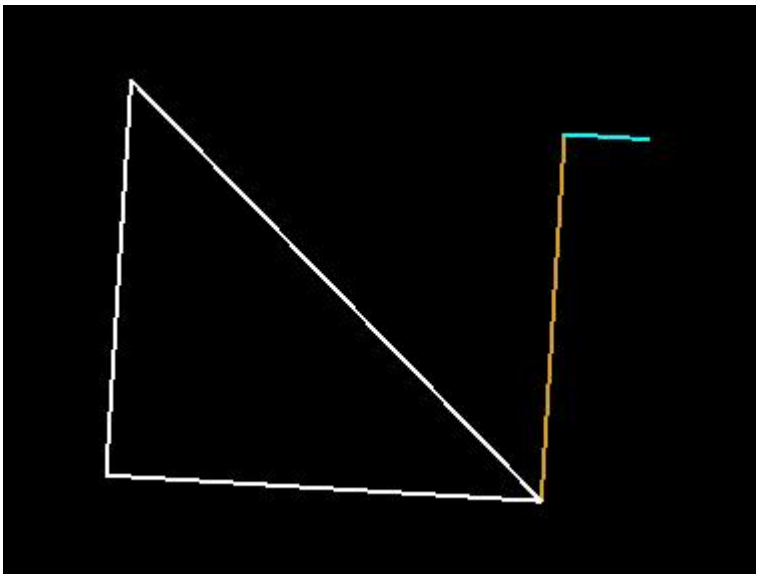


Figure: Right Angle to Vertex - Auto-Close Checked

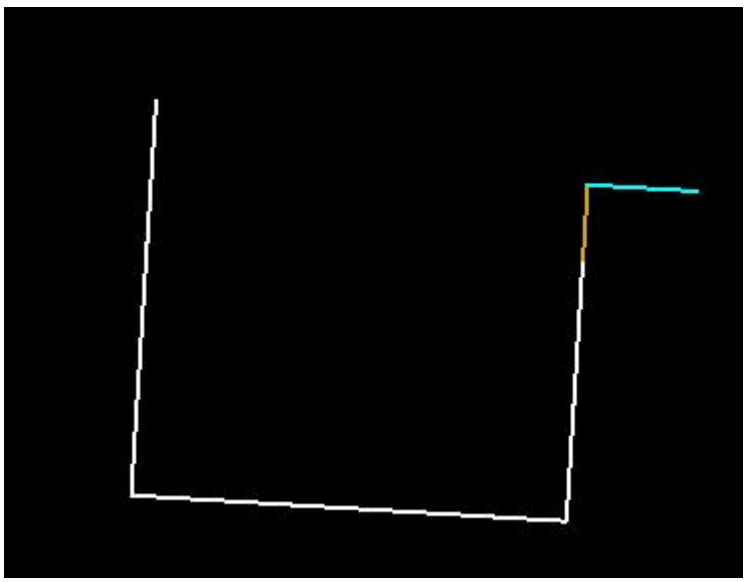


Figure: Right Angle to Vertex - Auto-Close Unchecked

Right Angle to By Edge:

If you switch to By Edge Mode after drawing one point in Right Angle Mod e, the first point is retained as the first point in By Edge Mode. Continue d rawing. If you switch to By Edge Mode after drawing more than two points in Right Angle Mode, all edges are retained. Continue drawing in By Edge Mode.

Auto Close checked: The last edge intersects the first edge to close. If the first edge and the last edge are parallel, the first and last points connect directly to close.

Auto Close unchecked: All edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

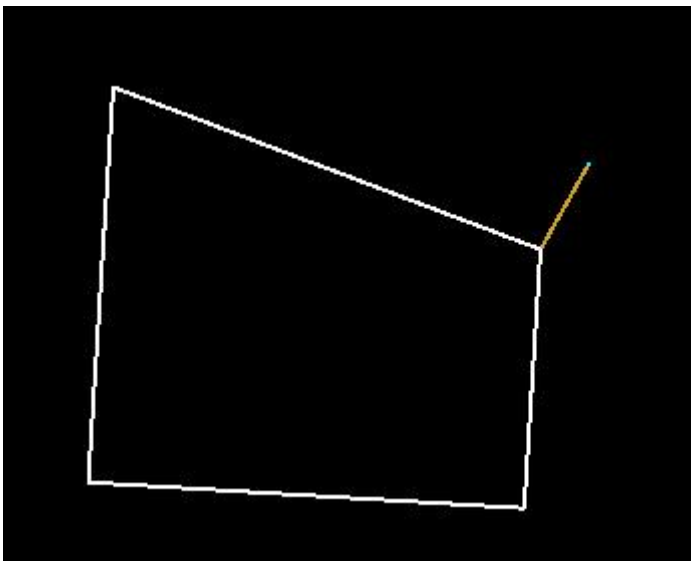


Figure: Right Angle to Edge - Auto-Close Checked

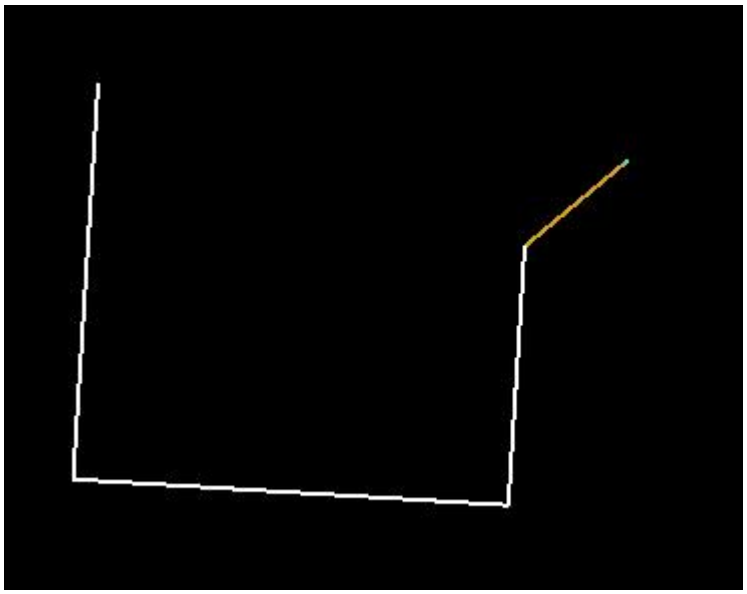


Figure: Right Angle to Edge - Auto-Close Unchecked

Right Angle to Arc:

If you switch to Arc Mode after drawing one point in Right Angle Mode, th e drawn vectors are cleared. If you switch to Arc Mode after drawing more than two points in Right Angle Mode, all edges are retained. The first dra wn point is projected onto the last edge as the start point of the arc. Cont inue drawing in Arc Mode.

Auto Close checked: The first point connects directly to the end point of t he last arc to close.

Auto Close unchecked: All edges and confirmed arcs are retained. If you press C or right-click Close, the first and last points connect directly to clos e.

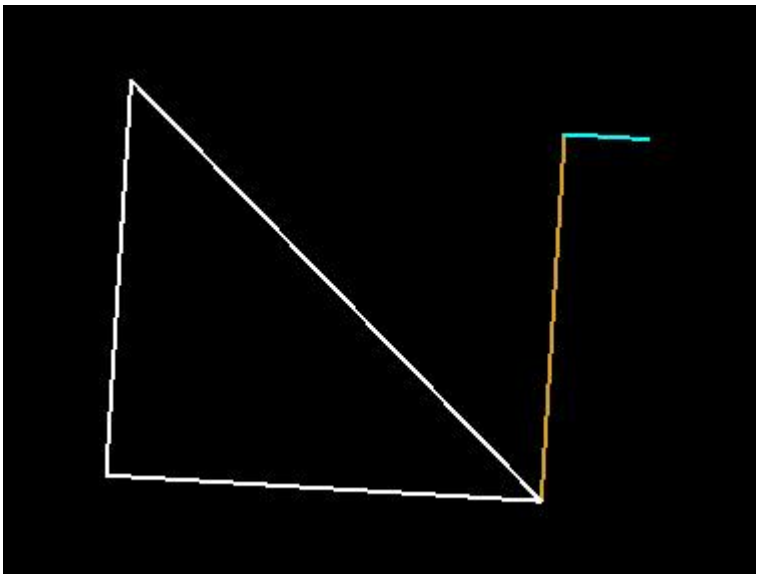


Figure: Right Angle to Arc - Auto-Close Checked

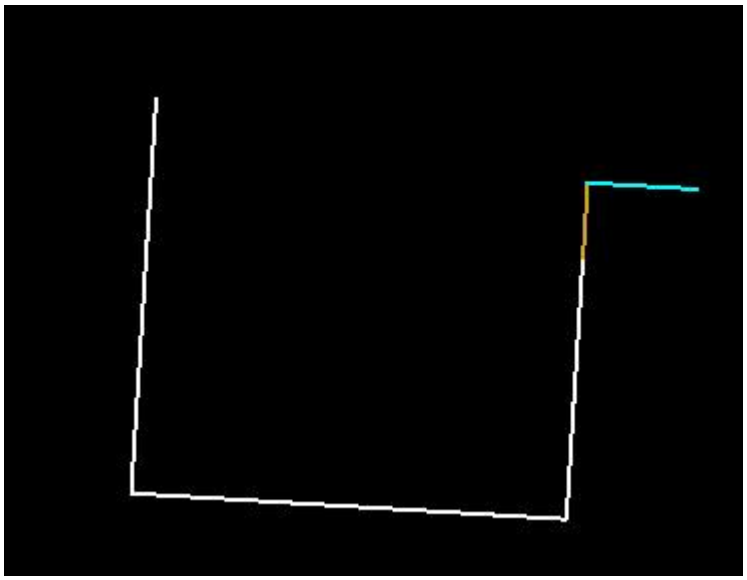


Figure: Right Angle to Arc - Auto-Close Unchecked

By Edge to Vertex:

If you switch to Vertex Mode after drawing one point in By Edge Mode, th e drawn vectors are cleared. If you switch to Vertex Mode after drawing m ore than two points in By Edge Mode, all edges defined by two points are retained. The first drawn point is projected onto the last edge. Continue dr awing in Vertex Mode.

Auto Close checked: The first and last points connect directly to close.

Auto Close unchecked: All edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

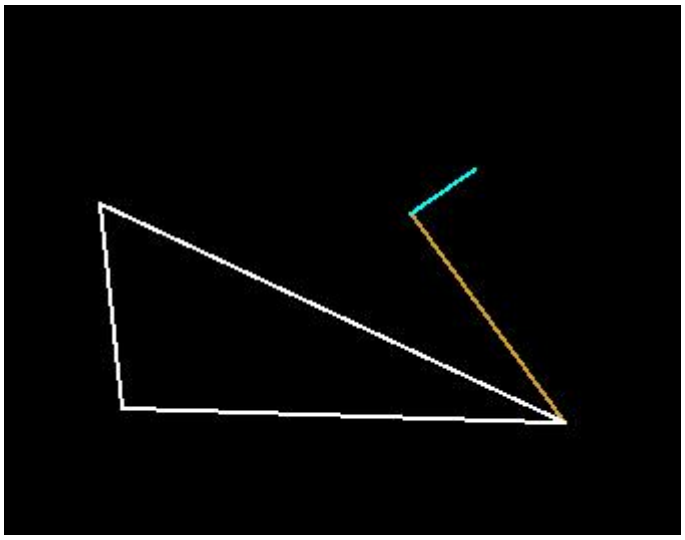


Figure: Edge to Vertex - Auto-Close Checked

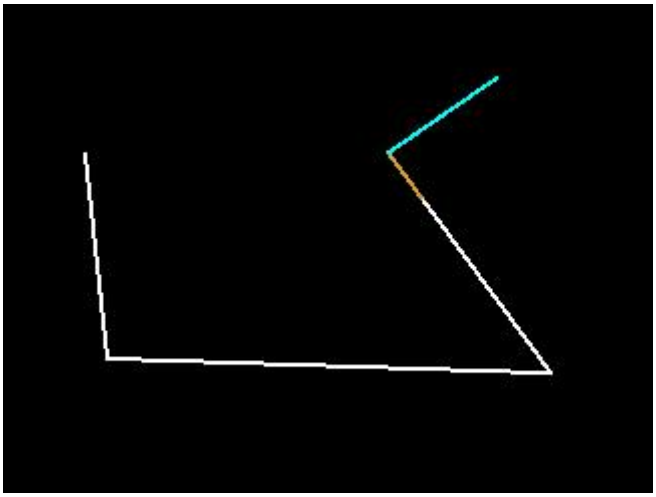


Figure: Edge to Vertex - Auto-Close Unchecked

By Edge to Right Angle:

If you switch to Right Angle Mode after drawing one point in By Edge Mode, the first point is retained as the first point for the first edge in Right Angle Mode. Continue drawing. If you switch to Right Angle Mode after drawing more than two points in By Edge Mode, all edges defined by two points are retained. The last edge serves as the first edge in Right Angle Mode.

Continue drawing.

Auto Close checked: The first point connects perpendicularly to the last ed ge to close.

Auto Close unchecked: All edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

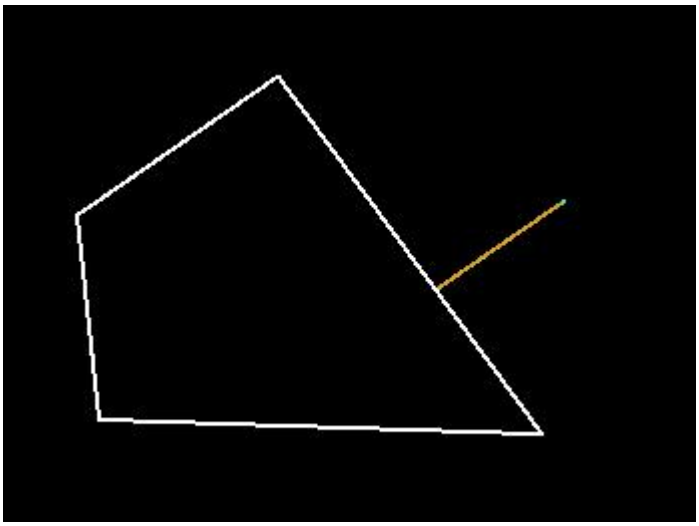


Figure: Edge to Right Angle - Auto-Close Checked

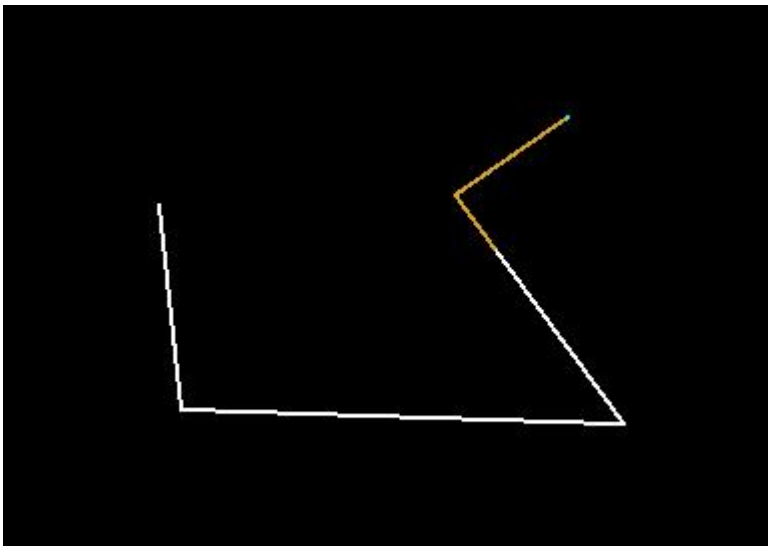


Figure: Edge to Right Angle - Auto-Close Unchecked

By Edge to Arc:

If you switch to Arc Mode after drawing one point in By Edge Mode, the d rawn vectors are cleared. If you switch to Arc Mode after drawing more th

an two points in By Edge Mode, all edges defined by two points are retain ed. The first drawn point is projected onto the last edge as the start point of the arc. Continue drawing in Arc Mode.

Auto Close checked: The first point connects directly to the end point of t he last arc to close.

Auto Close unchecked: All edges and confirmed arcs are retained. If you press C or right-click Close, the first and last points connect directly to clos e.

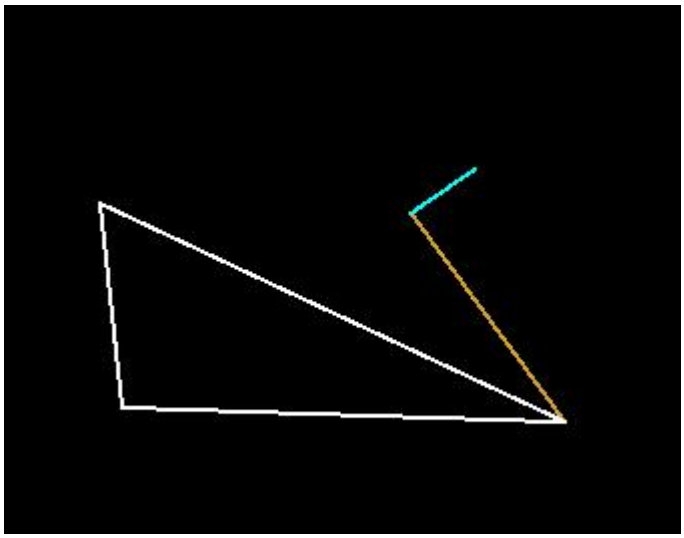


Figure: Edge to Arc - Auto-Close Checked

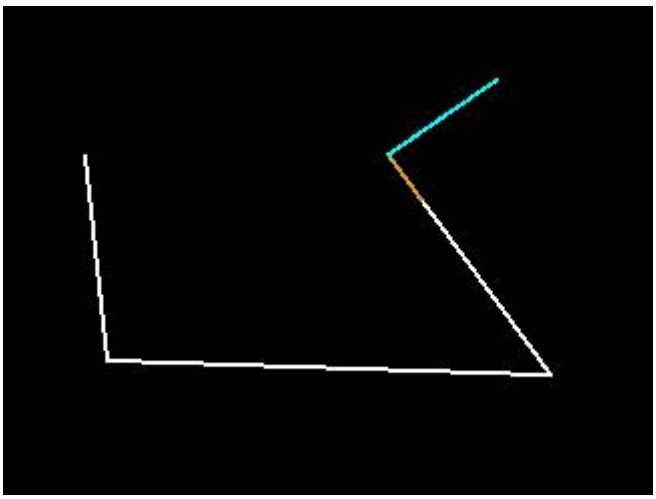


Figure: Edge to Arc - Auto-Close Unchecked

Arc to Vertex:

When switching to Vertex Mode while drawing in Arc Mode, continue drawing from the end point of the confirmed arc. The unconfirmed part of the arc is not retained.

Auto Close checked: The first and last points connect directly to close.

Auto Close unchecked: The confirmed arc and all edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

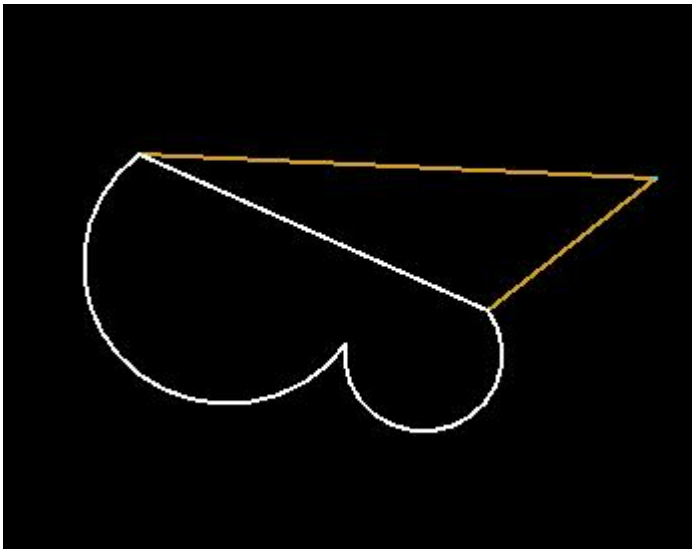


Figure: Arc to Vertex - Auto-Close Checked

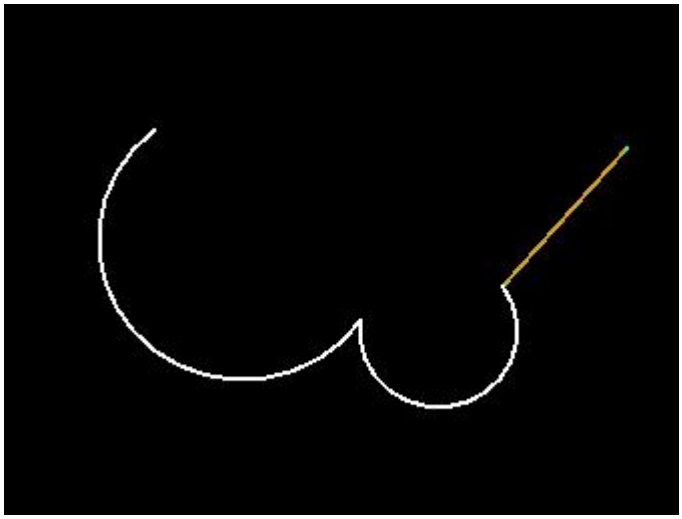


Figure: Arc to Vertex - Auto-Close Unchecked

Arc to Right Angle:

When switching to Right Angle Mode while drawing in Arc Mode, the end point of the confirmed arc directly serves as the first point for defining the first edge in Right Angle Mode. Continue drawing in Right Angle Mode. The unconfirmed part of the arc is not retained.

Auto Close checked: The first point connects perpendicularly to the last edge to close.

Auto Close unchecked: The confirmed arc and all edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

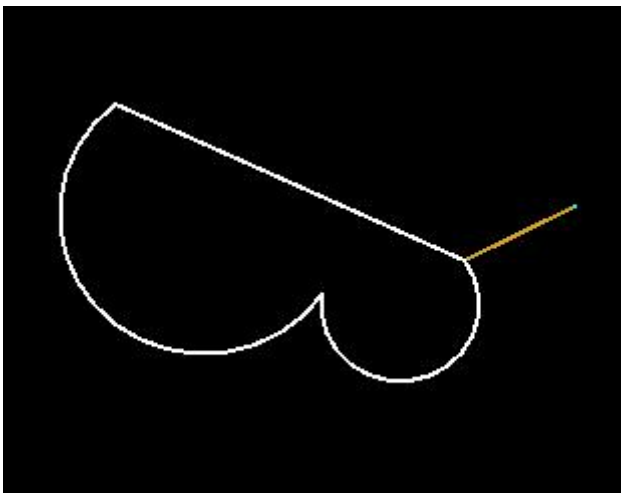


Figure: Arc to Right Angle - Auto-Close Checked

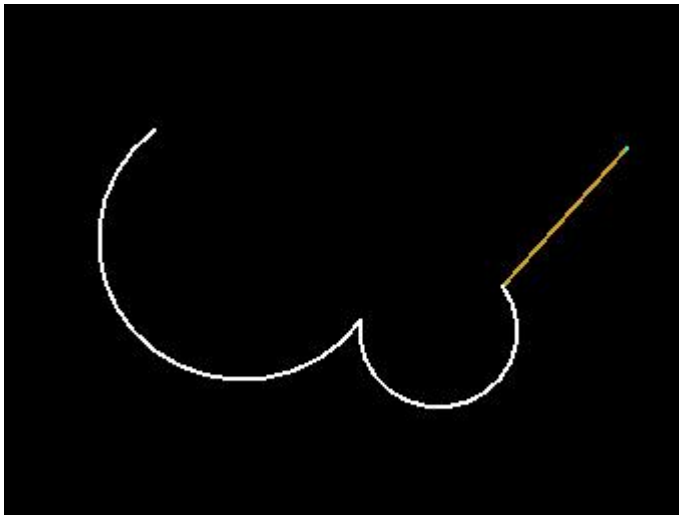


Figure: Arc to Right Angle - Auto-Close Unchecked

Arc to By Edge:

When switching to By Edge Mode while drawing in Arc Mode, the end point of the confirmed arc directly serves as the first point in By Edge Mode. Continue drawing in By Edge Mode. The unconfirmed part of the arc is not retained.

Auto Close checked: When the last edge is defined by clicking two points, the first and last points connect directly to close. When the last edge is defined by clicking one point, the extension line from the first point to the last point intersects the last edge to close.

Auto Close unchecked: The confirmed arc and all edges are retained. If you press C or right-click Close, the first and last points connect directly to close.

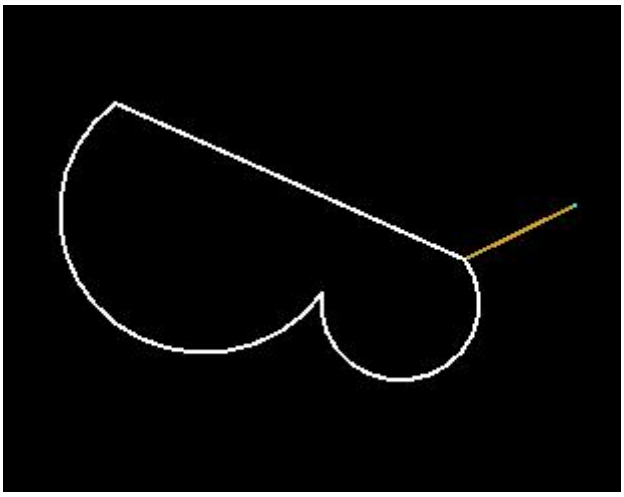


Figure: Arc to Edge - Auto-Close Checked

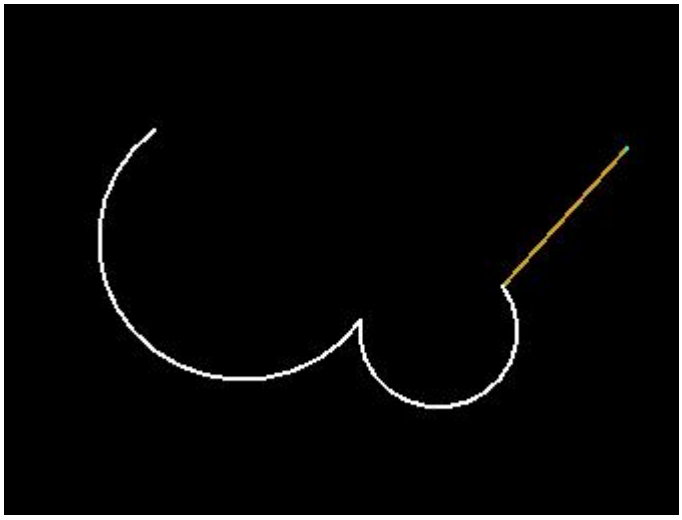


Figure: Arc to Edge - Auto-Close Unchecked

2.4.2.3 Circle

2.4.2.3.1 Three-Point Circle

Function Description:

Draws a circle in the active drawing by defining three points on its circumf erence.

Operation Steps:

1. Click Vector -> Circle -> Three-Point Circle.

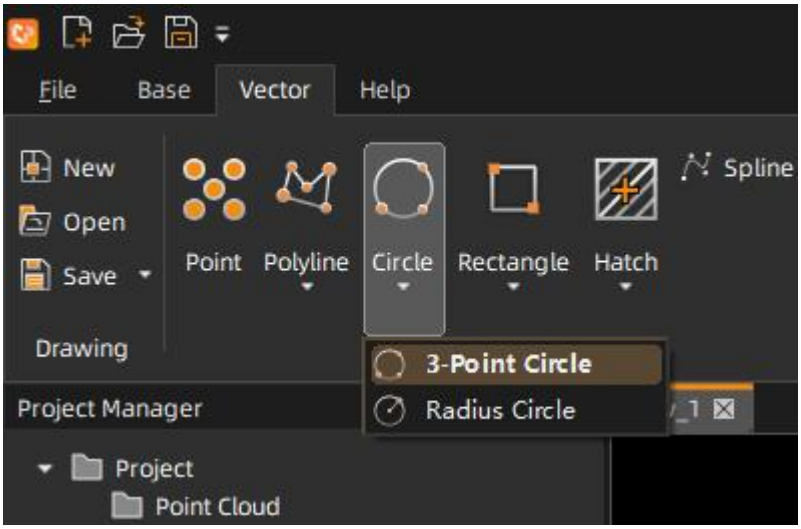


Figure: Three-Point Circle

2. In the view, click three points to define a circle.

3. While drawing the circle, right-click and select "Undo Point" to undo one point.

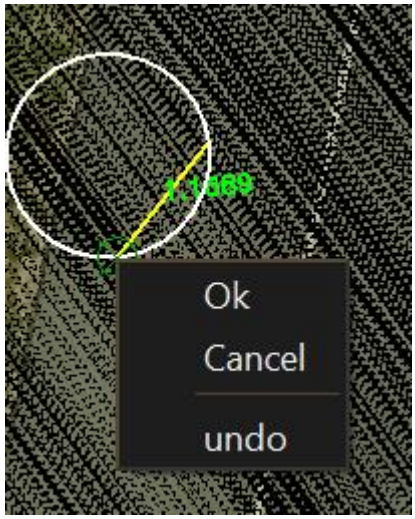


Figure: Right-Click Menu for Three-Point Circle

4. The default drawing mode is "2D Drawing". A circle drawn in 2D mode lies in a plane parallel to the XY plane, and its vector elevation matches the elevation snapped to at the first point. Selecting "3D Drawing" means the

reference plane for the drawn circle is determined by the three points clicked during drawing.

5. Before drawing, you can right-click to switch to "Radius Circle" drawing.

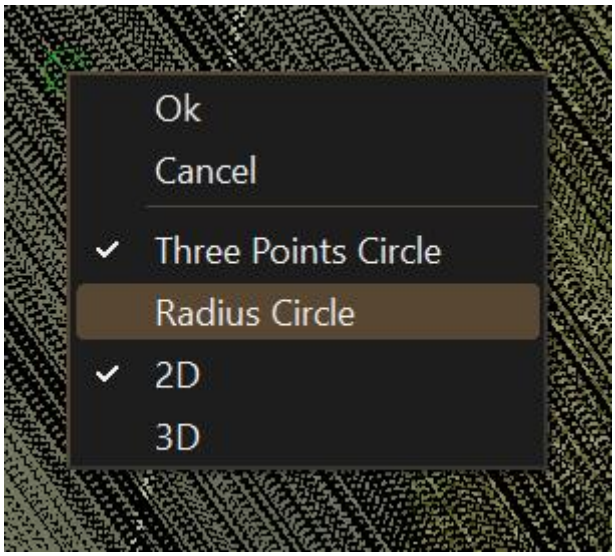


Figure: Right-Click Menu Before Drawing Three-Point Circle

2.4.2.3.2 Radius Circle

Function Description:

Draws a circle in the active drawing by defining its center and radius using two points.

Operation Steps:

1. Click Vector -> Circle -> Radius Circle.

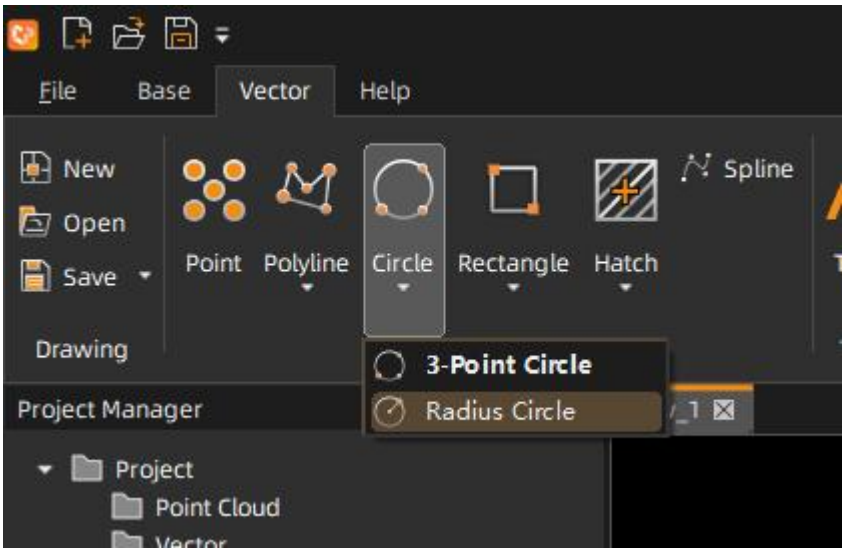


Figure: Radius Circle

2. In the view, click two points to define a circle.

3. While drawing the circle, right-click and select "Undo Point" to undo one point.

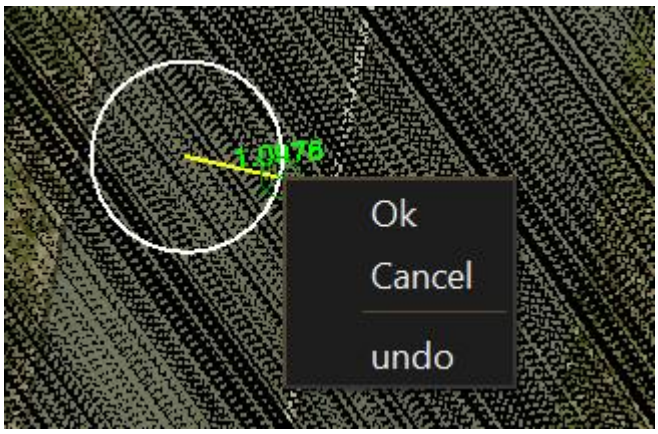


Figure: Right-Click Menu for Radius Circle

4. The default drawing mode is "2D Drawing". A circle drawn in 2D mode lies in a plane parallel to the XY plane, and its vector elevation matches the elevation snapped to at the first point. Selecting "3D Drawing" yields the same result as 2D Drawing.

5. Before drawing, you can right-click to switch to "Three-Point Circle" drawi

ng.

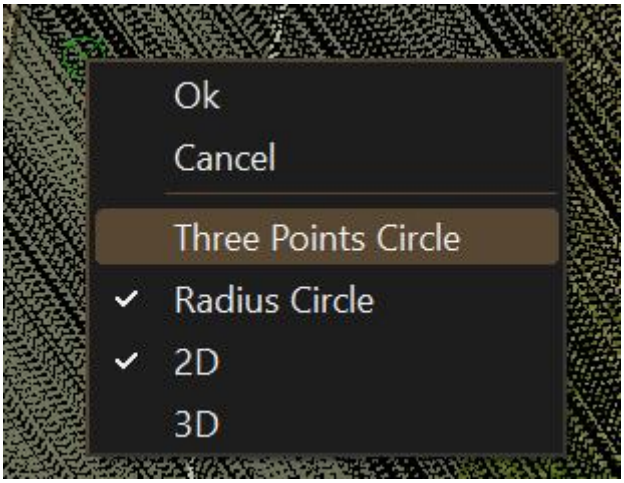


Figure: Right-Click Menu Before Drawing Radius Circle

2.4.2.4 Rectangle

2.4.2.4.1 Two-Point Rectangle

Function Description:

Draws a rectangle in the active drawing by clicking two points.

Operation Steps:

1. Click Vector -> Rectangle -> Two-Point Rectangle.

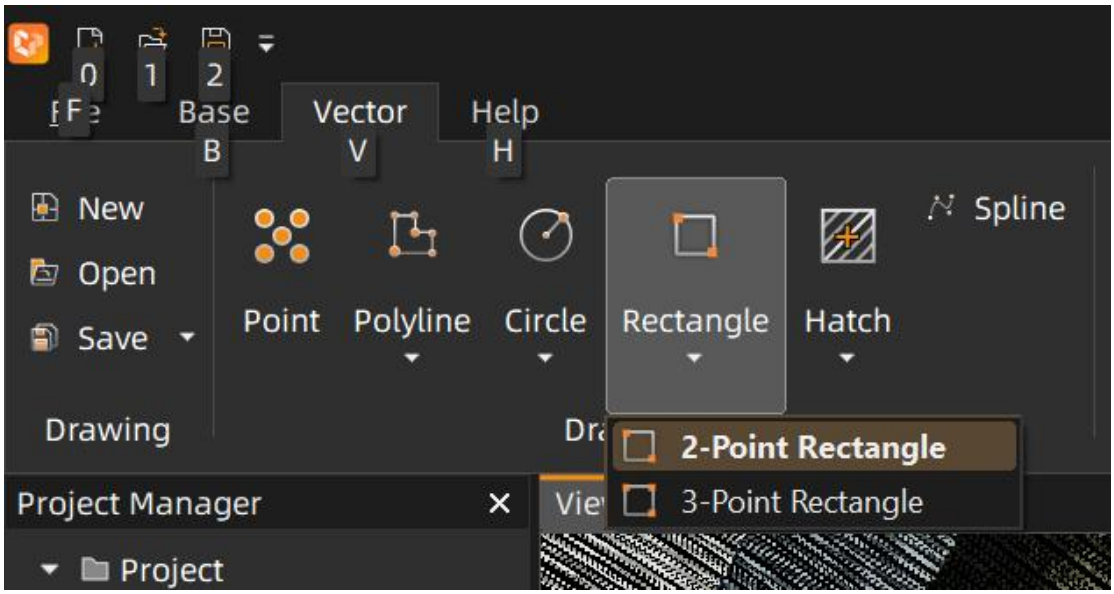


Figure: Two-Point Rectangle

2. In the view, click two points to define a rectangle.

3. While drawing the rectangle, right-click and select "Undo Point" to undo one point.

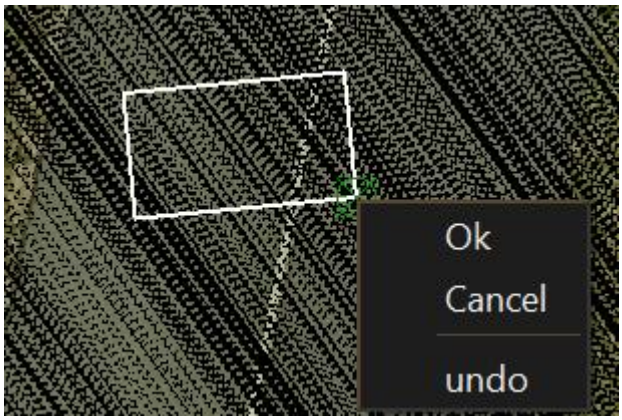


Figure: Right-Click Menu for Two-Point Rectangle

4. The default drawing mode is "2D Drawing". In 2D mode, the drawn rect angle lies in a plane parallel to the XY plane, and its vector elevation matc hes the elevation snapped to at the first point. "3D Drawing" yields the sa me result as 2D Drawing.

5. Before drawing, you can right-click to switch to "Three-Point Rectangle" d

rawing.

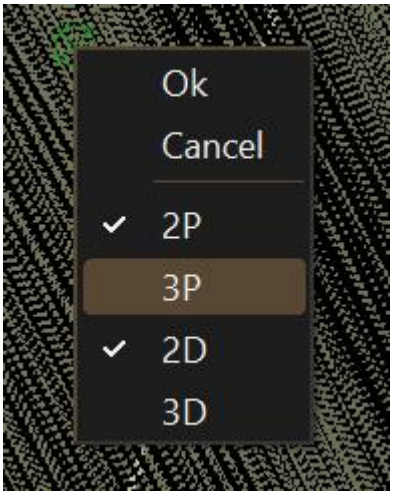


Figure: Right-Click Menu Before Drawing Two-Point Rectangle

2.4.2.4.2 Three-Point Rectangle

Function Description:

Draws a rectangle in the active drawing by clicking three points.

Operation Steps:

1. Click Vector -> Rectangle -> Three-Point Rectangle.

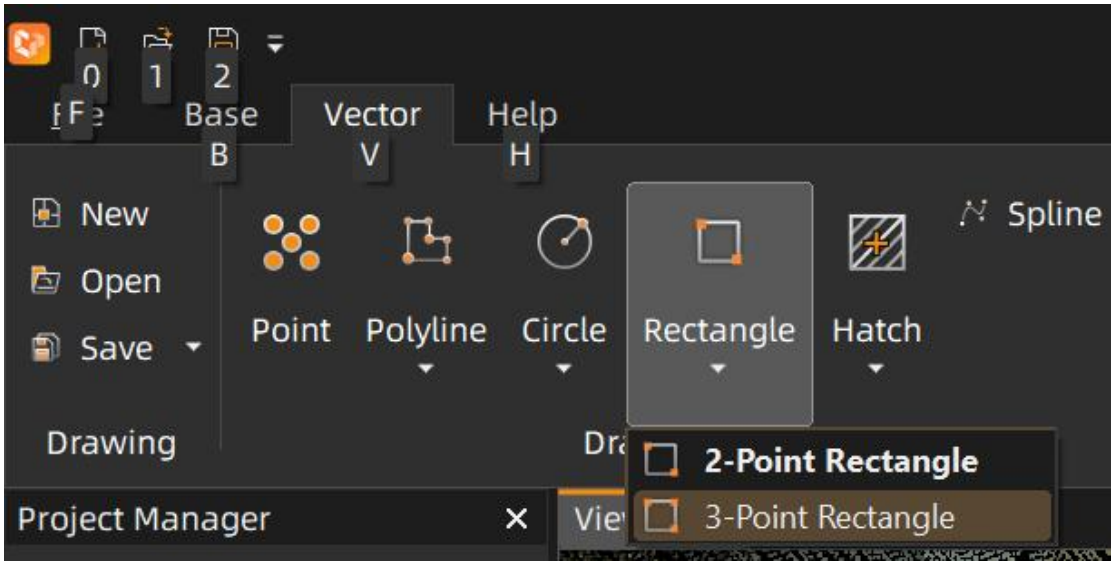


Figure: Three-Point Rectangle

2. In the view, click three points to define a rectangle.

3. While drawing the rectangle, right-click and select "Undo Point" to undo one point.

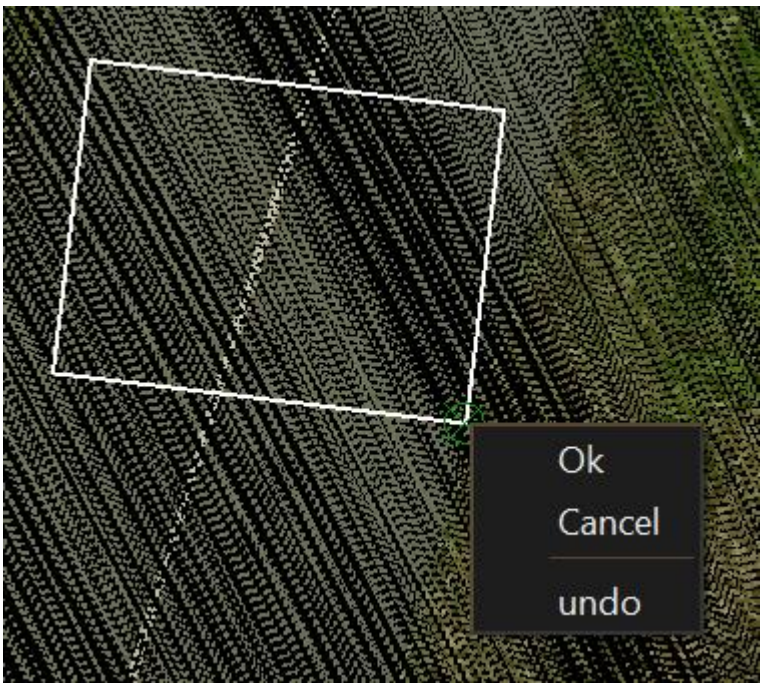


Figure: Right-Click Menu for Three-Point Rectangle

4. The default drawing mode is "2D Drawing". In 2D mode, the drawn rect angle lies in a plane parallel to the XY plane, and its vector elevation matc hes the elevation snapped to at the first point. Selecting "3D Drawing" mea ns the reference plane for the drawn rectangle is determined by the three points clicked during drawing.

5. Before drawing, you can right-click to switch to "Two-Point Rectangle" dr awing.

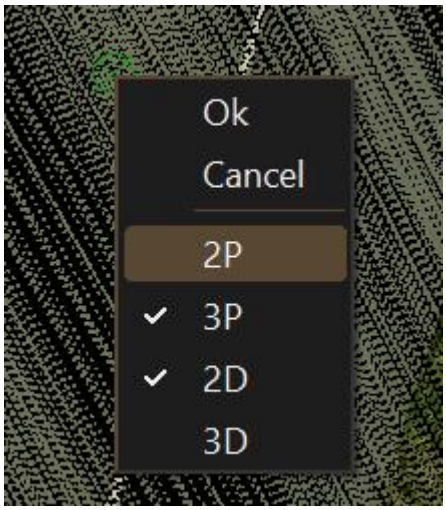


Figure: Right-Click Menu Before Drawing Three-Point Rectangle

2.4.2.5 Hatch

2.4.2.5.1 Pick Internal Point

Function Description:

Hatches a closed vector feature by clicking inside it in the active drawing.

Operation Steps:

1. Click Vector -> Hatch -> Pick Internal Point. The "Hatch Creation" panel a ppears on the right side of the software.

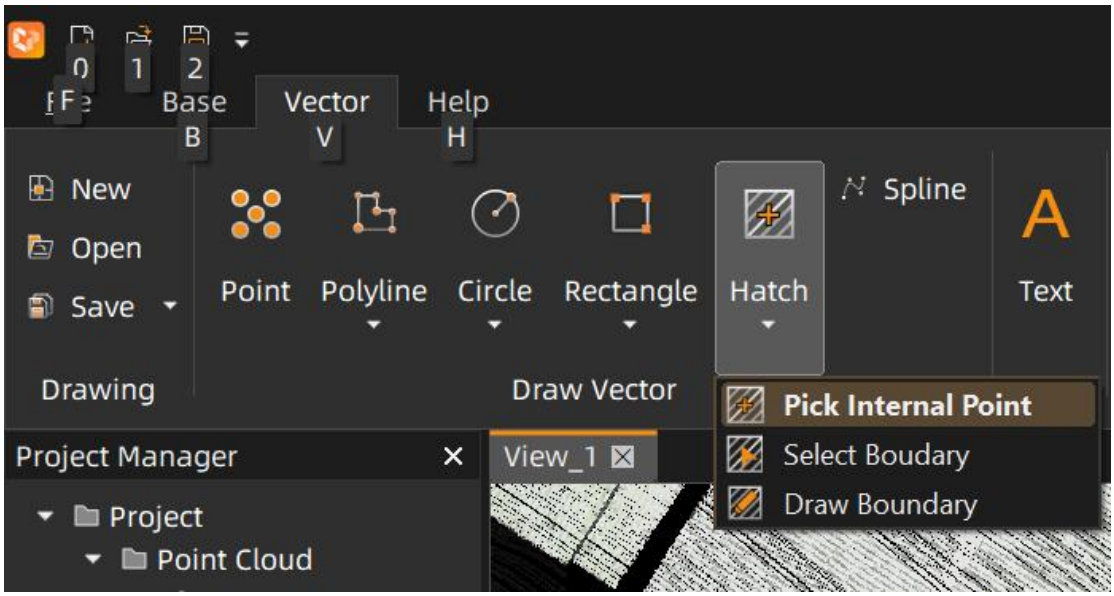


Figure: Pick Internal Point

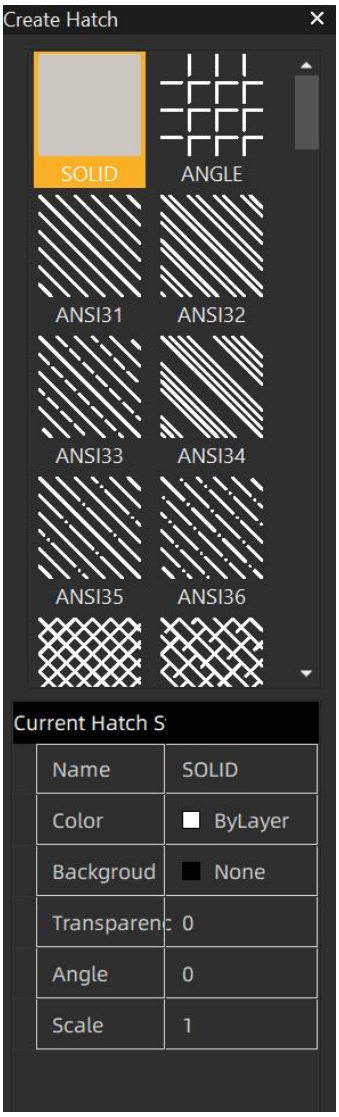


Figure: Create Hatch Panel

2. Select the desired hatch pattern in the "Hatch Creation" panel.

3. Left-click inside the closed vector to be hatched. The interior of the vect or is filled with the selected pattern.

You can edit the current hatch pattern in the "Hatch Creation" panel. See s ection "2.4.6.15 Hatch Editing" for details.

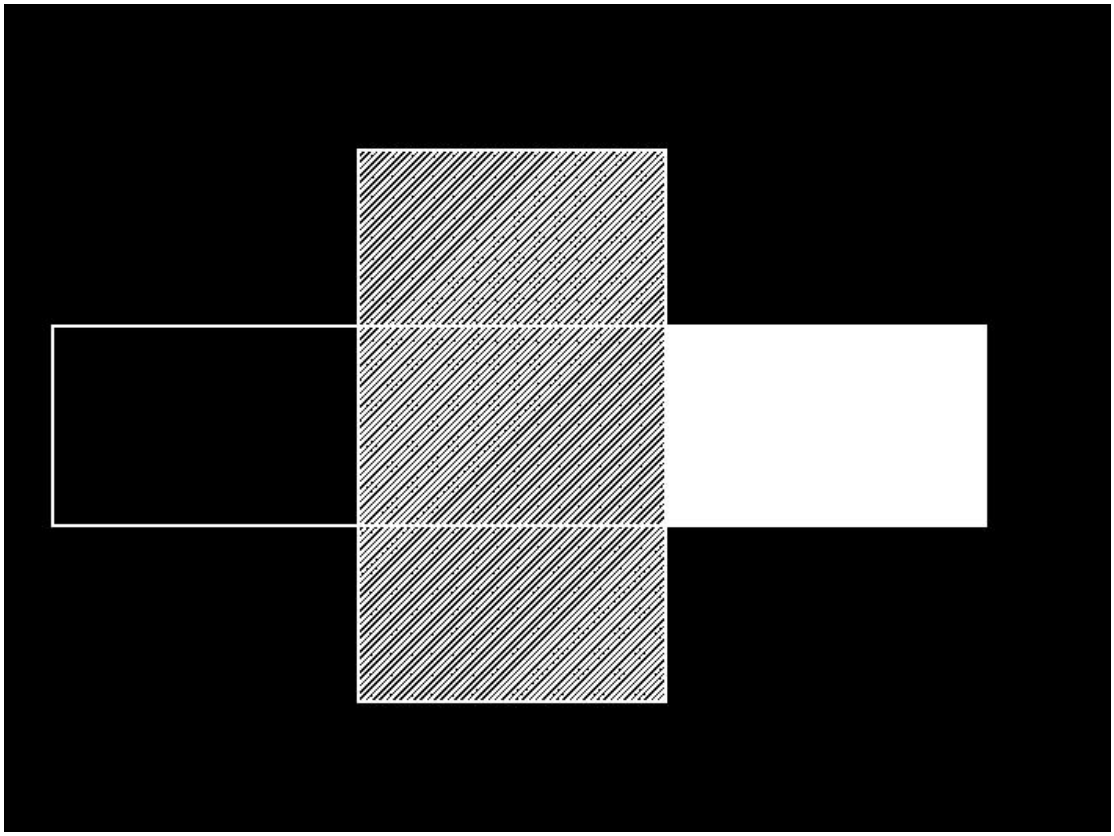


Figure: Hatch Result

Note:

After activating the "Pick Internal Point" hatch command, the patterns hatch continuously at one time will be treated as a single integral object, and e diting and modifications will change the entire object.

2.4.2.5.2 Select Boundary Lines

Function Description:

Hatches a closed area formed by selected vector lines in the active drawing.

Operation Steps:

1. Click Vector -> Hatch -> Select Boundary Lines. The "Hatch Creation" panel appears on the right side of the software.

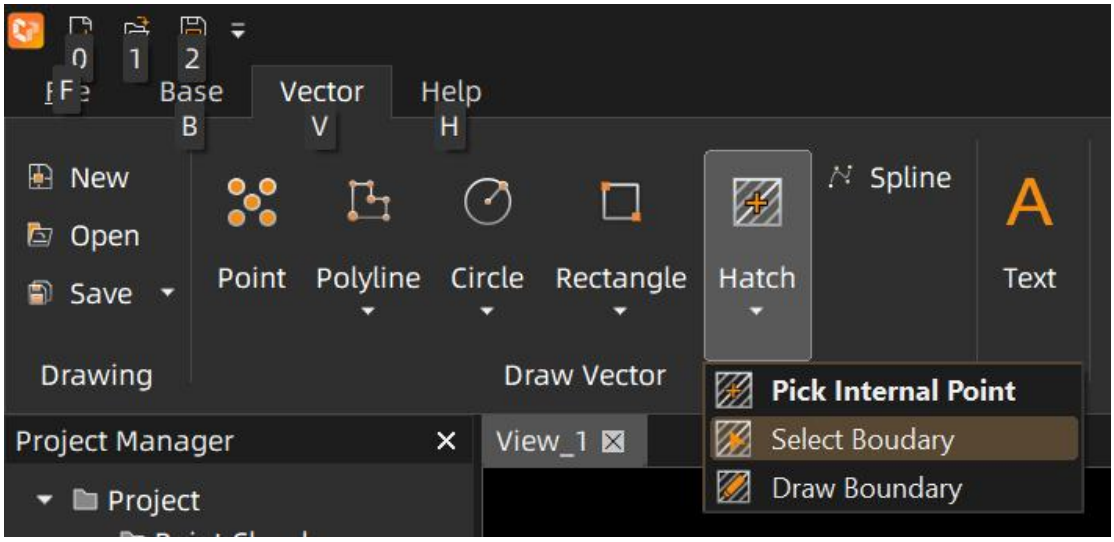


Figure: Select Boundary

2. Select the desired hatch pattern in the "Hatch Creation" panel.

3. Select the vector lines that form the closed area to be hatched. Press Enter or right-click and select "Confirm". The interior of the closed area is filled with the selected pattern.

You can edit the current hatch pattern in the "Hatch Creation" panel. See section "2.4.6.15 Hatch Editing" for details.

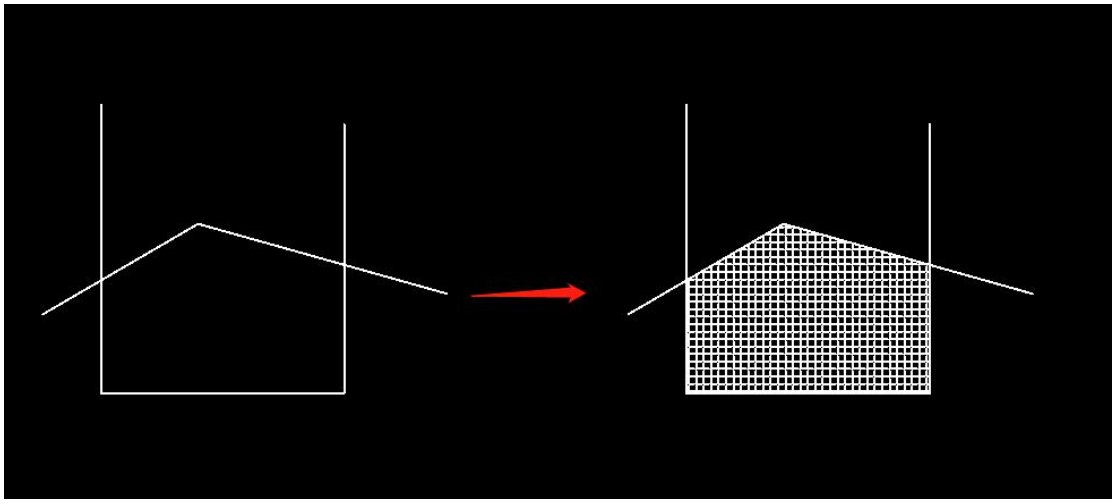


Figure: Hatch Result

2.4.2.5.3 Draw Boundary Lines

Function Description:

Hatches a closed area drawn by the user in the active drawing.

Operation Steps:

1. Click Vector -> Hatch -> Draw Boundary Lines. The "Hatch Creation" panel appears on the right side of the software.

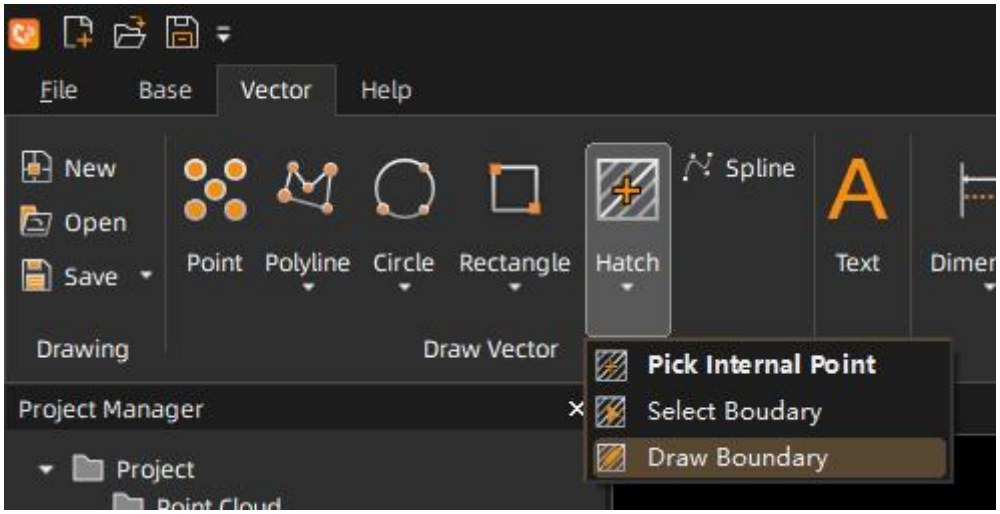


Figure: Draw Boundary

2. Select the desired hatch pattern in the "Hatch Creation" panel.

3. In the view, click to draw a closed vector. Press Enter or right-click and select "Confirm". The interior of the closed area is filled with the selected p attern. The drawn boundary line is not retained.

You can edit the current hatch pattern in the "Hatch Creation" panel. See s ection "2.4.6.15 Hatch Editing" for details.

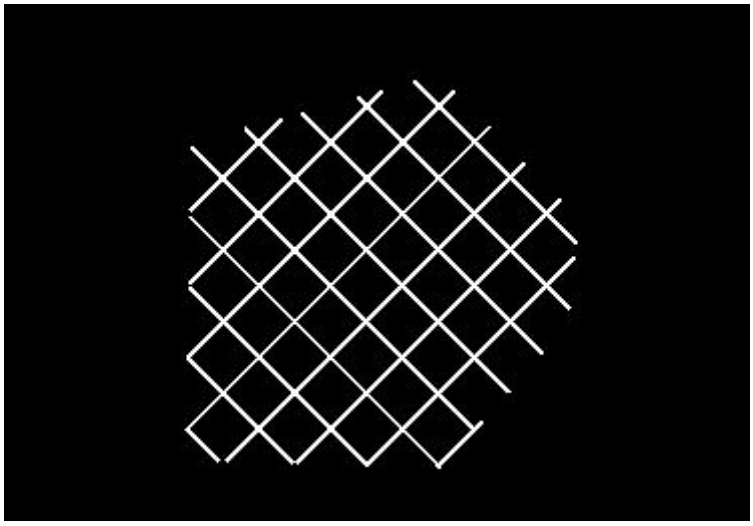


Figure: Hatch Result

Note:

After activating the "Draw Boundary" hatch command, the patterns that are continuously drawn and hatch will be treated as a single integral object, a nd editing and modifications will chane the entire object.

2.4.2.6 Spline Curve

Function Description:

Draws a spline curve in the active drawing.

Operation Steps:

1. Click Vector -> Spline.

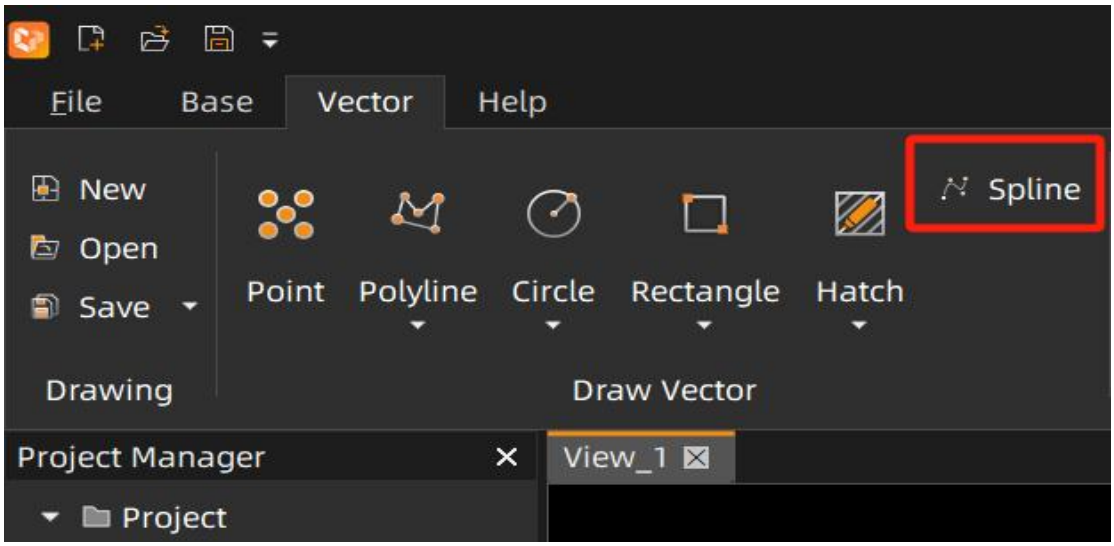


Figure: Spline Curve

2. In the view window, specify the start point of the spline curve. Move the mouse; a yellow guide line appears.

3. In the view window, specify the next point of the spline curve. Continue specifying points as needed.

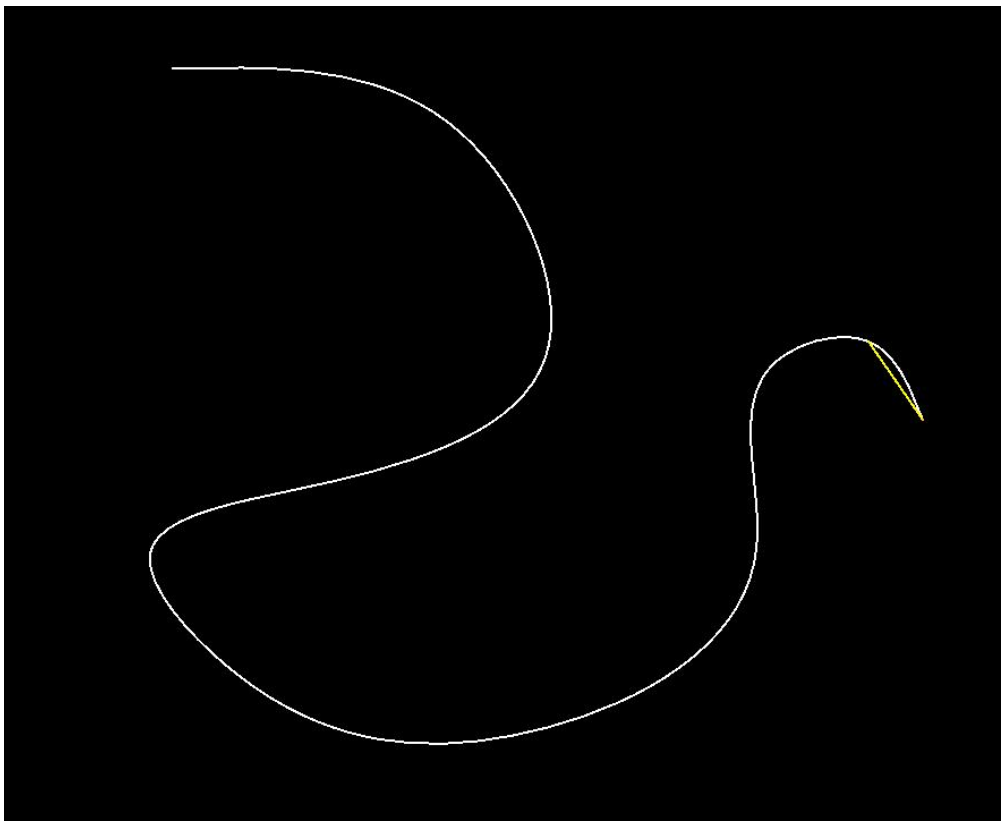


Figure: Effect of Drawing Spline Curve

4. In the view window, press Enter or right-click and select "Confirm" to finish drawing the spline curve. By default, the drawn spline curve is not closed. To draw a closed spline curve, right-click and select "Close". The drawn spline curve will be closed.

5. While drawing the spline curve, right-click and select "Undo Point" or use shortcut key U to undo one point.

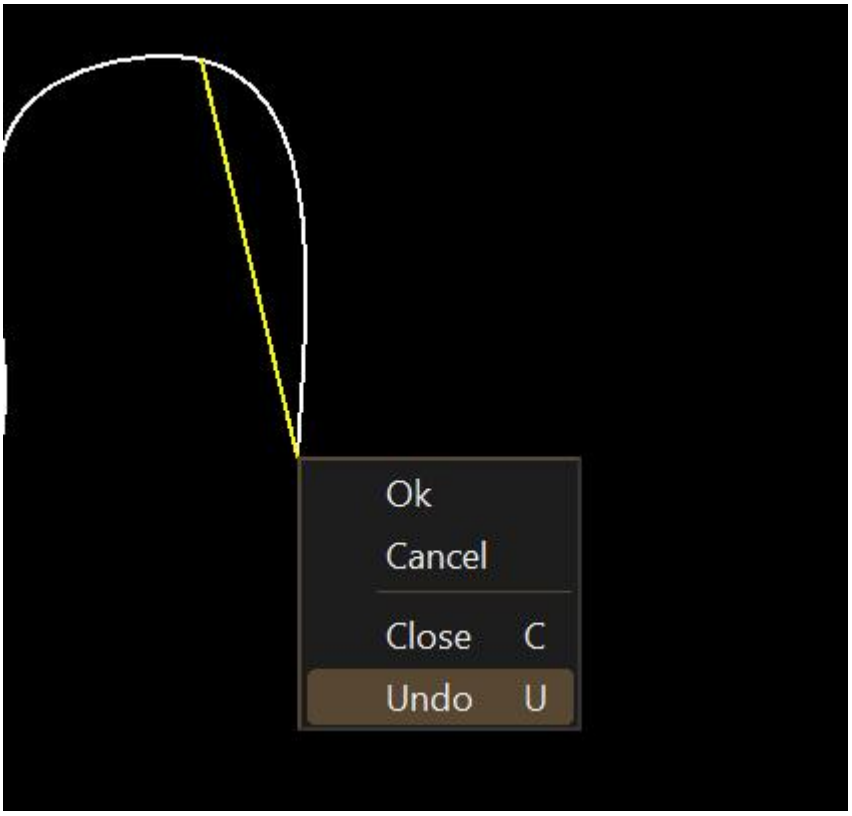


Figure: Right-Click Menu for Spline Curve

2.4.3 Text

2.4.3.1 Single Line Text

Operation Steps:

Draws single-line text in the active drawing.

Operation Steps:

1. Click Vector -> Text -> Single Line Text. Output message: Please specify t he insertion point for the text.

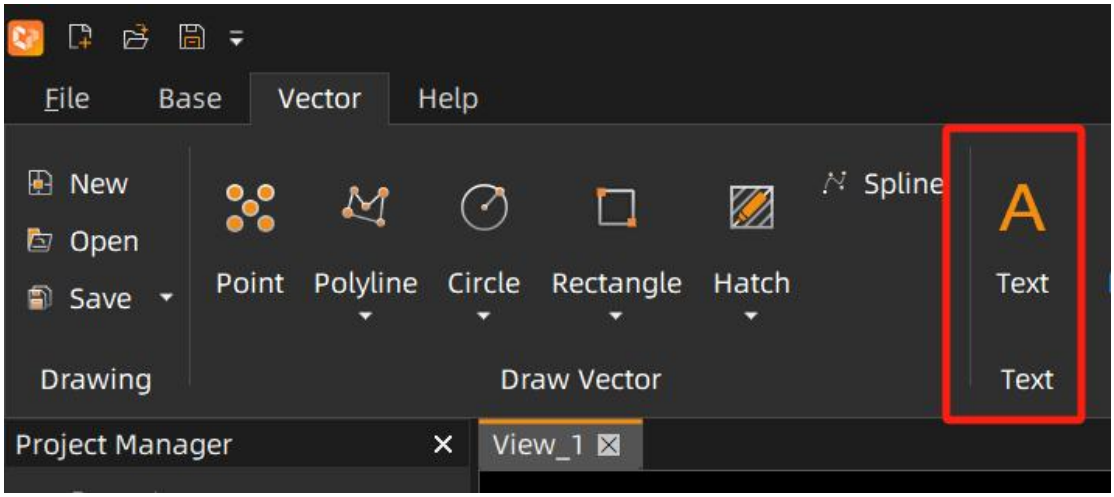


Figure: Text

2. Click a point in the view; this point is the insertion point for the text an d also determines the plane for the text. Output message: Please specify t he direction of the text. A preview effect "TEXT" is shown. Moving the mou se rotates the preview effect.

3. Click a second point in the view to determine the text direction. Output message: Please specify the height of the text. Moving the mouse changes the size of the preview effect.

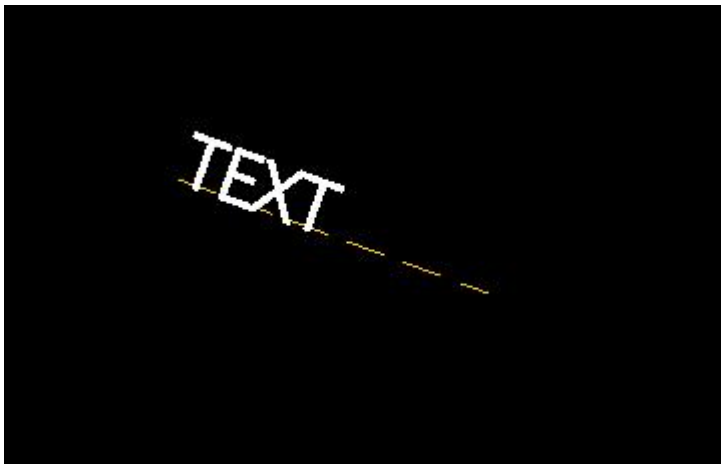


Figure: Preview Effect of Specifying Direction

4. Click a third point in the view to determine the text height. The "Text" dialog box appears. Enter the content. Press Enter in the input box to create a new line. Click the "Confirm" button to close the dialog box and submit the result. Each line of text is created as a separate single-line text vector. The function does not exit.

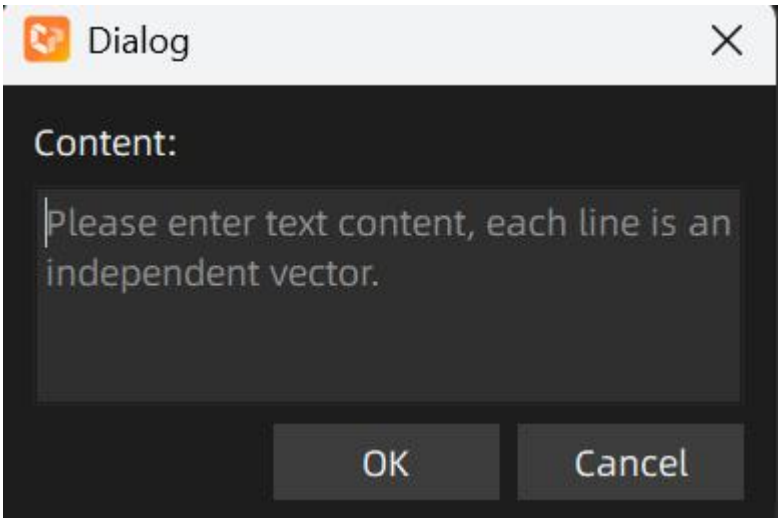


Figure: Text Input Dialog Box

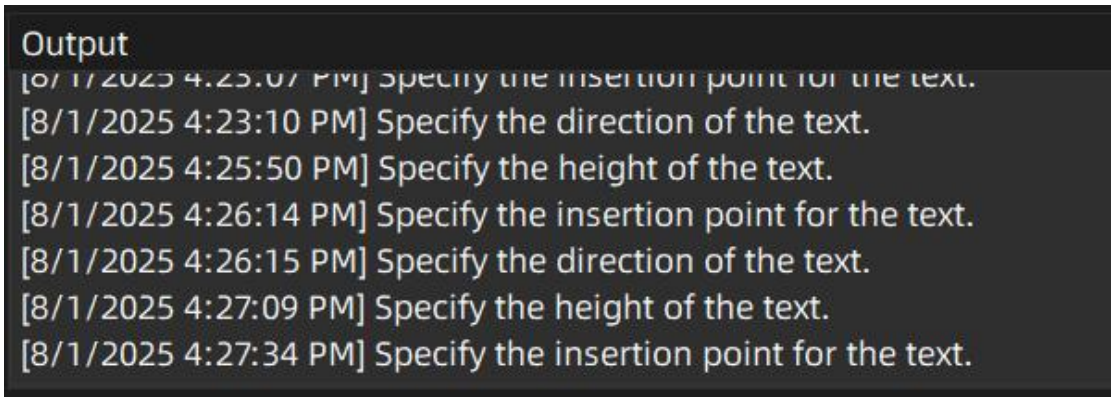


Figure: Text Output Message

5. In the view, left-click to continue creating text, repeating the previous ste p. The insertion point for the text is the clicked location. The direction, just ification, height, etc., are the same as before.

2.4.3.2 Multiline Text

Operation Steps:

Draws multiline text in the active drawing.

Operation Steps:

1. Click Vector -> Text -> Multiline Text. Output message: Please specify the insertion point for the text.

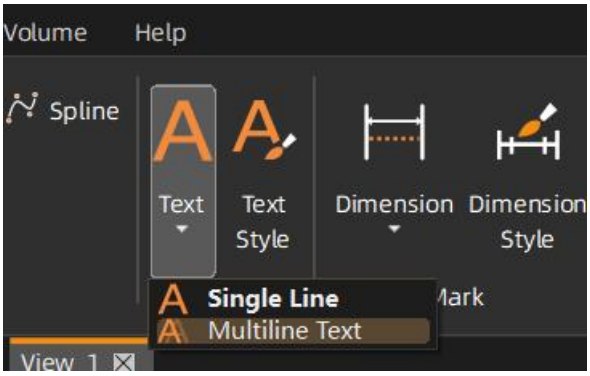


Figure: Multiline Text

2. Click a point in the view; this point is the insertion point for the text and also determines the plane for the text. Output message: Please specify the direction of the text. A preview effect "TEXT" is shown. Moving the mouse rotates the preview effect.

3. Click a second point in the view to determine the text direction. Output message: Please specify the height of the text. Moving the mouse changes the size of the preview effect.

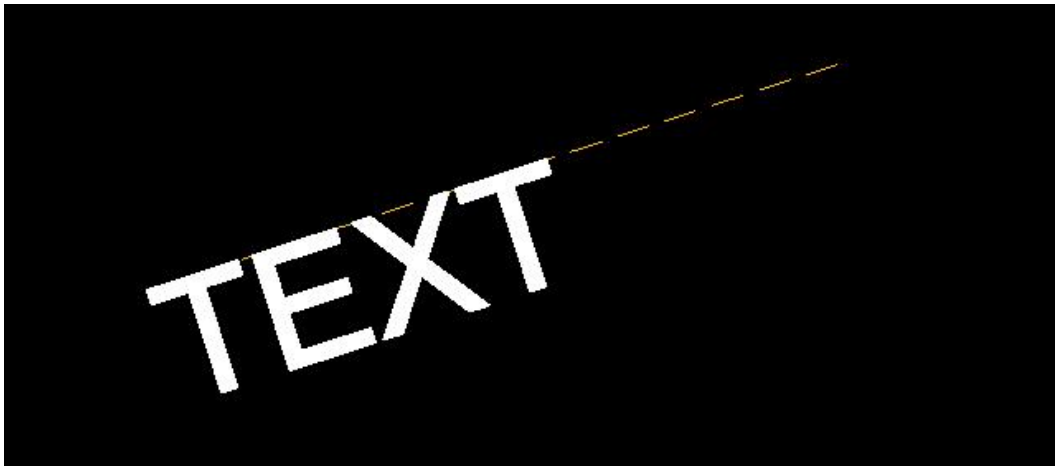


Figure: Preview effect in specified direction

4. Click a third point in the view to determine the text height. The "Text" dialog box appears. Enter the content. Press Enter in the input box to create a new line. Click the "Confirm" button to close the dialog box and submit the result. Multiple lines of text are contained within a single multiline text vector. The function does not exit.

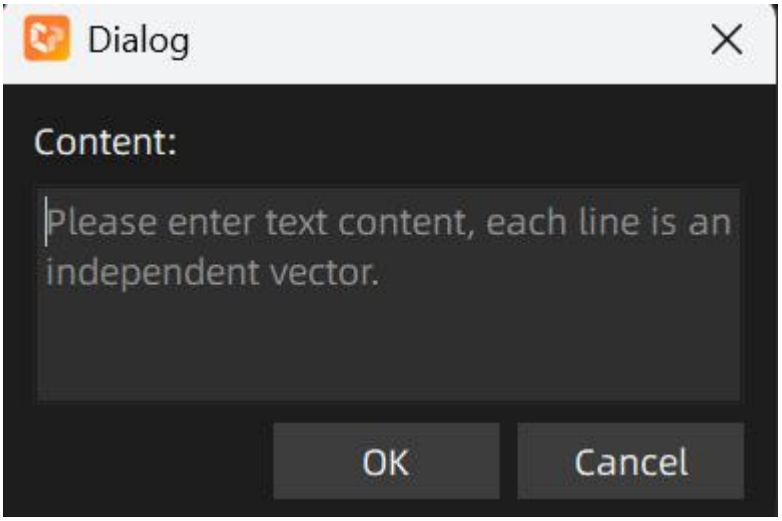


Figure: Text Input Dialog Box

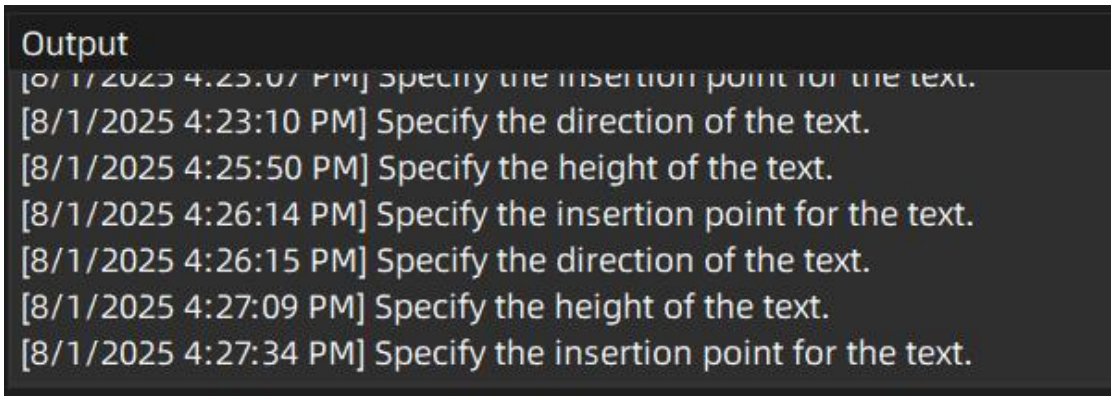


Figure: Text Output Message

5. In the view, left-click to continue creating text, repeating the previous step. The insertion point for the text is the clicked location. The direction, justification, height, etc., are the same as before.

2.4.3.3 Text Style

Function Description:

Creates, modifies, or specifies text styles.

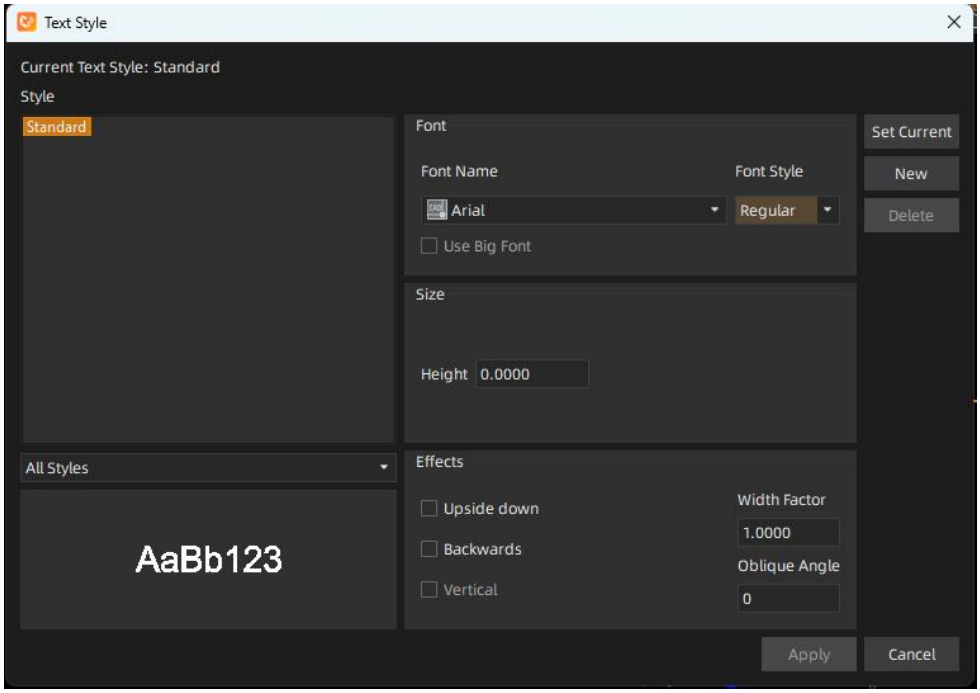


Figure: Text Style

2.4.3.3.1 Set Current

Function Description:

Sets the selected text style in the style list as the current font style. The current font style will be applied to newly created text.

Operation Steps:

1. Click Vector -> Dimension Style. The Text Style dialog box appears.

2. Select a text style from the style list. Click "Set Current". The selected style becomes the current text style and will be applied to subsequently drawn text.

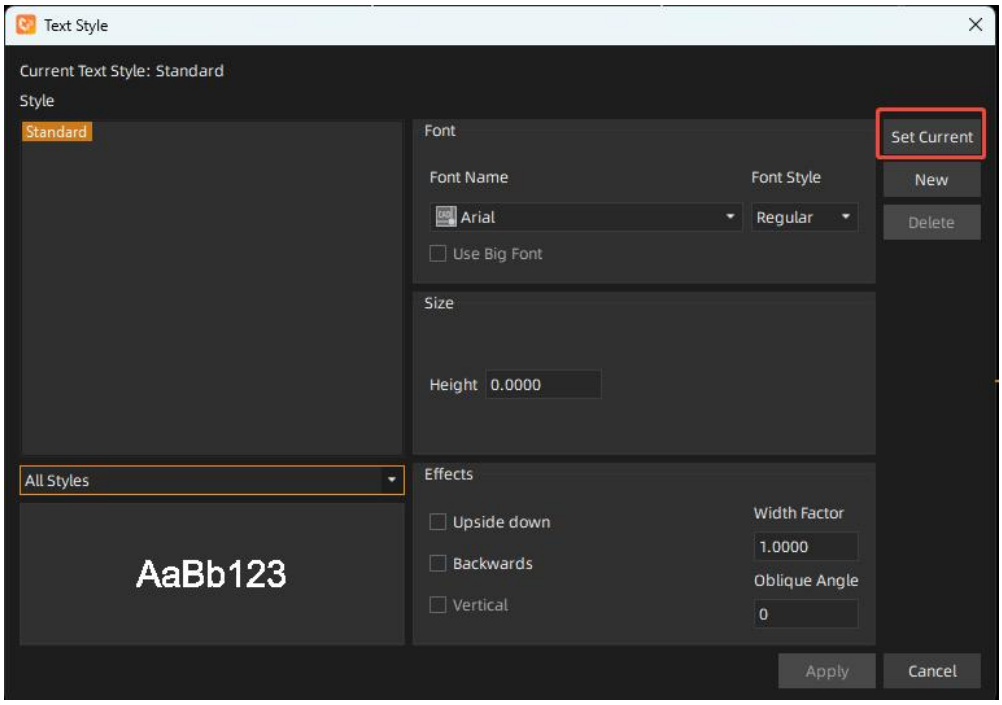


Figure: Set Current

2.4.3.3.2 New

Function Description:

Creates a new text style. Users can customize style parameters as needed.

Operation Steps:

1. Click Vector -> Text Style. The Text Style dialog box appears.

2. Click "New". The New Text Style dialog box appears.

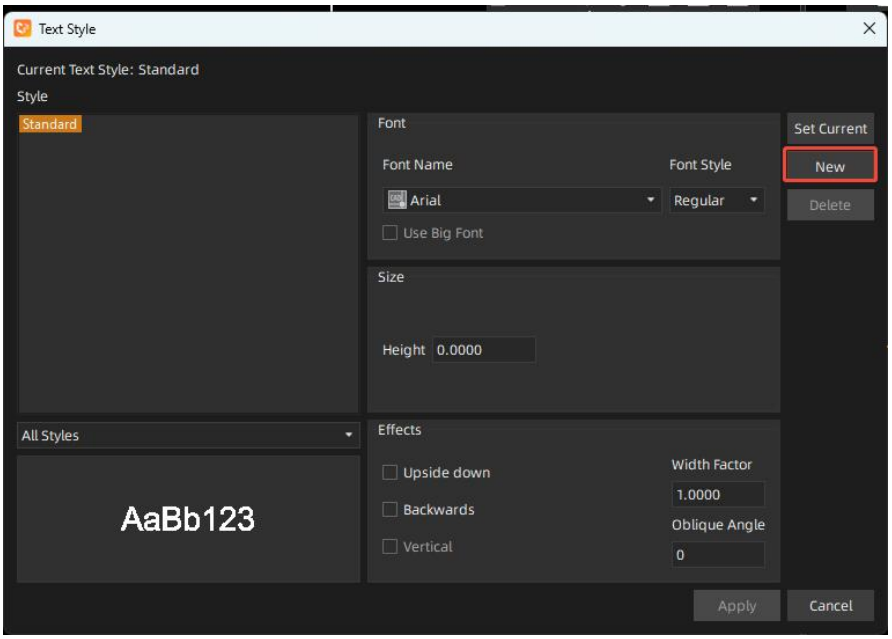


Figure: New Style

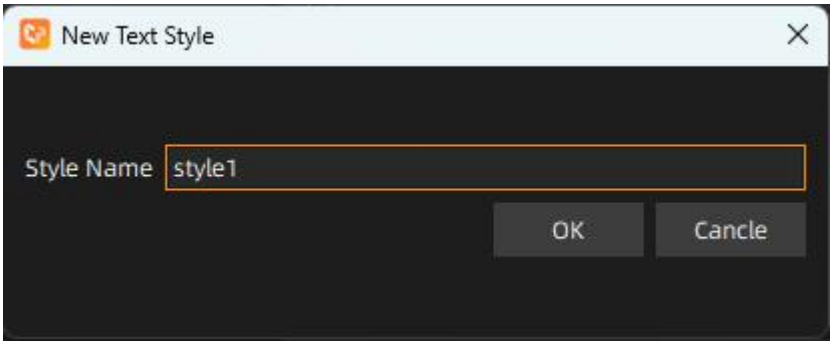


Figure: New Style Dialog

3. Enter a new style name and click "Confirm" to create it successfully. The new style is set as the current text style by default.

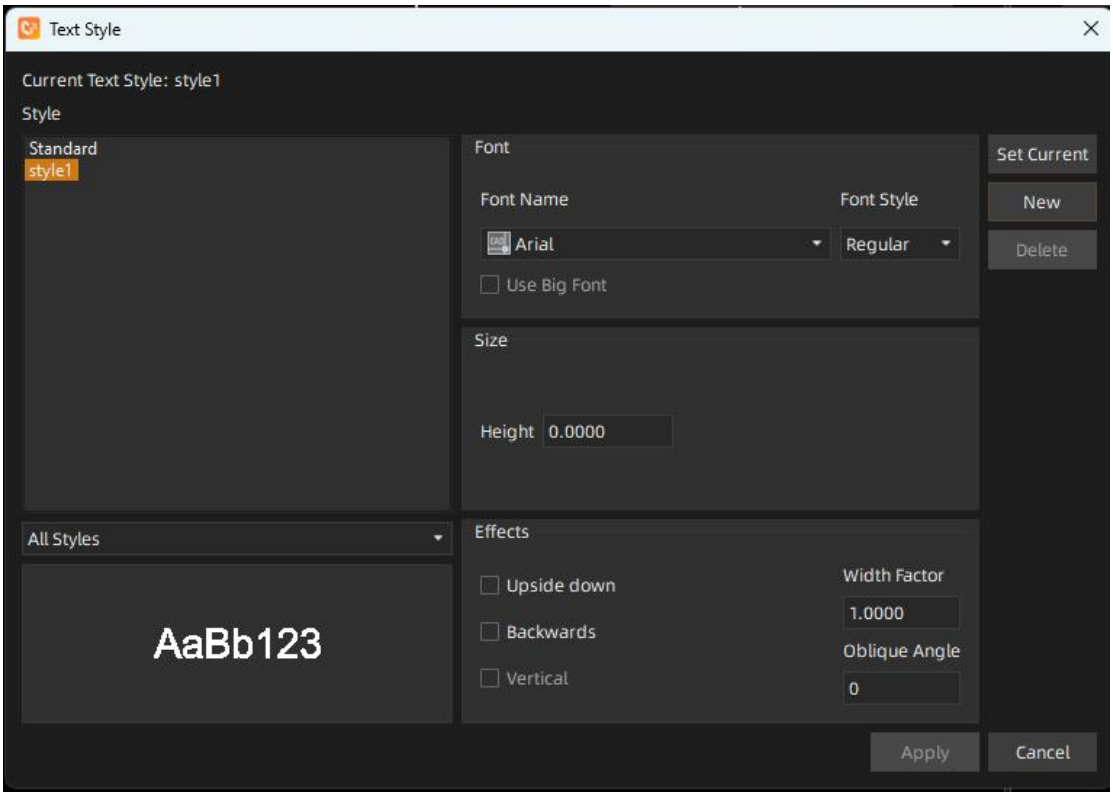


Figure: New Style

4. After successful creation, users can set text-related parameters as needed in the dialog box. Click "Apply" and close the dialog box. The new style will be applied to subsequently drawn text.

Parameter Settings:

Font Name: Lists the font family names of all registered TrueType fonts and all compiled shape (SHX) fonts in the fonts folder. When a name is selected from the list, the program reads the specified font file. Character definitions for the file are automatically loaded unless the file is already in use by another text style. Multiple styles using the same font can be defined.

Font Style: Specifies the font format, such as italic, bold, or regular. After selecting "Use Big Font", this option changes to "Big Font", used to select big font files.

Use Big Font: Specifies the big font file for Asian languages. Only SHX files can create "big fonts".

Height: Used to change the size of the text.

Upside Down: Displays characters upside down.

Backwards: Displays characters backwards.

Vertical: Displays vertically aligned characters. "Vertical" is only available if t he selected font supports bidirectional orientation. Vertical positioning for T rueType fonts is not available.

Width Factor: Sets the character spacing. Entering a value less than 1.0 co mpresses the text. Entering a value greater than 1.0 expands the text.

Oblique Angle: Sets the oblique angle of the text. Entering a value betwee n -85 and 85 will slant the text.

2.4.3.3.3 Delete

Function Description:

Deletes the selected text style from the style list. If the selected style is th e default style "Standard", the current style, or a style currently in use in t he drawing, deletion is not supported.

Operation Steps:

1. Click Vector -> Text Style. The Text Style dialog box appears.

2. Select a text style from the style list. Click "Delete". The selected style is removed from the style list. If the selected style is the default style "Stand ard", the current style, or a style in use, deletion is not supported.

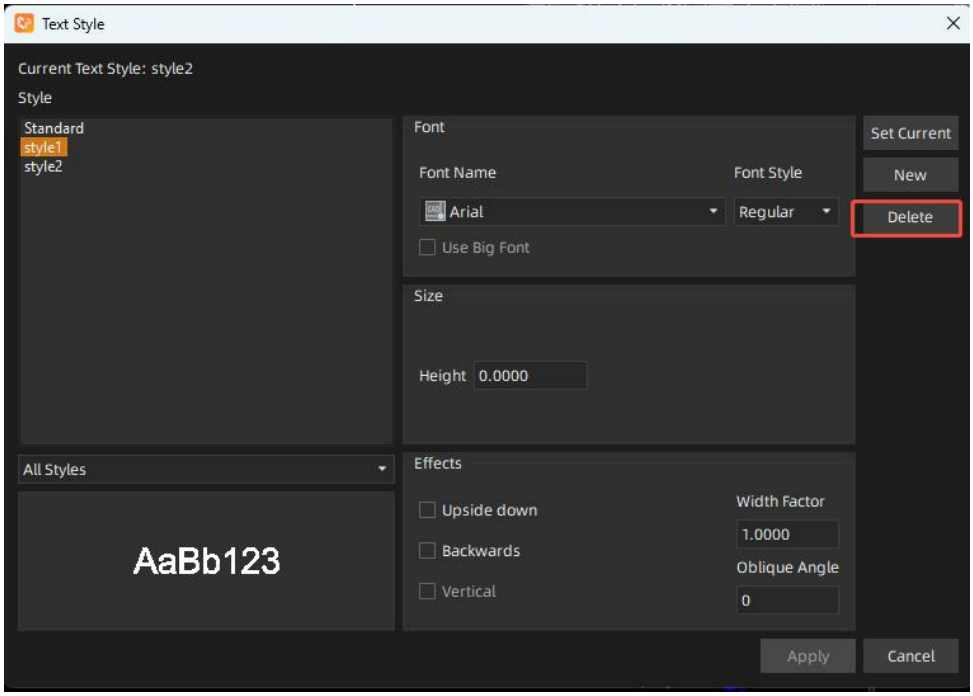


Figure: Delete

2.4.4 Dimension

2.4.4.1 Dimension

2.4.4.1.1 Aligned Dimension

Function Description:

Adds dimensional annotations to point clouds, vectors, and models. The an notation results are saved in the currently active drawing. Two drawing mo des are available: Continuous and Single.

Continuous Drawing Operation Steps:

1. Click Vector -> Dimension -> Aligned Dimension to activate Aligned Dime nsion.

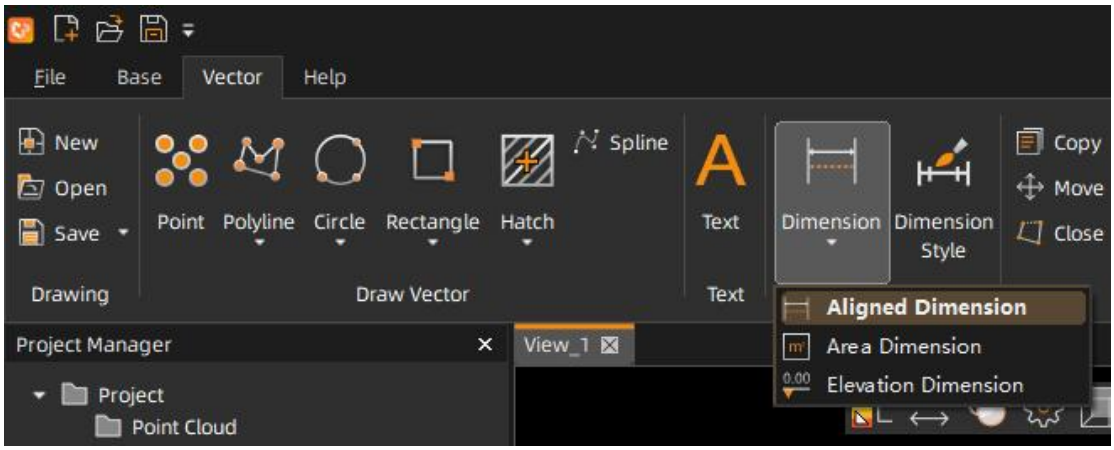


Figure: Aligned Dimension

2. In the view, click a point as the start point of the aligned dimension. After clicking, move the mouse to adjust the length of the dimension line in preview.

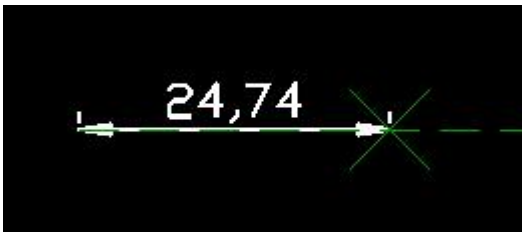


Figure: Start Point of Aligned Dimension

3. In the view, click a second point to determine the length and direction of the dimension line. After clicking, move the mouse to adjust the length of the extension lines in preview.



Figure: Adjusting Extension Line Length of Aligned Dimension

4. In the view, click a third point to determine the length of the extension lines. The current aligned dimension is drawn. After clicking, move the mouse to preview the next aligned dimension. The end point of the current dimension becomes the start point for the next one, and the dimension line

direction and extension line length from the current dimension are used. Continue drawing until you press Esc or activate another function, which exits Aligned Dimension drawing and retains the already drawn results.

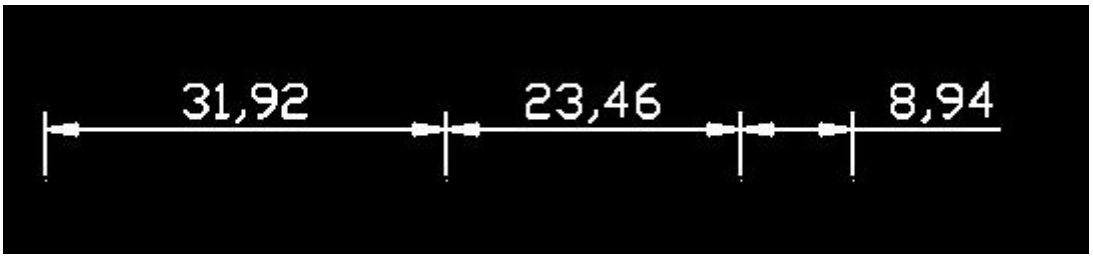


Figure: Continuously Drawing Aligned Dimensions

Single Drawing Operation Steps:

1. Click Vector -> Dimension -> Aligned Dimension to activate Aligned Dimension.

2. In the view, right-click and click the Single Drawing option in the right-click menu to switch to Single Aligned Dimension drawing.

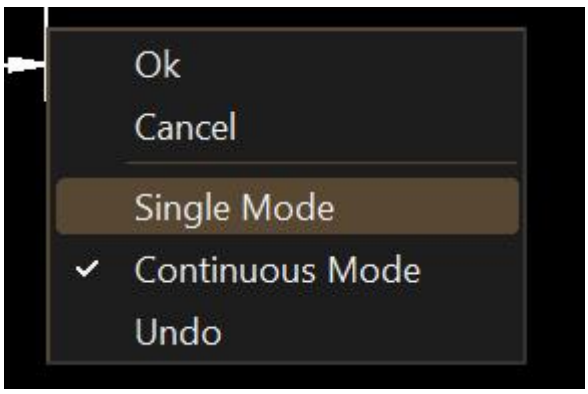


Figure: Switch to Single Aligned Dimension

3. In the view, sequentially select the start point, end point, and extension line length for the aligned dimension. The single aligned dimension is drawn.



Figure: Single Aligned Dimension Drawing

4. In the view, left-click again to start the next single aligned dimension dra wing.

2.4.4.1.2 Area Dimension

Function Description:

Dimensions the area of a closed 2D region using three methods: Pick Inter nal Point, Select Boundary Lines, or Draw Boundary Lines.

Pick Internal Point Operation Steps:

1. Click Vector -> Dimension -> Area Dimension to activate Area Dimension. The parameter panel appears on the right.

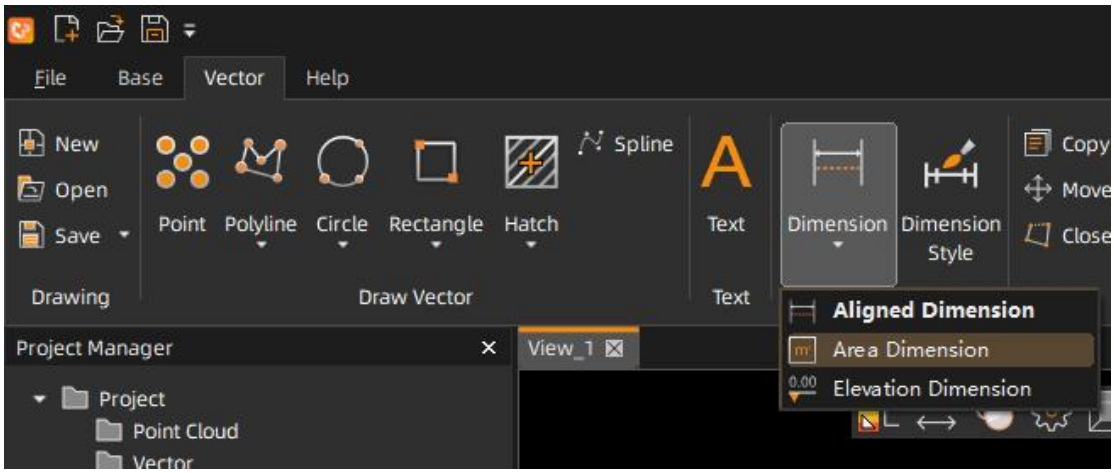


Figure: Area Dimension

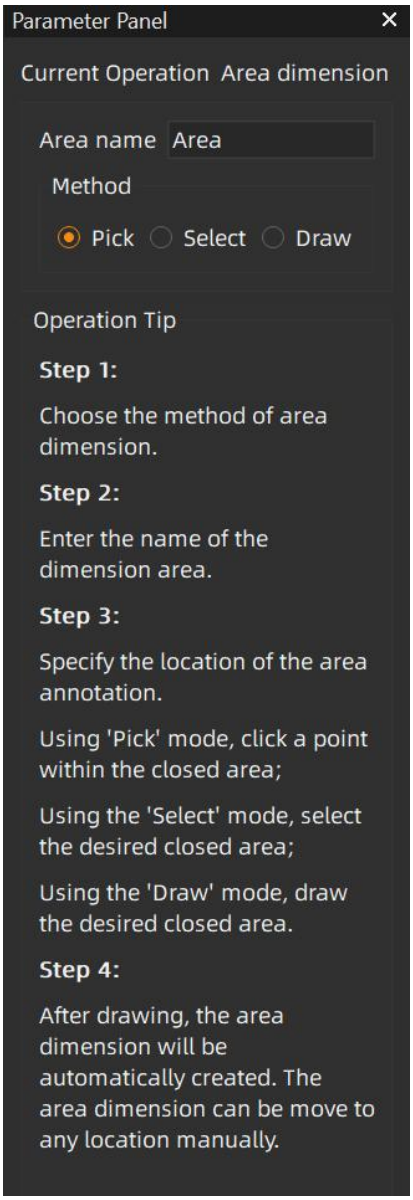


Figure: Area Dimension Parameter Panel

2. After selecting "Pick Internal Point" in the parameter panel, click inside a 2D closed region. The area dimension is added.



Figure: Area Dimension by Picking Internal Point

Select Boundary Lines Operation Steps:

1. Click Vector -> Dimension -> Area Dimension to activate Area Dimension.

2. After selecting "Select Boundary Lines" in the parameter panel, select the vector lines forming the closed region to be dimensioned in the view. Press Enter or right-click to confirm. The area dimension is added.

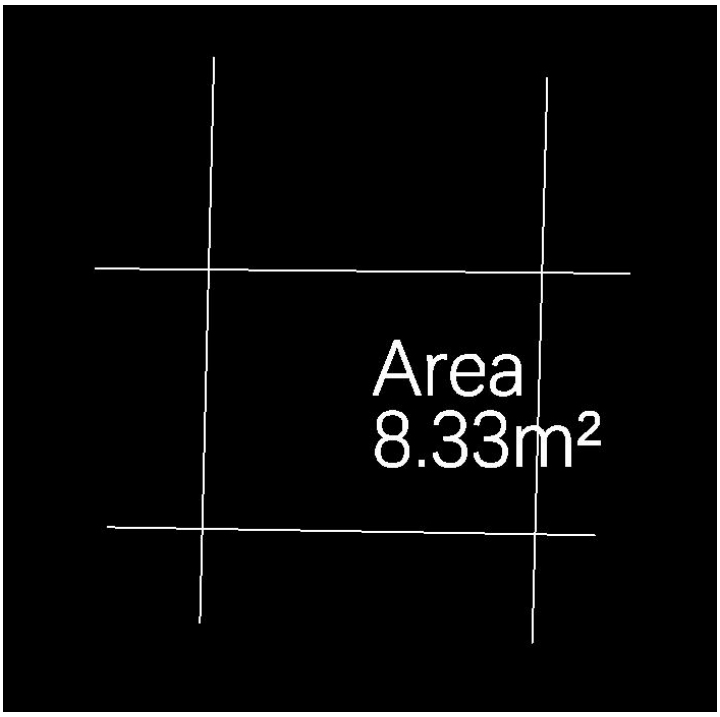


Figure: Area Dimension by Selecting Boundary Lines

Draw Boundary Lines Operation Steps:

1. Click Vector -> Dimension -> Area Dimension to activate Area Dimension.

2. After selecting "Draw Boundary Lines" in the parameter panel, draw a 2 D closed vector in the view. After drawing three points, right-click to confir m / press Enter / double-click to end drawing. The area dimension is adde d.

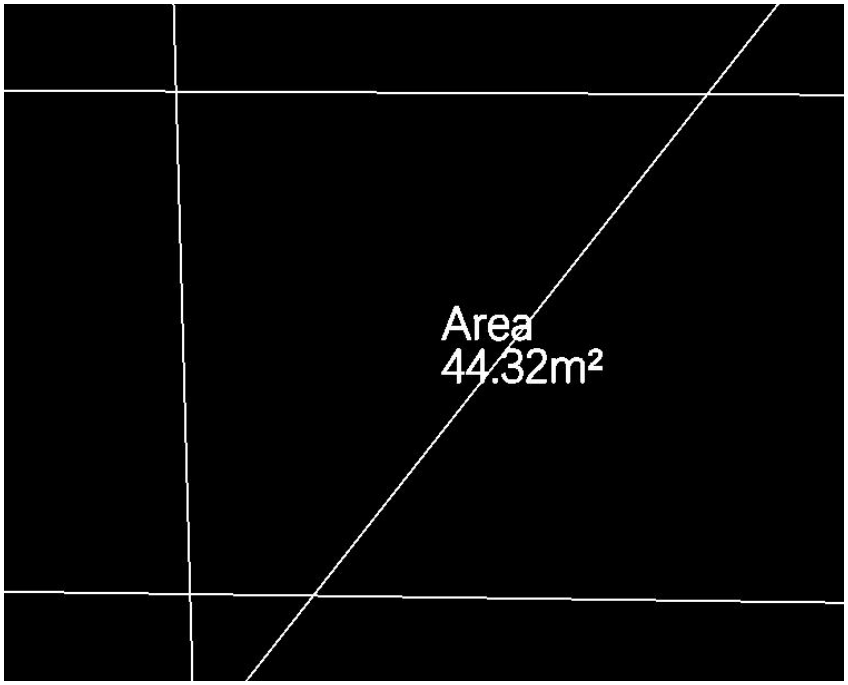


Figure: Area Dimension by Drawing Boundary Lines

2.4.4.2 Elevation Dimension

Function Description:

Click a point in the view to create an elevation annotation at that point, eit her absolutely or relatively.

Absolute Elevation Operation Steps:

1. Click Vector -> Dimension -> Elevation to activate Elevation.

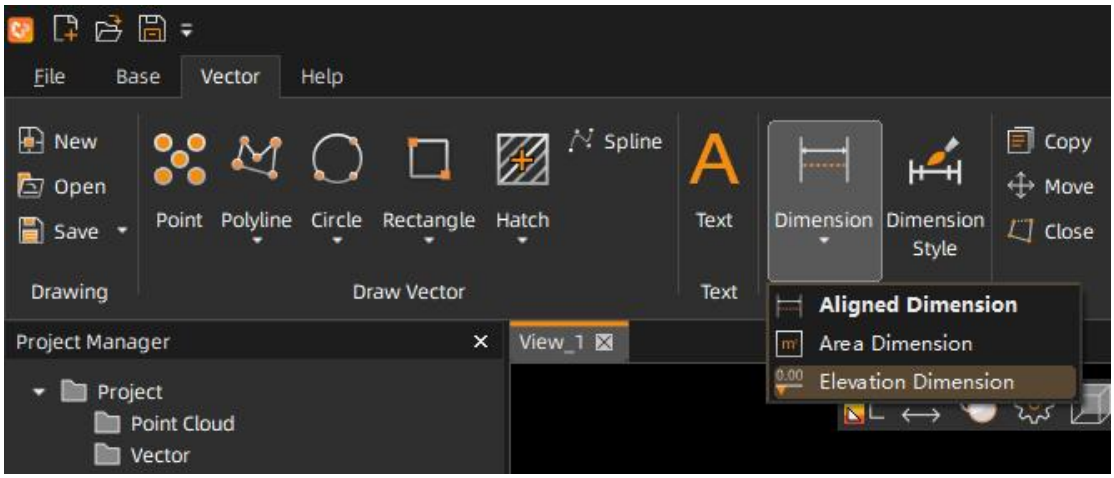


Figure: Elevation Dimension

2. The Elevation parameter panel appears on the right. "Absolute" elevation mode is selected by default. Output message: Entered absolute elevation mode, please click in the view to draw elevation.

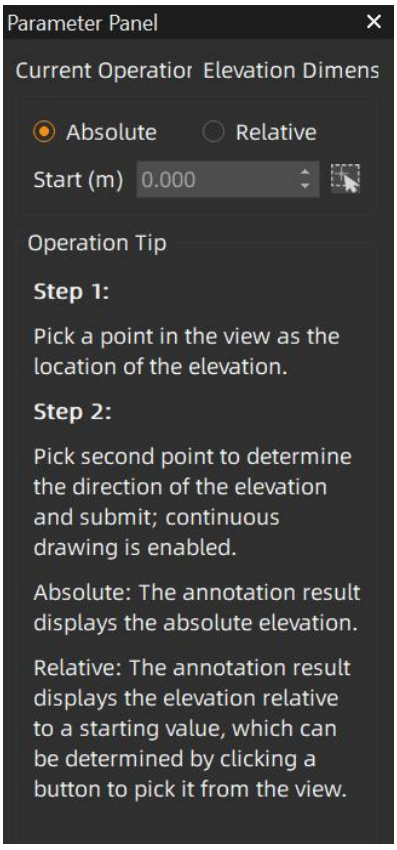


Figure: Elevation Parameter Panel

3. Click a point in the view to determine the position of the elevation anno tation.

4. Click a second point to determine the direction of the elevation annotati on.

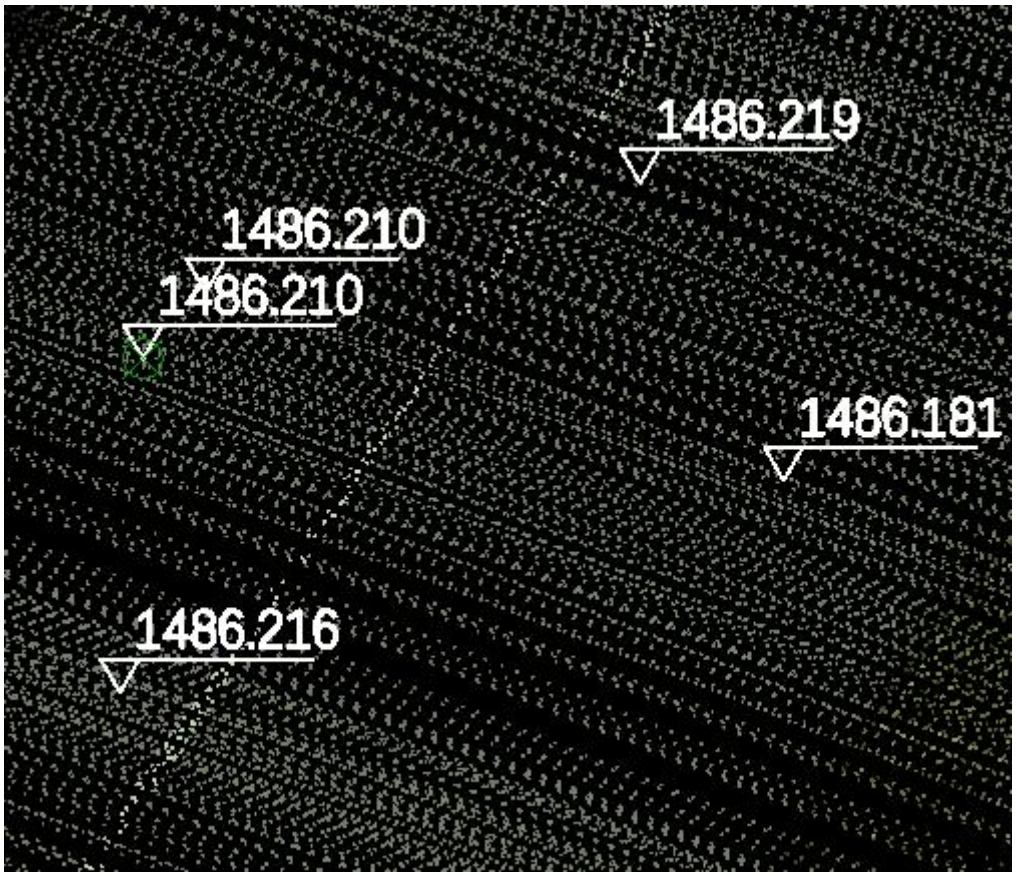


Figure: Absolute Elevation

Relative Elevation Operation Steps:

1. Click Vector -> Dimension -> Elevation to activate Elevation.

2. The Elevation parameter panel appears on the right. Select "Relative" in the parameter panel. Output message: Entered relative elevation mode, ple ase set the base elevation first, then click in the view to draw elevation.

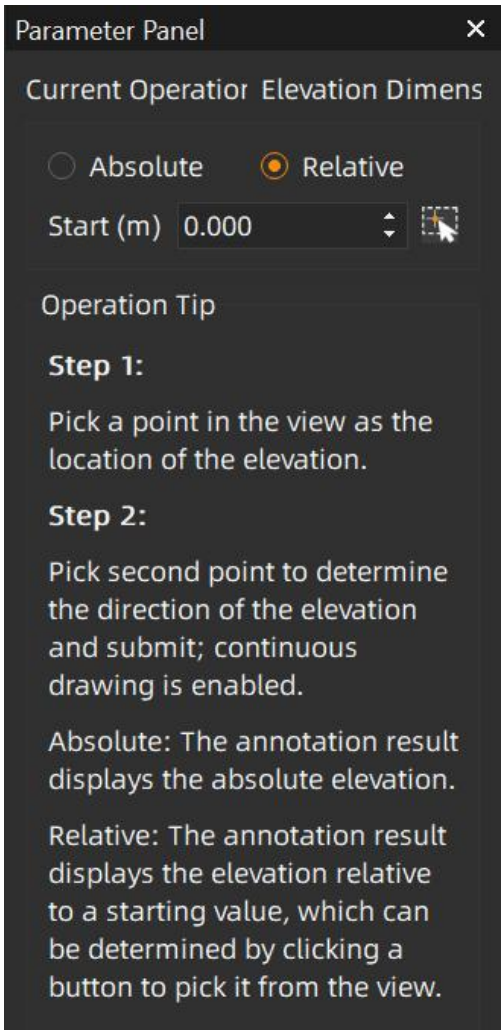


Figure: Elevation Parameter Panel

3. In the view, use the interactive button to pick the base elevation or ente r it manually.

4. Click a point in the view to determine the position of the elevation anno tation.

5. Click a second point in the view to determine the direction of the elevat ion annotation.

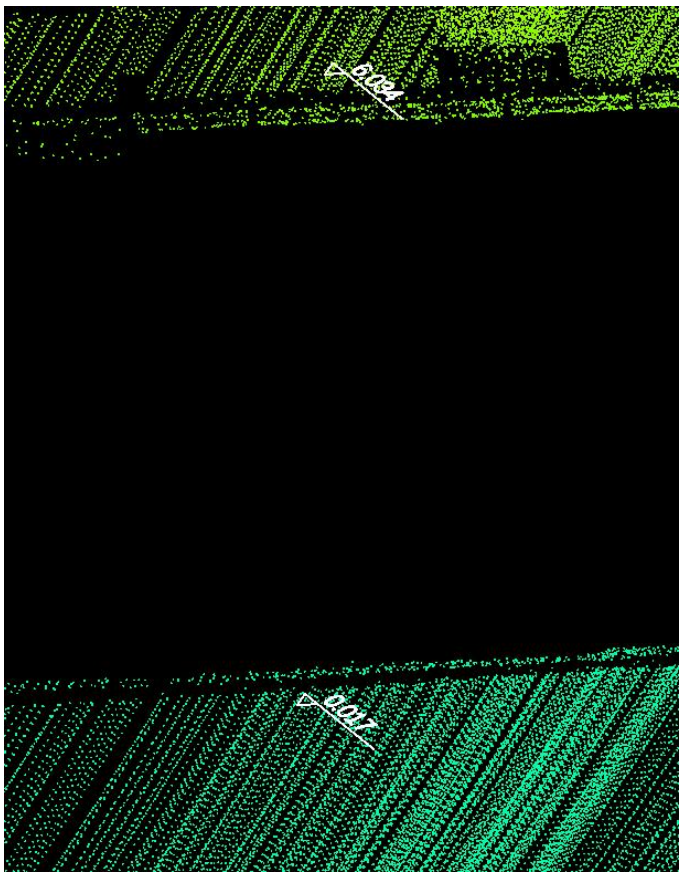


Figure: Relative Elevation

2.4.4.3 Dimension Style

Function Description:

Creates and modifies aligned dimension styles.

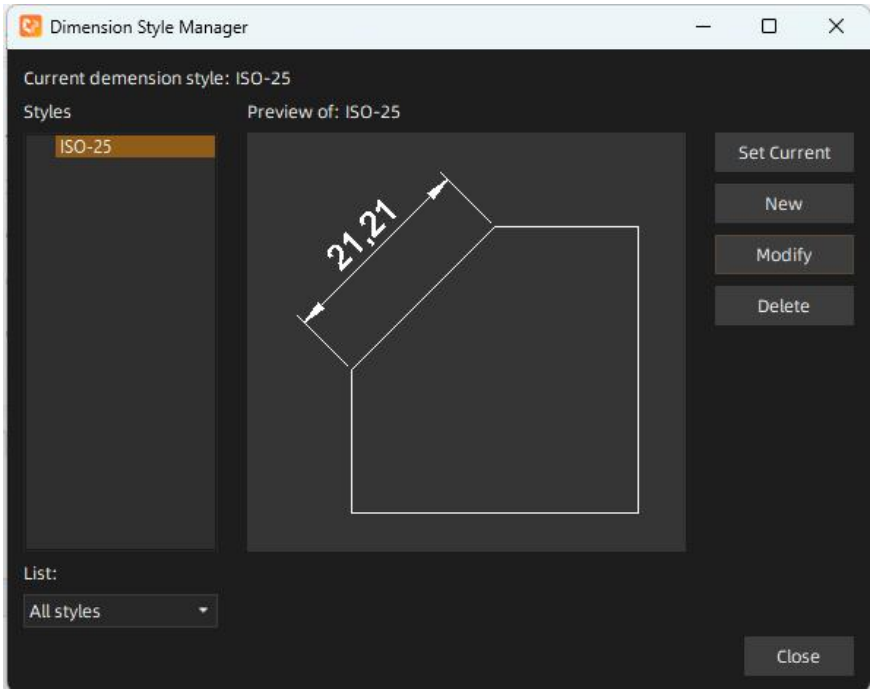


Figure: Dimension Style Manager

2.4.4.3.1 Set Current

Function Description:

Sets the selected dimension style in the style list as the current dimension style. The current dimension style will be applied to newly created aligned dimensions.

Operation Steps:

1. Click Vector -> Dimension Style. The Dimension Style Manager appears.

2. Select a dimension style from the style list. Click "Set Current". The selec ted style becomes the current dimension style and will be applied to subse quently drawn aligned dimensions.

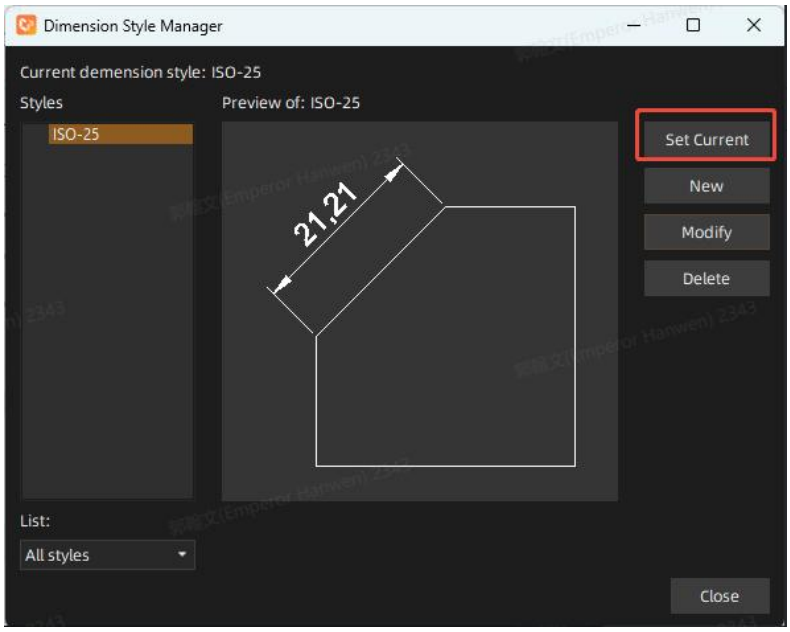


Figure: Set Current

2.4.4.3.2 New

Function Description:

Creates a new aligned dimension style. Users can customize style parameters as needed.

Operation Steps:

1. Click Vector -> Dimension Style. The Dimension Style Manager appears.

2. Click "New". The Create New Dimension Style dialog box appears.

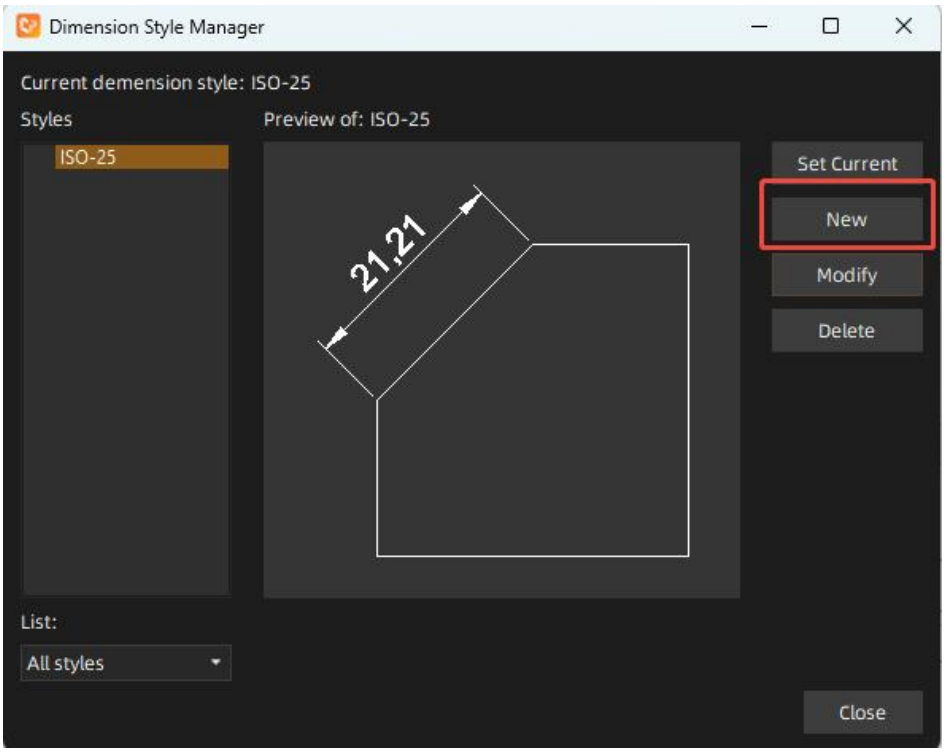


Figure: New Style

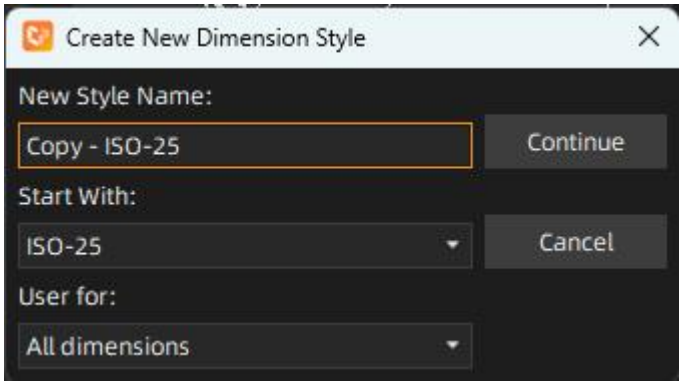


Figure: New Style Dialog

3. Enter a new style name and select a base style. The selected style will be used as the basis for the new style. The current dimension style is selected as the base style by default.

4. Click "Continue". The New Dimension Style dialog box appears. In this dialog box, users can set parameters related to Lines, Symbols and Arrows, Text, and Primary Units as needed.

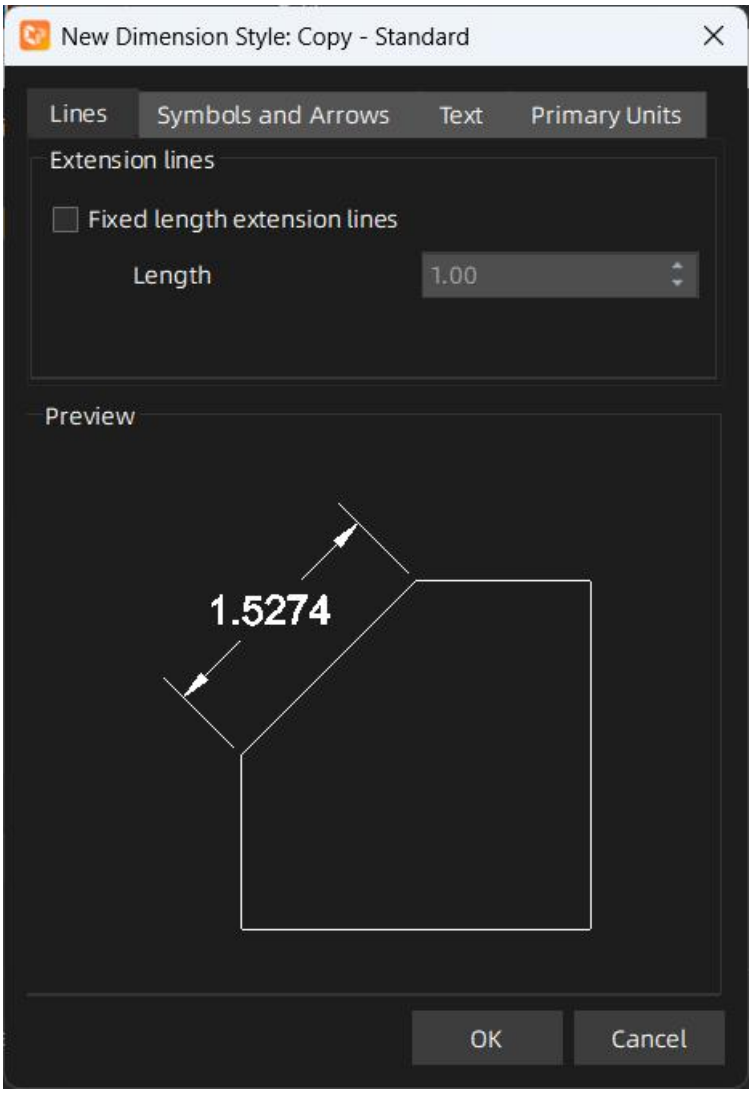


Figure: New Dimension Style

5. Click "OK". The new style is created successfully. Select the new style and click "Set Current". Close the dialog box. The new style will be applied to subsequently drawn aligned dimensions.

2.4.4.3.3 Modify

Function Description:

Opens the "Modify Dimension Style" dialog box to modify the selected dimension style in the style list.

Operation Steps:

1. Click Vector -> Dimension Style. The Dimension Style Manager appears.

2. Select a dimension style from the style list. Click "Modify". The Modify Dimension Style dialog box appears. In this dialog box, users can modify parameters related to Lines, Symbols and Arrows, Text, and Primary Units as needed.

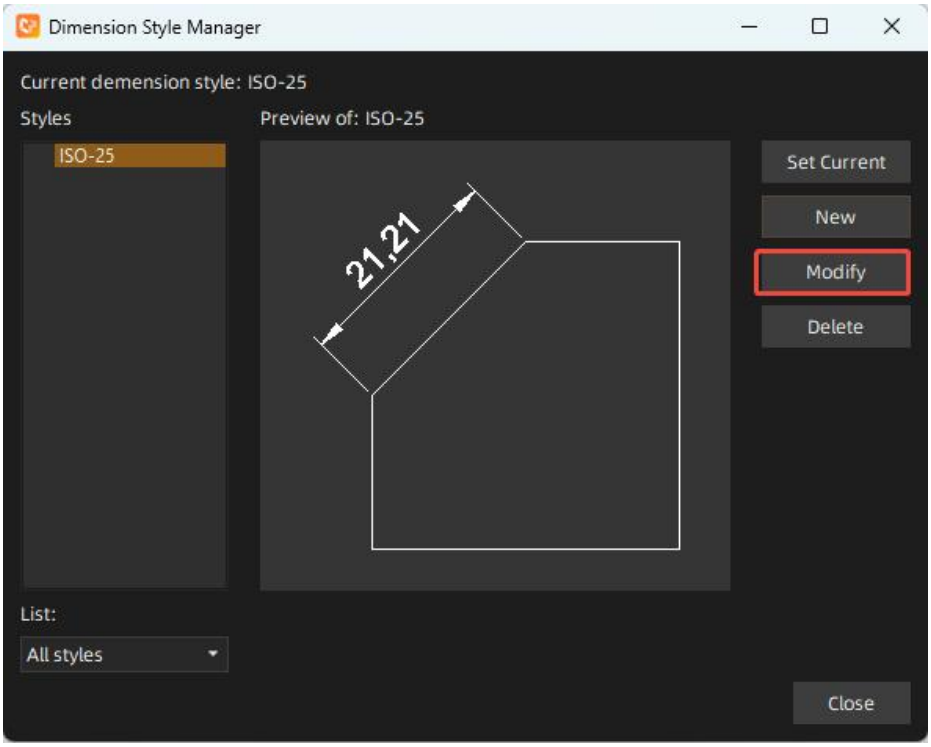


Figure: Modify

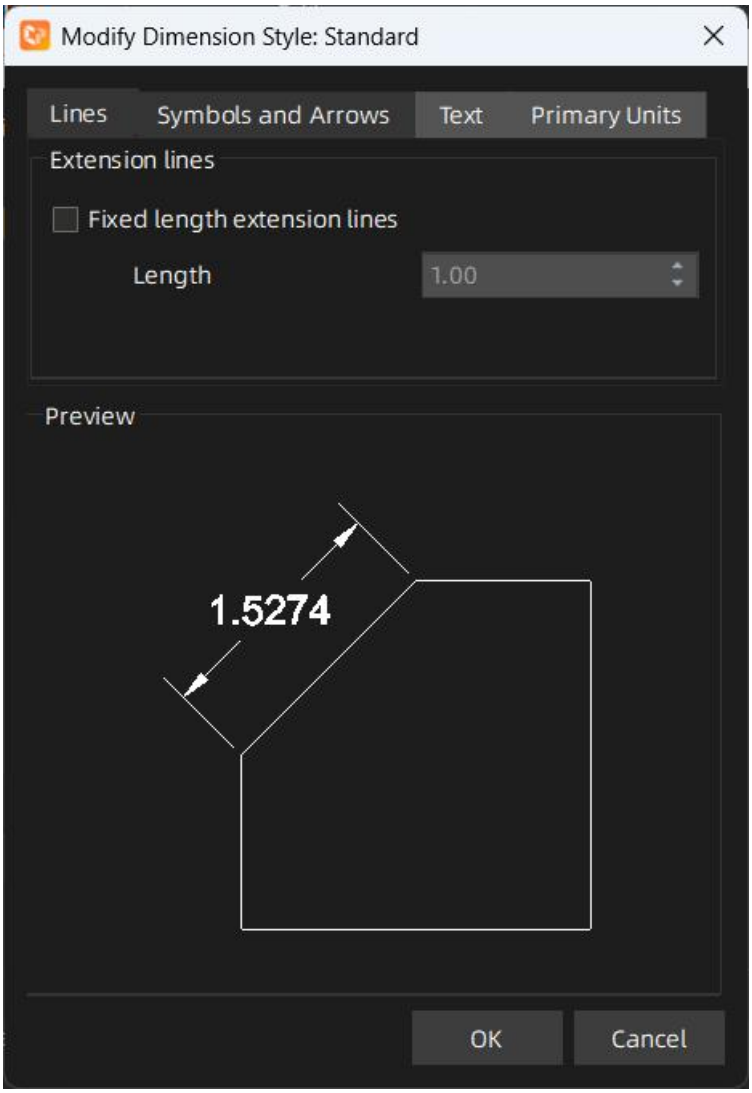


Figure: Modify

3. Click "OK". The style modification is successful. Select the modified style and click "Set Current". Close the dialog box. The modified style will be applied to subsequently drawn aligned dimensions.

Note:

If you need to modify the style of existing aligned dimensions in the current drawing, you must first set the corresponding dimension style as current, then modify it. This will update the style of existing aligned dimensions in the drawing to the modified version. Modifying a non-current dimension style will not affect the existing aligned dimensions in the drawing that use that style.

2.4.4.3.4 Delete

Function Description:

Deletes the selected dimension style from the style list. If the selected style is the current style or a style currently in use in the drawing, deletion is not supported.

Operation Steps:

1. Click Vector -> Dimension Style. The Dimension Style Manager appears.

2. Select a dimension style from the style list. Click "Delete". The selected s tyle is removed from the style list. If the selected style is the current style or a style in use, deletion is not supported.

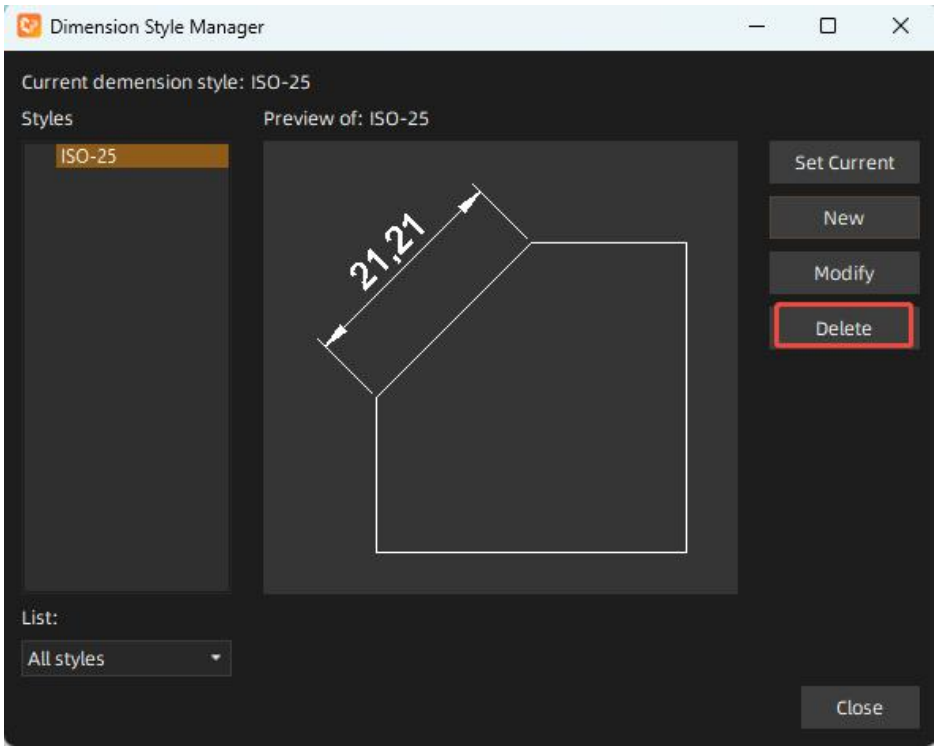


Figure: Delete

2.4.4.3.5 Lines

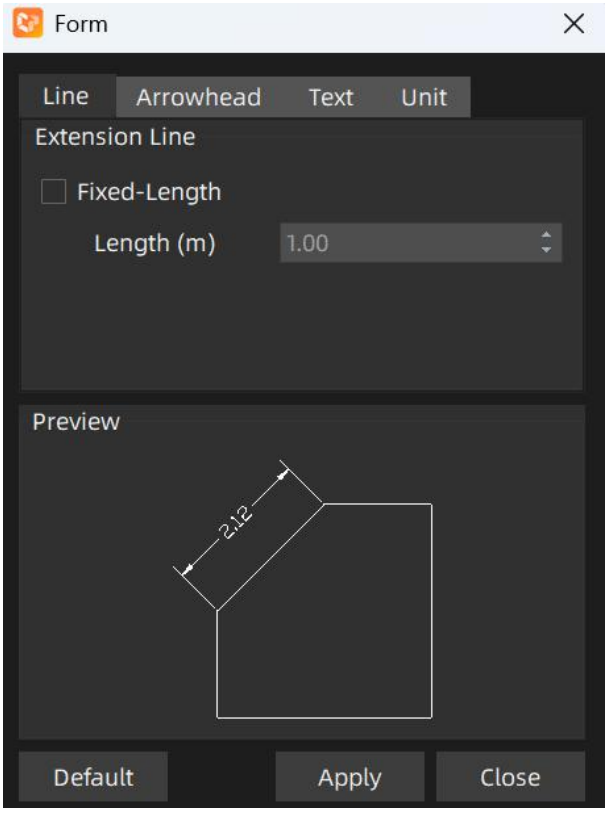


Figure: Line Setting Interface

Extension Lines: Users can specify the dimension style to set the total length of the extension lines (starting from the dimension line to the dimension origin).



Figure: Extension Lines

Fixed length extension lines: When checked, a length value can be set. W

hen drawing an aligned dimension, if the interactively adjusted extension li ne length is less than the set fixed extension line length, the interactively a djusted length is used. If the interactively adjusted length is greater than th e set fixed length, the fixed length is used.

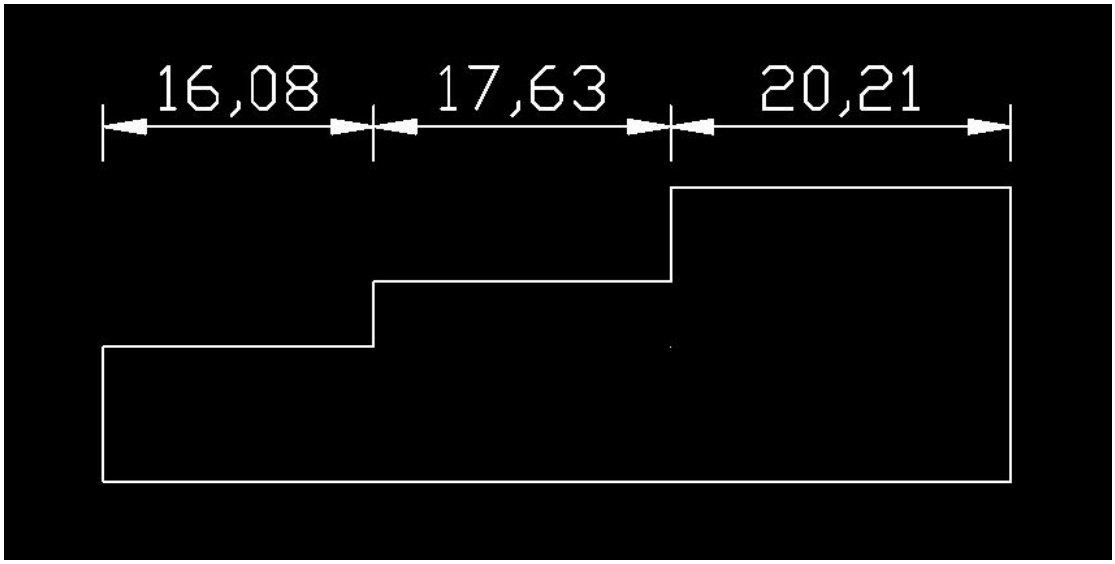


Figure: Fixed Extension Line Result

2.4.4.3.6 Symbols and Arrows

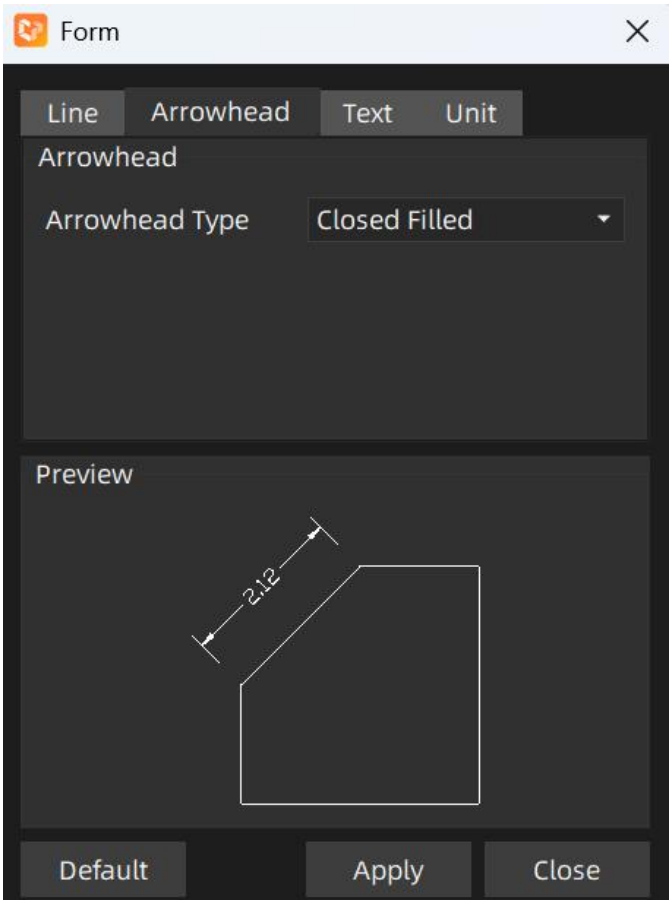


Figure: Arrow Setting Interface

Arrow Type: Sets the arrow style for the dimension line. Default: Closed fill ed. Currently, user-defined arrows are not supported.

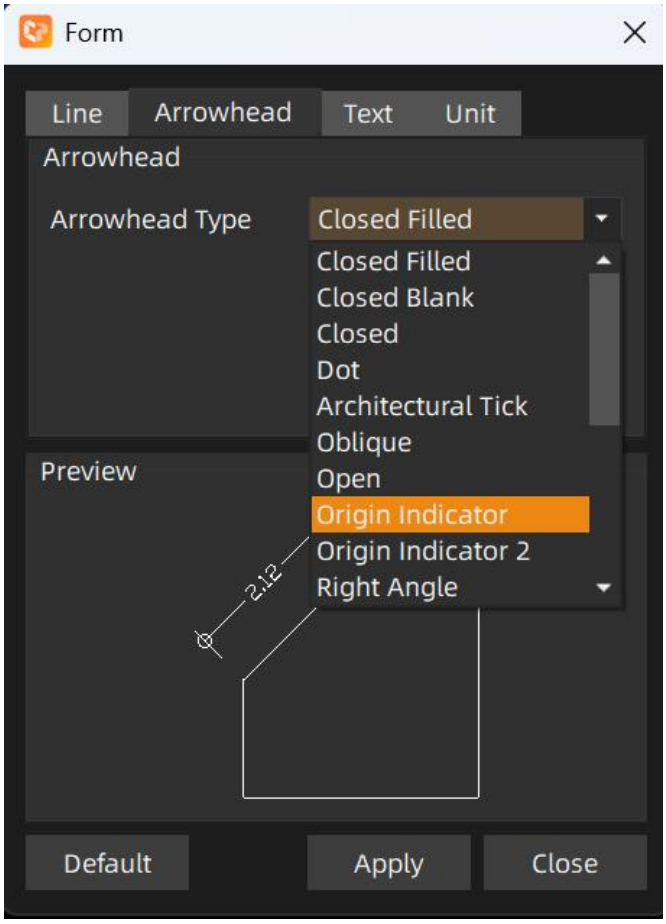


Figure: Select Arrow Style

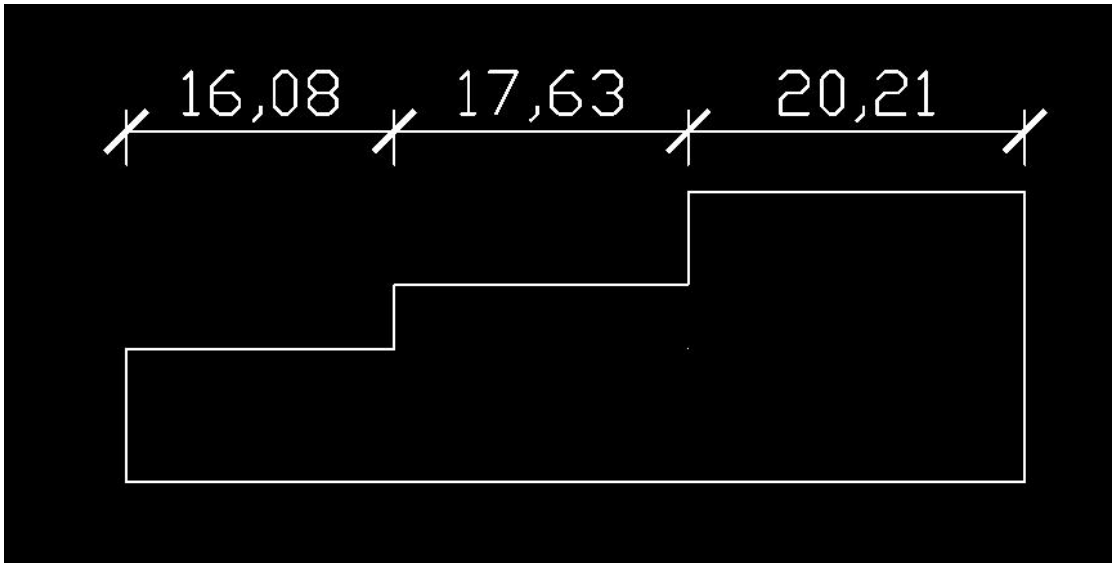


Figure: Modified Arrow Style Result

2.4.4.3.7 Text

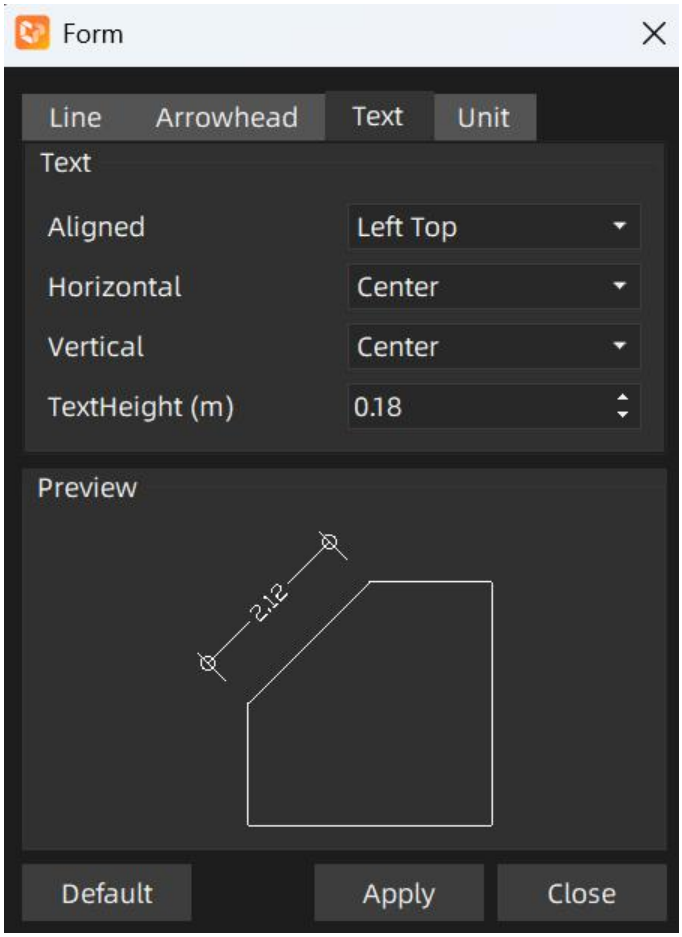


Figure: Text Setting Interface

Horizontal: Controls the horizontal position of the dimension text on the d imension line relative to the extension lines. Horizontal position options incl ude:

Centered: Places the dimension text centered along the dimension line bet ween the two extension lines.



Figure: Centered

First Extension Line: Left-justifies the text along the dimension line with th e first extension line.



Figure: First Extension Line

Second Extension Line: Right-justifies the text along the dimension line wit h the second extension line.



Figure: Second Extension Line

Above First Extension Line: Places the dimension text along or above the first extension line.



Figure: Above First Extension Line

Above Second Extension Line: Places the dimension text along or above t he second extension line.



Figure: Above Second Extension Line

Vertical: Controls the vertical position of the dimension text relative to the dimension line. Vertical position options include:

Centered: Places the dimension text centered between the two parts of th e dimension line.



Figure: Centered

Above: Places the dimension text above the dimension line.



Figure: Above

External: Places the dimension text on the side of the dimension line farth est from the first definition point.



Figure: External

JIS: Places the dimension text according to the Japanese Industrial Standar d.

Below: Places the dimension text below the dimension line.



Figure: Below

Text Height: Sets the height of the current dimension text style. Default va lue is 2.5.

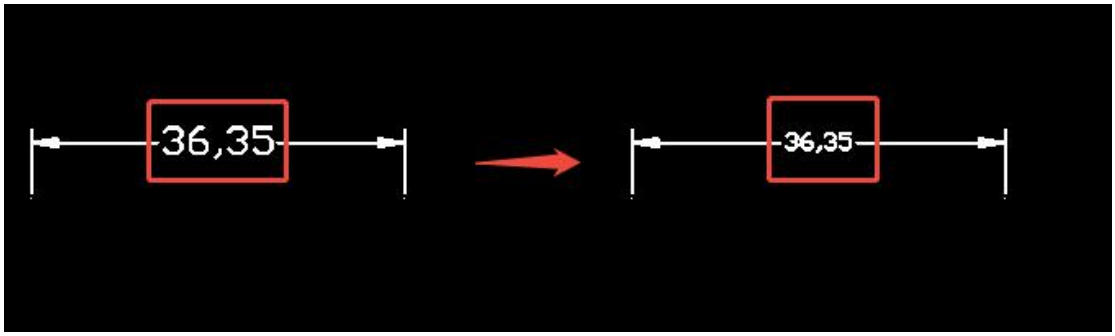


Figure: Modify Text Height Result

2.4.4.3.8 Primary Units

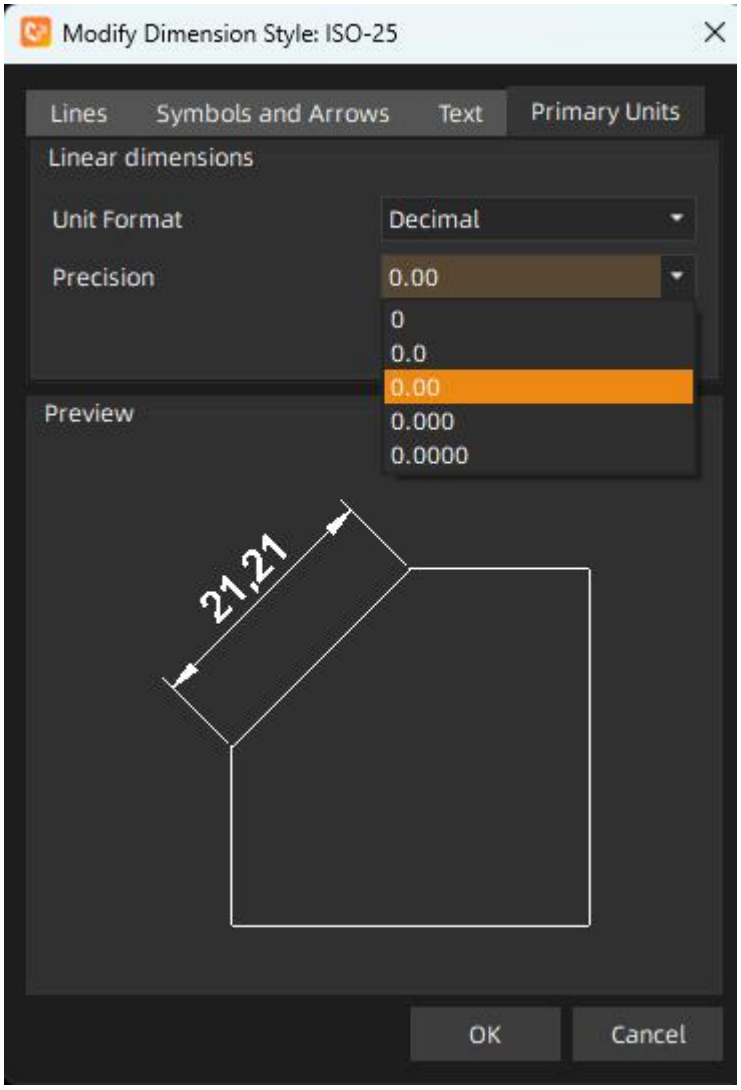


Figure: Unit Setting Interface

Unit Format: Sets the current unit format for aligned dimensions. Currently only one: Decimal.

Precision: Displays and sets the number of decimal places in the dimension text.

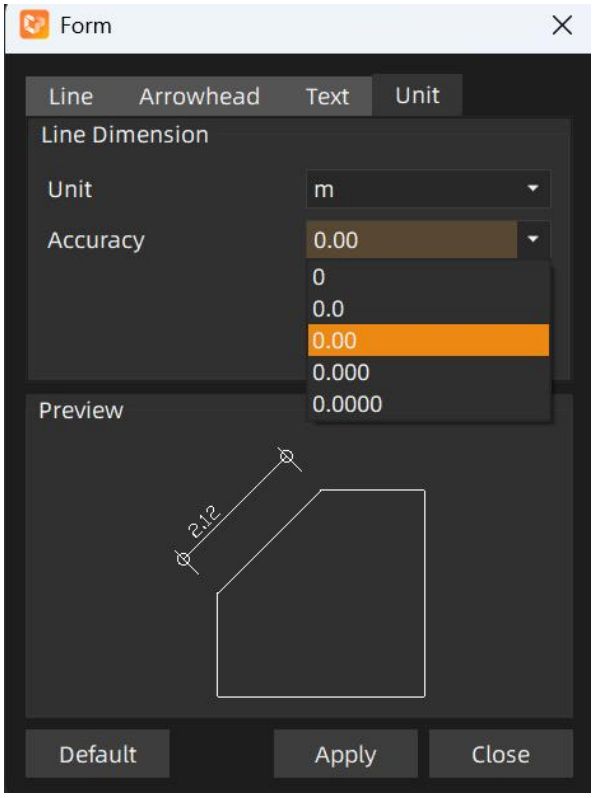


Figure: Accuracy Adjustment

2.4.5 Edit

2.4.5.1 Copy

Function Description:

Copies selected vectors in the active drawing to a specified location.

Operation Steps:

1. Click Vector -> Edit -> Copy.

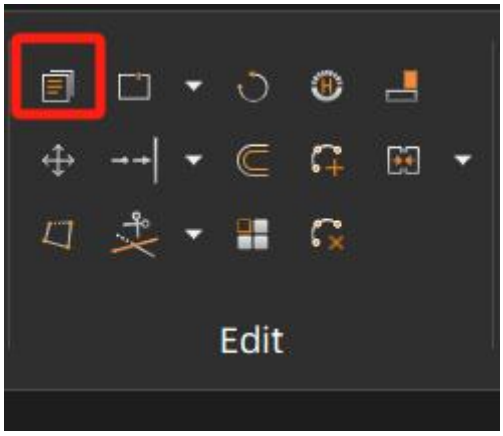


Figure: Copy

2. In the view, select the vector(s) to copy (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

3. In the view, click a point to specify the base point.

4. Move the mouse to a new location and click again to copy the vector(s) to the specified location. Supports continuous copying.

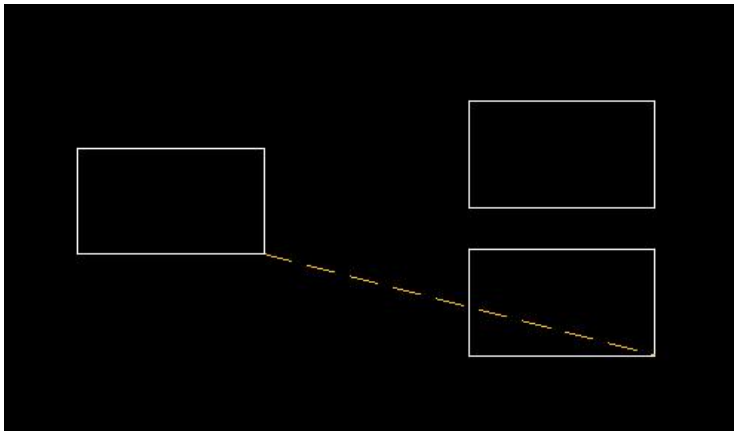


Figure: Copy Vector

Note: The copy function supports selecting the vector first, then clicking the copy button. The selected vector will be used as the copy object, and copying can be started after selecting the base point.

2.4.5.2 Move

Function Description:

Moves selected vectors in the active drawing to a specified location.

Operation Steps:

1. Click Vector -> Edit -> Move.

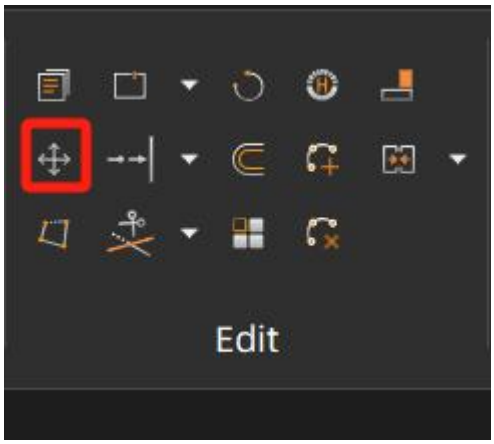


Figure: Move

2. In the view, select the vector(s) to move (multi-select supported). Click th e right-click menu "Confirm" or press Enter to confirm the selection set.

3. In the view, click a point to specify the base point.

4. Move the mouse to a new location and click again to move the vector(s) to the specified location.

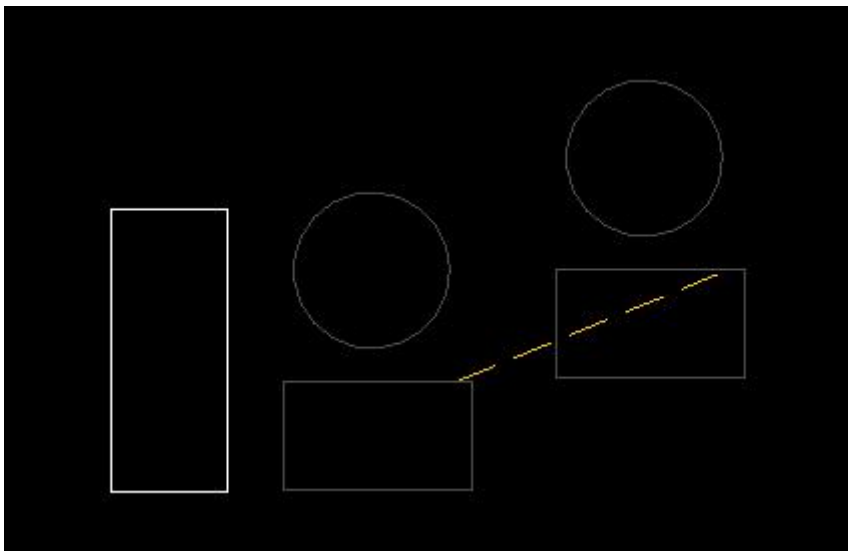


Figure: Move Vector

Note: The move function supports selecting the vector first, then clicking move. The selected vector will be used as the move object, and the vector can be moved after selecting the base point.

2.4.5.3 Close

Function Description:

Closes a selected non-closed polyline in the active drawing by connecting its start and end points.

Operation Steps:

1. Click Vector -> Edit -> Close.

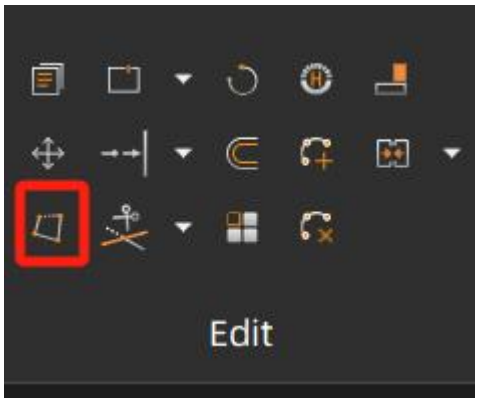


Figure: Close

2. In the view, select the polyline to close. The start and end points of the polyline are connected, closing it.

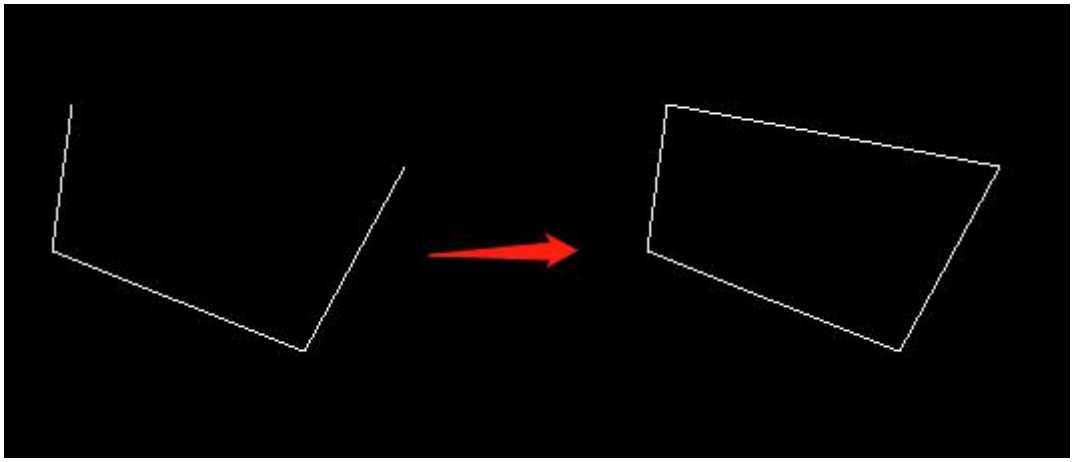


Figure: Close Result

2.4.5.4 Break

2.4.5.4.1 Break at Point

Function Description:

Selects a vector in the active drawing, specifies a point, and breaks the vec tor at that point.

Operation Steps:

1. Click Vector -> Edit -> Break -> Break at Point.

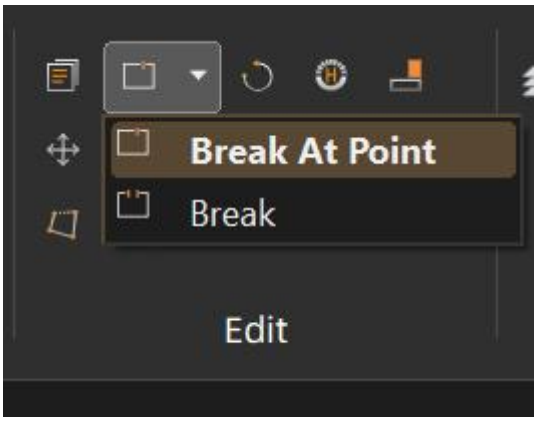


Figure: Break At Point

2. In the view, select the vector to break.

3. Click a point on the selected vector to specify the break location. The vector will be broken at that point.

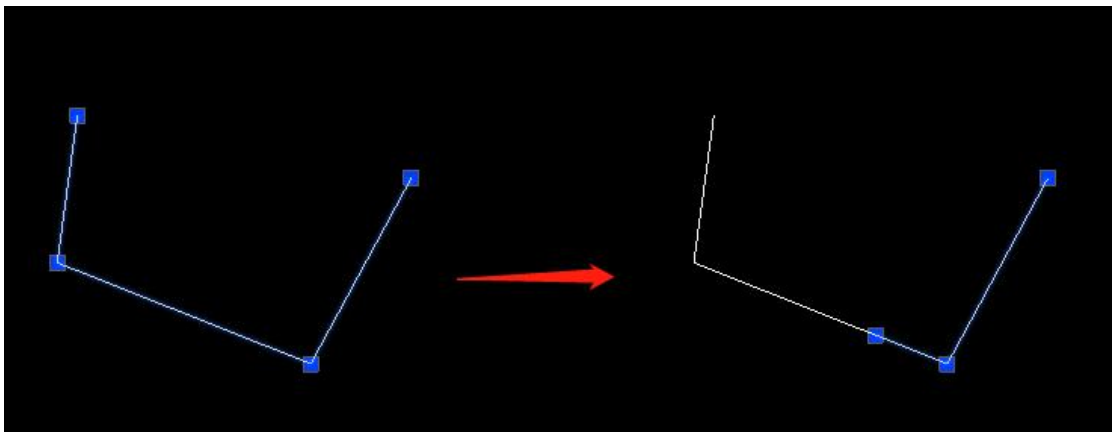


Figure: Single-Point Break Result

2.4.5.4.2 Break at Two Points

Function Description:

Selects a vector in the active drawing, specifies two points, and breaks the vector between those two points.

Operation Steps:

1. Click Vector -> Edit -> Break -> Break at Two Points.

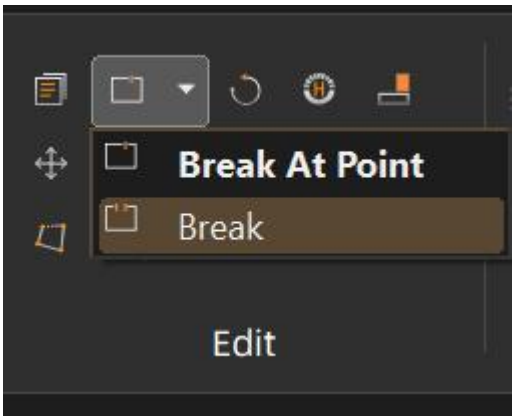


Figure: Break

2. In the view, click to select the vector to break.

3. Click another point on the selected vector to specify the break location. The vector will be broken between the two points.

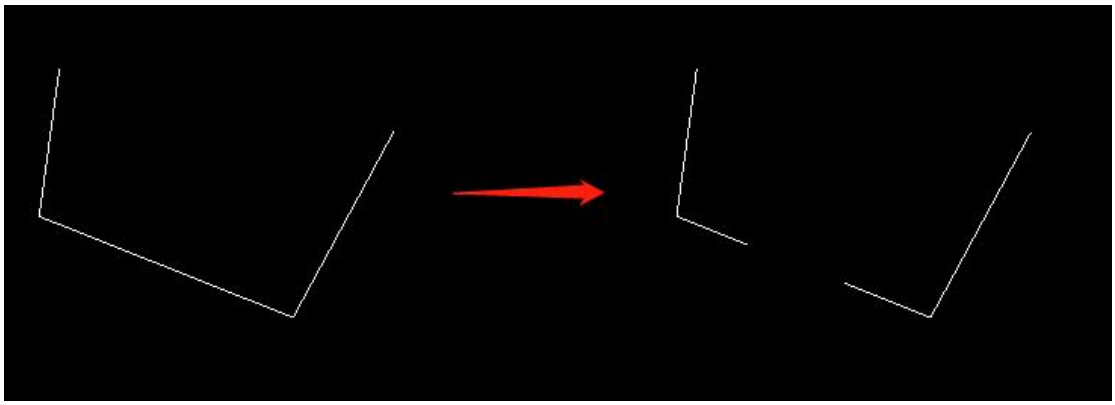


Figure: Two-Point Break Result

2.4.5.5 Extend

2.4.5.5.1 Standard Extend

Function Description:

Extends vectors in the active drawing to a specified reference object.

Operation Steps:

1. Click Vector -> Edit -> Extend -> Standard Extend.

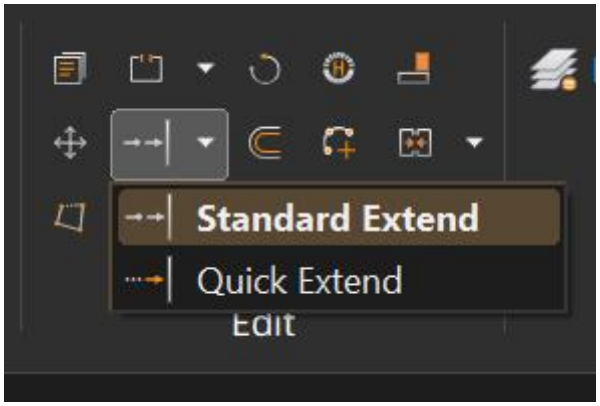


Figure: Standard Extend

2. In the view, select the reference object(s) (multi-select supported). Click t he right-click menu "Confirm" or press Enter to confirm the selection set.

3. In the view, click to select the vector(s) to extend. The vector(s) will be e xtended to the reference object along their natural path. Supports multiple extensions.

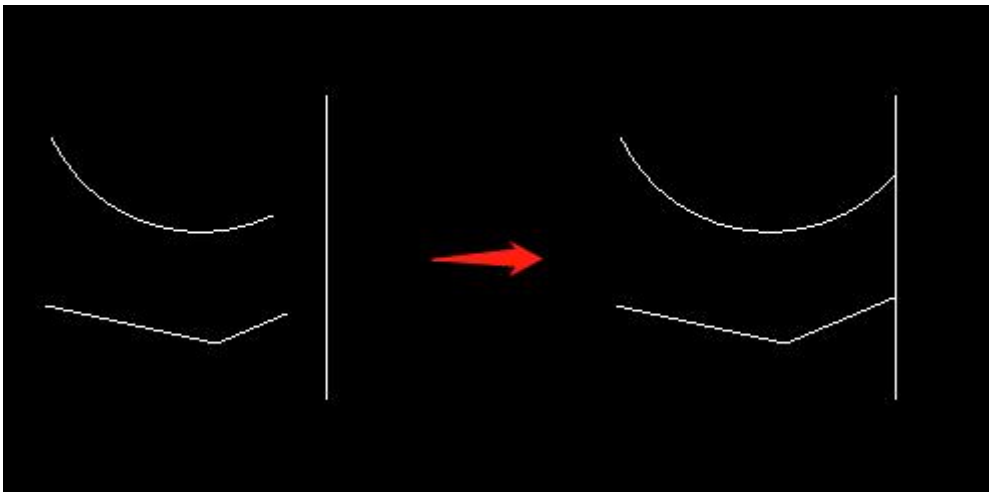


Figure: Standard Extend Result

Note: Standard extend supports selecting the vector first, then clicking the standard extend button. The selected vector will be used as the reference object, and the extend function can be used.

2.4.5.5.2 Quick Extend

Function Description:

Extends vectors in the active drawing to the nearest vector object.

Operation Steps:

1. Click Vector -> Edit -> Extend -> Quick Extend.

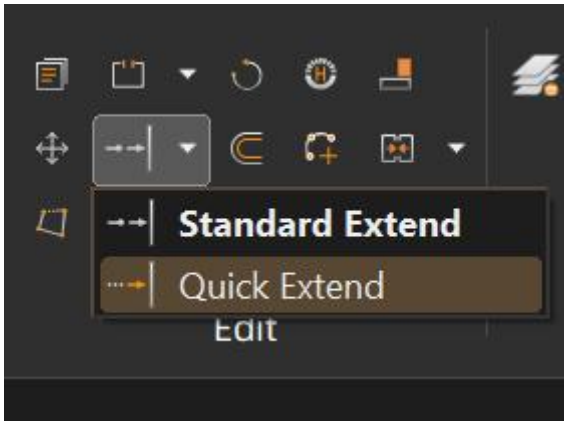


Figure: Quick Extend

2. In the view, click to select the vector(s) to extend. The vector(s) will be e xtended to the nearest vector object along their natural path. Supports mul tiple extensions.

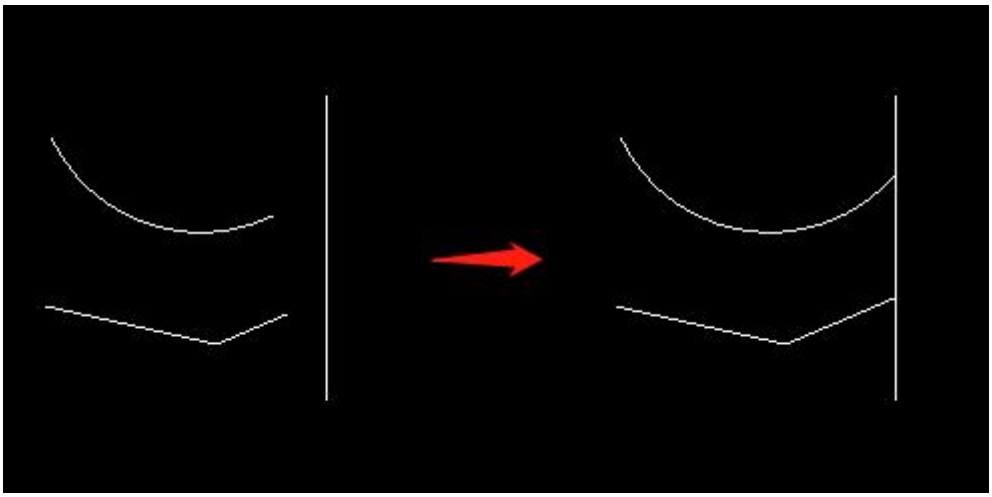


Figure: Quick Extend Result

2.4.5.6 Trim

2.4.5.6.1 Standard Trim

Function Description:

After selecting reference objects, trims away the portions of vector objects in the active drawing that intersect with the reference objects.

Operation Steps:

1. Click Vector -> Edit -> Trim -> Standard Trim.

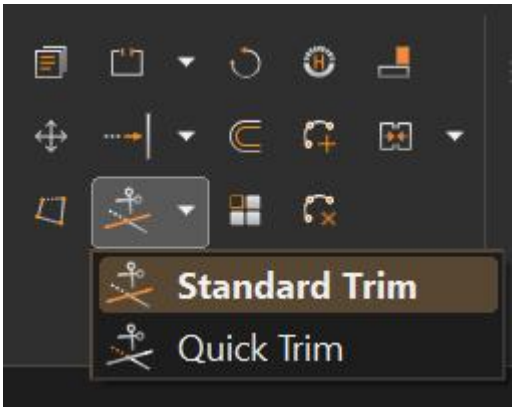


Figure: Standard Trim

2. In the view, select the reference object(s) (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

3. In the view, click the portion of the vector object intersecting the reference object that needs to be trimmed. That portion is trimmed away. Supports multiple trims.

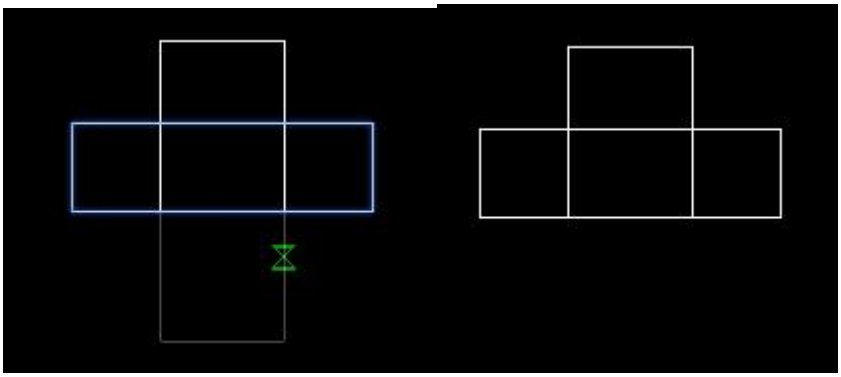


Figure: Standard Trim Result

Note: Standard trim supports selecting the vector first, then clicking the standard trim button. The selected vector will be used as the reference object, and the standard trim function can be used.

2.4.5.6.2 Quick Trim

Function Description:

Selects a vector object in the active drawing and trims away a portion of it from an intersection point.

Operation Steps:

1. Click Vector -> Edit -> Trim -> Quick Trim.

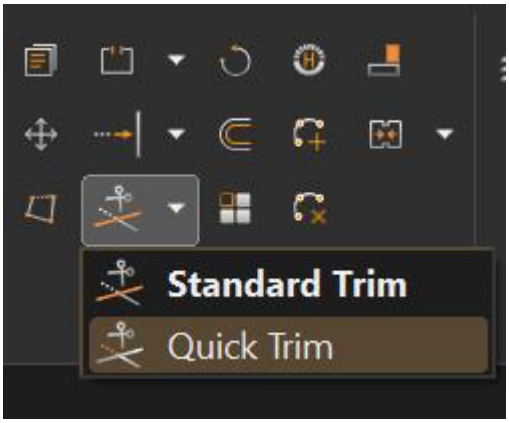


Figure: Quick Trim

2. In the view, click the portion of the vector object to be trimmed. That portion is trimmed away from the intersection point. Supports multiple trims.

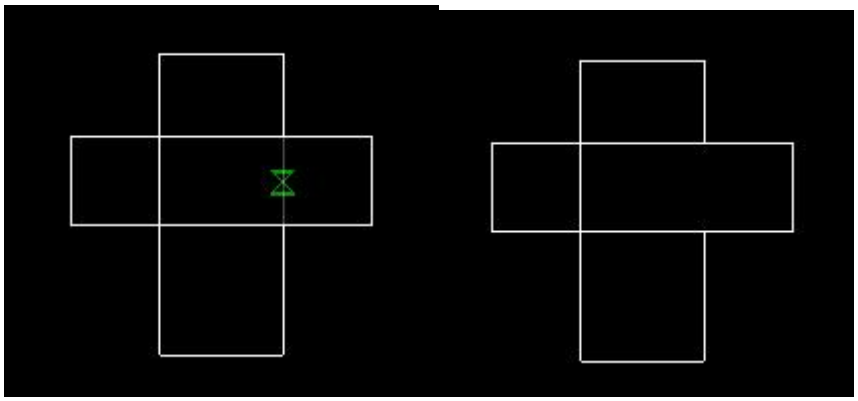


Figure: Quick Trim Result

2.4.5.7 Rotate

Function Description:

Rotates selected vectors in the active drawing to a specified location.

Operation Steps:

1. Click Vector -> Edit -> Rotate. The parameter panel appears on the right side of the software.

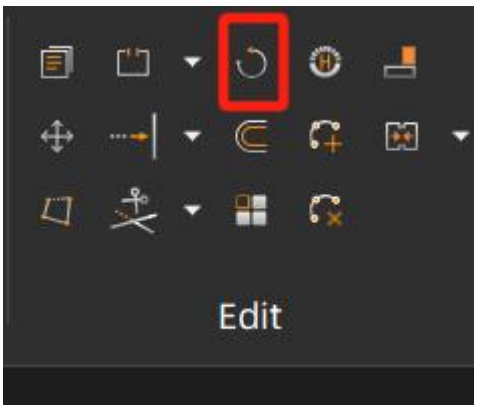


Figure: Rotate

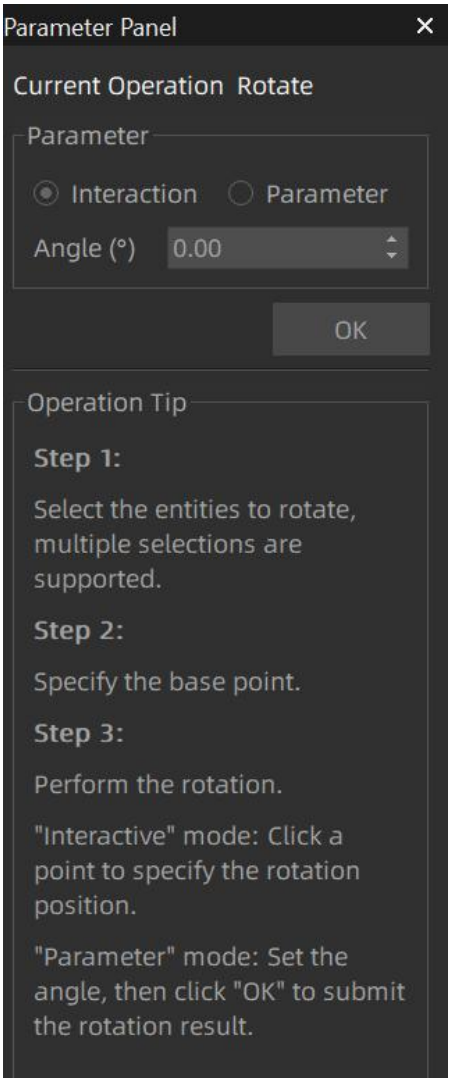


Figure: Rotate Parameter Panel

2. In the view, select the vector(s) to rotate (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

3. In the view, click a point to specify the base point.

4. Move the mouse to determine the angle and click again. Or select "Parameter" in the parameter panel, enter the angle value, and click "Confirm". The vector(s) will be rotated to the specified location.

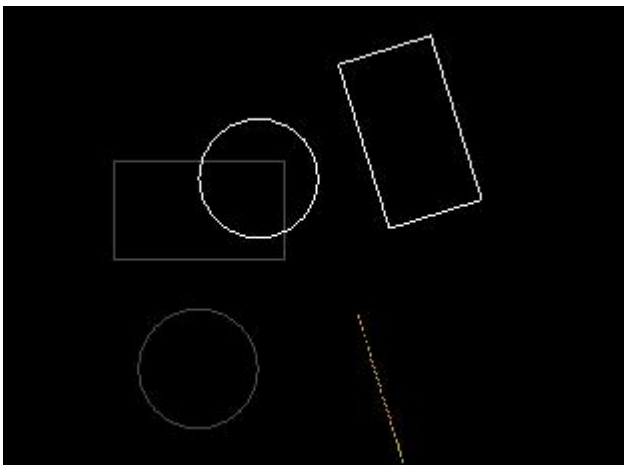


Figure: Rotate Vector

Parameter Settings:

Angle (°): The angle (in degrees) the vector rotates counterclockwise around the base point. Setting range [0, 360].

Note: The rotate function supports selecting the vector first, then clicking the rotate button. The selected vector will be used as the rotate object, and the vector can be rotated after selecting the base point.

2.4.5.8 Offset

Function Description:

Selects a vector to offset. Using interactive or parameter methods, offsets the selected vector by a specified direction and distance, performing single or continuous offsets to generate new vectors.

Operation Steps:

1. Click Vector -> Offset to activate Offset.

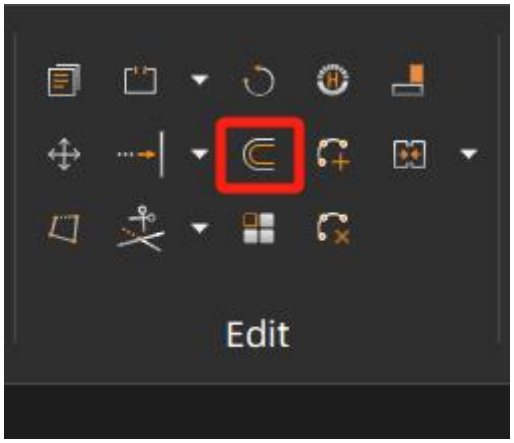


Figure: Offset Button

2. The Offset parameter panel appears on the right side of the software.

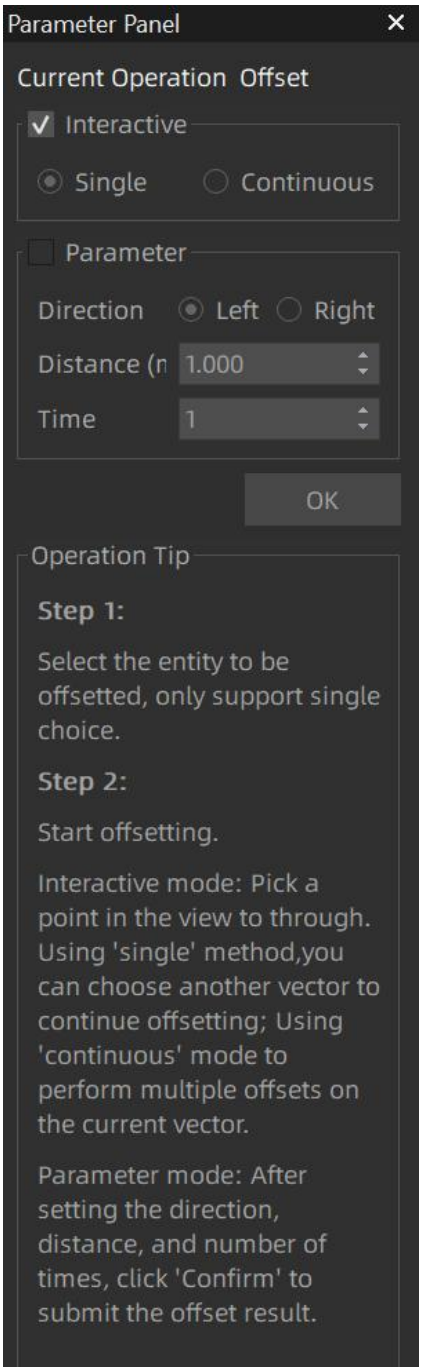


Figure: Offset Parameter Panel

3. In the view, select the vector to offset (single selection only). The parameter panel defaults to "Interactive" mode and "Single Offset".

In "Interactive" mode, "Single Offset" performs one offset on the currently selected vector. After offsetting, you need to select the vector again for another offset. If "Continuous Offset" is selected, it performs continuous offsets on the currently selected vector.

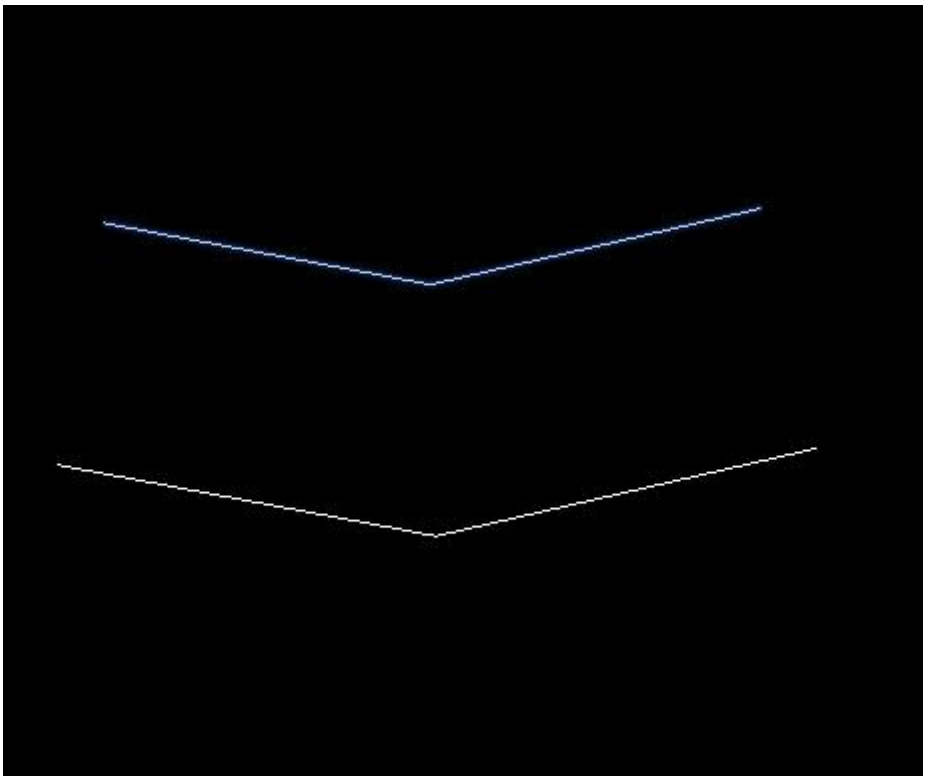


Figure: Offset Preview

4. Move the mouse to determine the position and click again. Or select "Parameter" in the parameter panel, enter the offset "Direction, Distance, and Count", and click "Confirm". The offset vector(s) are generated at the specified location.

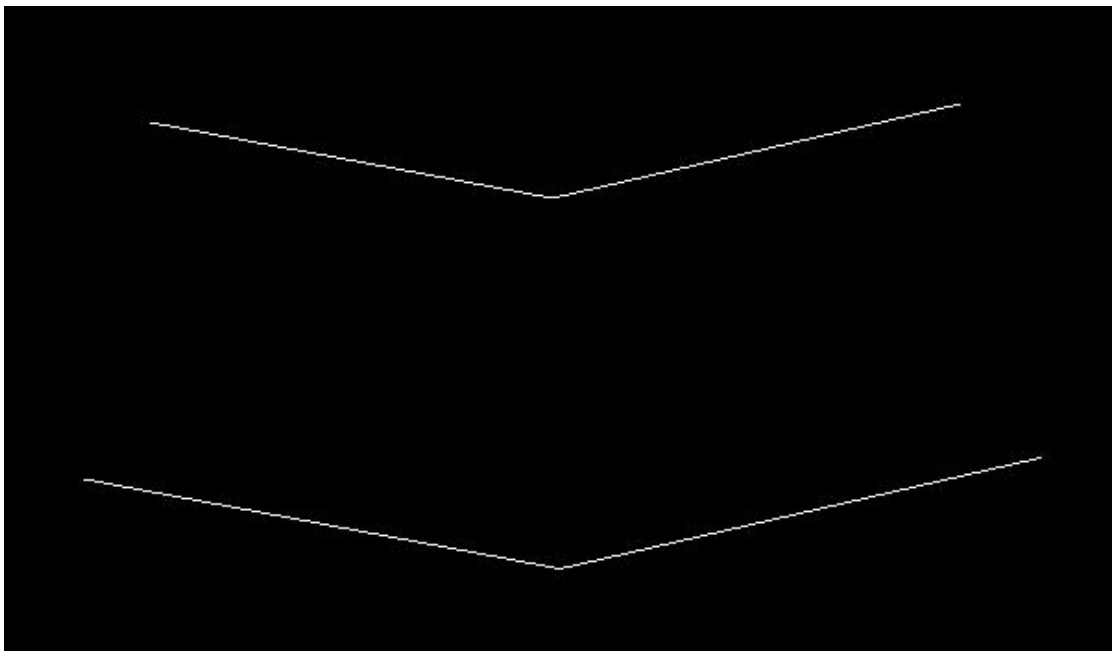


Figure: Offset Result

Note: The offset function supports selecting a single offsettable vector first, then clicking the offset button. The selected vector will be used as the reference object, and the offset function can be used.

2.4.5.9 Array

Function Description:

Selects vectors to array. Modifies the number of rows/columns, row spacing, and column spacing. Clicking Confirm creates a rectangular array of copies.

Operation Steps:

1. Click Vector -> Array to activate Array. Output message: Please set the number of rows/columns, row spacing, and column spacing in the parameter panel.

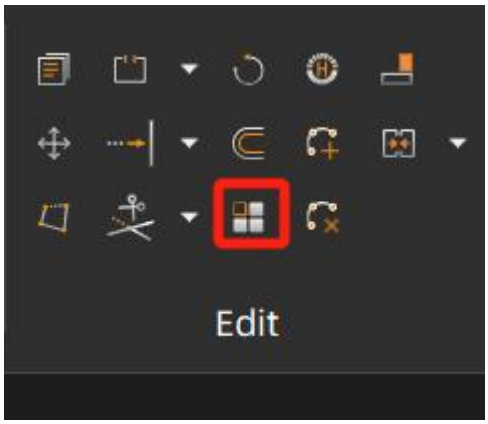


Figure: Array

2. The Array parameter panel appears on the right side of the software.

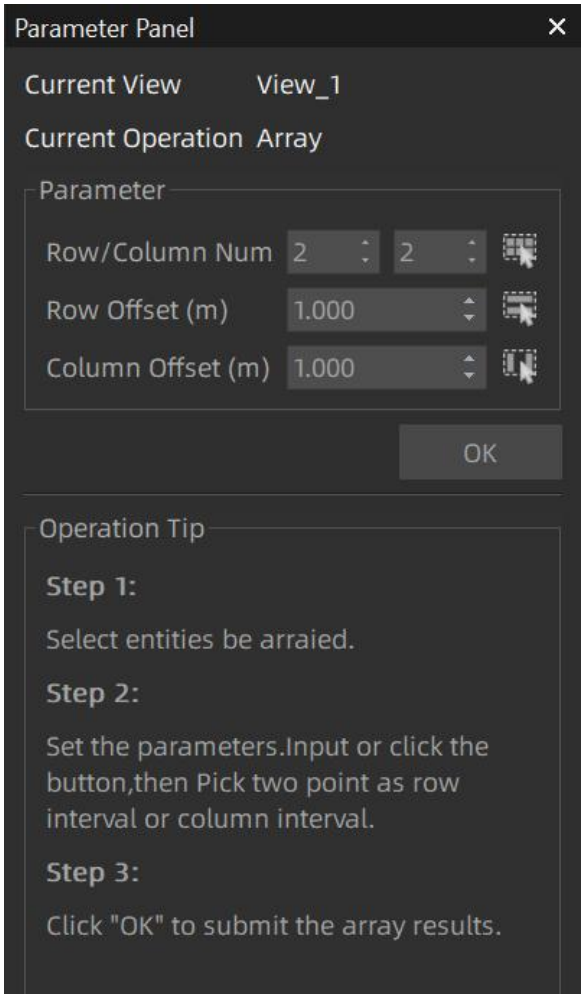


Figure: Array Parameter Panel

3. In the view, select the vector(s) to array (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

4. Set the parameters. Manually enter the number of rows/columns, row spacing, column spacing, or click the buttons next to the parameters to specify them interactively in the view.

5. Click "Confirm" to submit the array result.

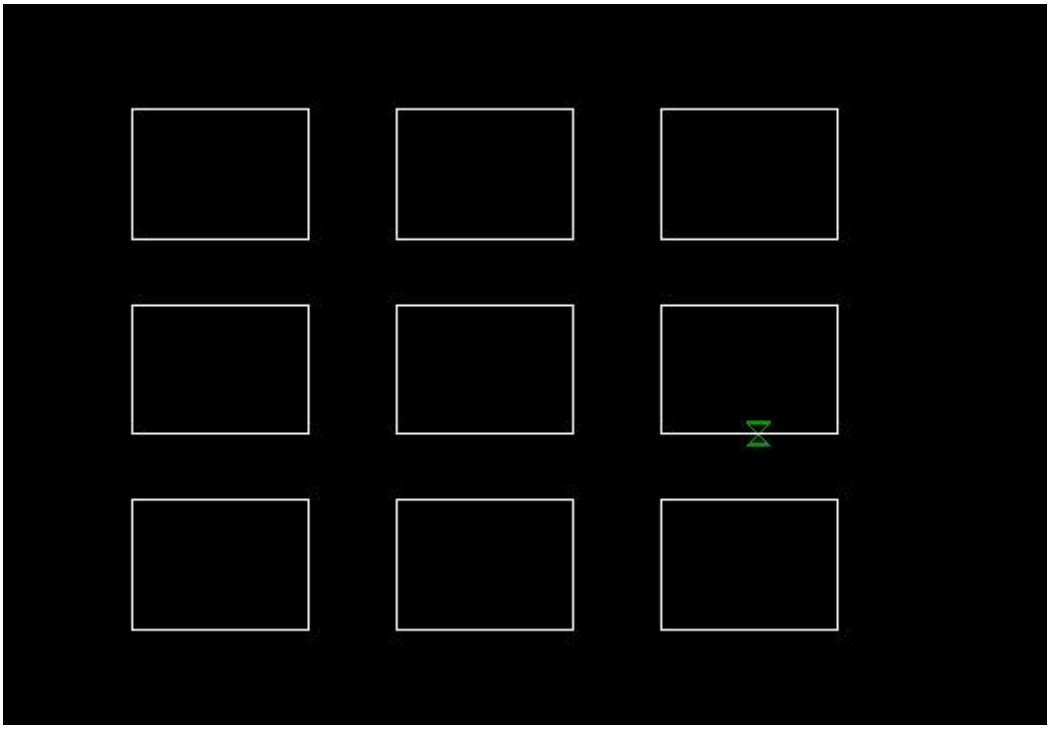


Figure: Array Effect

Note: The array function supports selecting the vector first, then clicking the array button. The selected vector will be used as the array object, and the array function can be used.

2.4.5.10 Modify Elevation

Function Description:

Modifies the elevation values of selected vectors using relative or absolute values.

Operation Steps:

1. Click Vector -> Modify Elevation to activate Modify Elevation. Output message: Please select the vectors whose elevation needs to be modified, then click the right-click menu "Confirm" or press Enter to end selection.

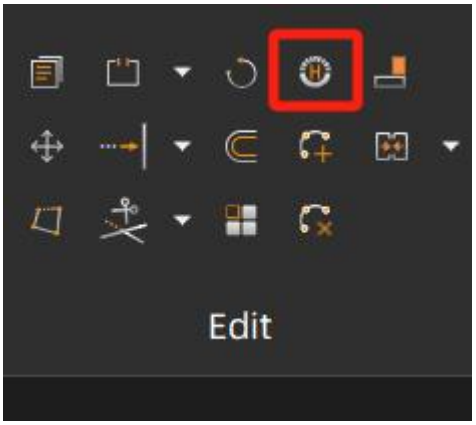


Figure: Elevation Edit

2. In the view, select the vector(s) whose elevation to modify (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set. Output message: Please set the modification method and elevation value in the parameter panel.

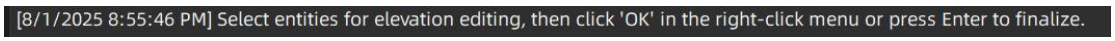


Figure: Output Message

3. Set the parameters. Select "Relative Value" to modify relative to the vector's original elevation.

4. Select "Absolute Value". The vector will be directly modified to the set elevation. When using absolute value, you can click the Pick button to the right of the elevation input box. Click a point in the view window to get the absolute elevation of that point, which will be automatically filled into the input box.

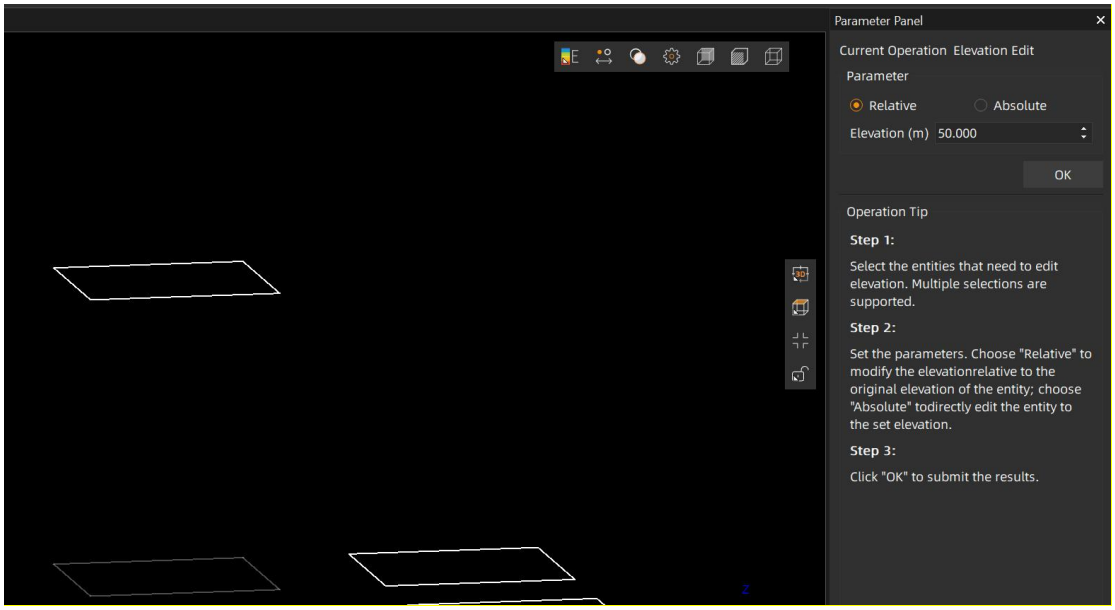


Figure: Relative Value Preview Effect

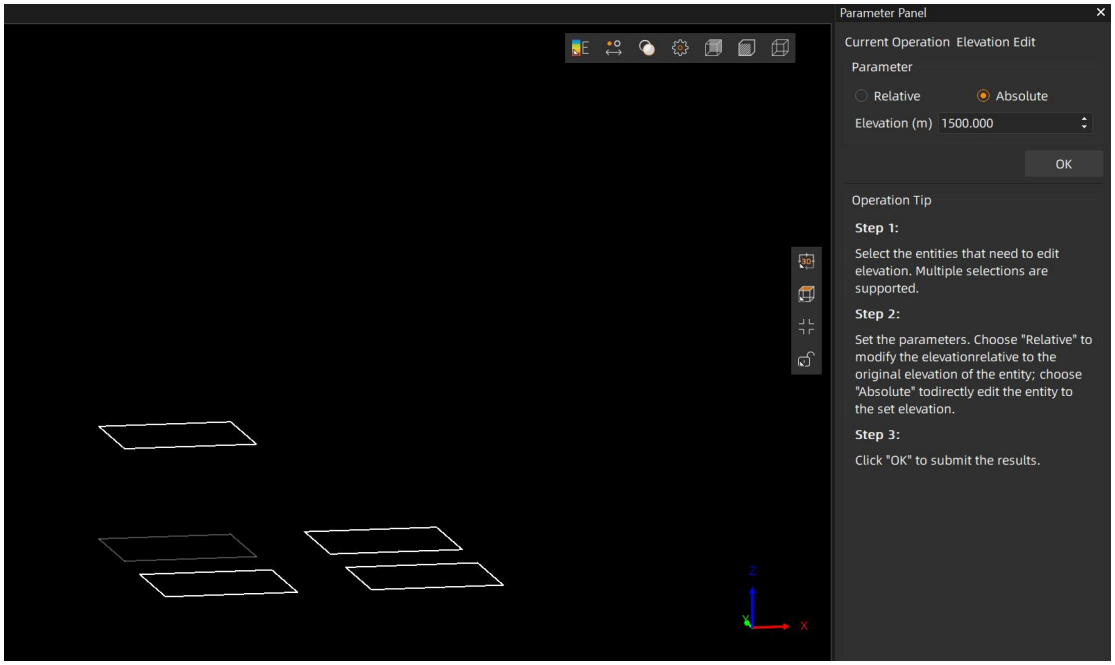


Figure: Absolute Value Preview Effect

5. Click "Confirm" to submit the elevation modification result.

Note: The elevation modification function supports selecting the vector first, then clicking the elevation modification button. The selected vector will be used as the elevation modification object, and the elevation modification function can be used.

2.4.5.11 Add Vertex

Function Description:

Adds vertices to existing polylines, 3D polylines, or arc features.

Operation Steps:

1. Click Vector -> Add Vertex.

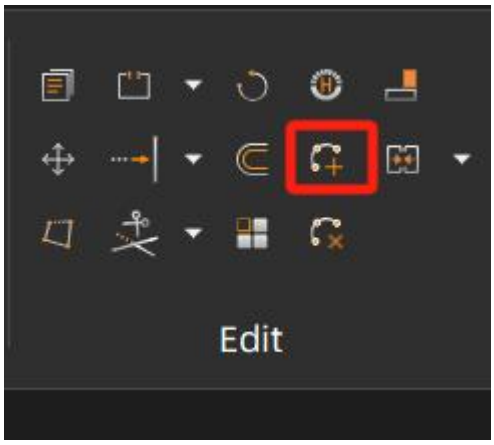


Figure: Add Point

2. In the view, select the vector(s) to which to add vertices (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

3. Left-click on the selected vector at the location where you want to add a vertex. A vertex is added at that point.

4. Double-click left mouse button / right-click / press Esc to exit the Add Vertex function.

2.4.5.12 Delete Vertex

Function Description:

Deletes a vertex from an existing polyline or 3D polyline, provided it has more than two vertices.

Operation Steps:

1. Click Vector -> Delete Vertex.

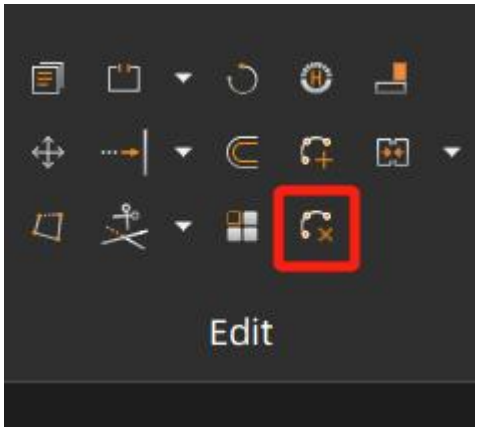


Figure: Delete Point

2. In the view, select the vector(s) (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

3. Left-click on a vertex of the selected vector. If the selected vector is a polyline or 3D polyline with more than two vertices, the selected vertex is deleted. Otherwise, no change occurs.

4. Double-click left mouse button / right-click / press Esc to exit the Delete Vertex function.

2.4.5.13 Move Vertex

Function Description:

Moves a grip point of a vector.

Operation Steps:

1. Select a vector, then click on an endpoint grip. The grip turns red. Move the mouse; the vertex follows the mouse movement.

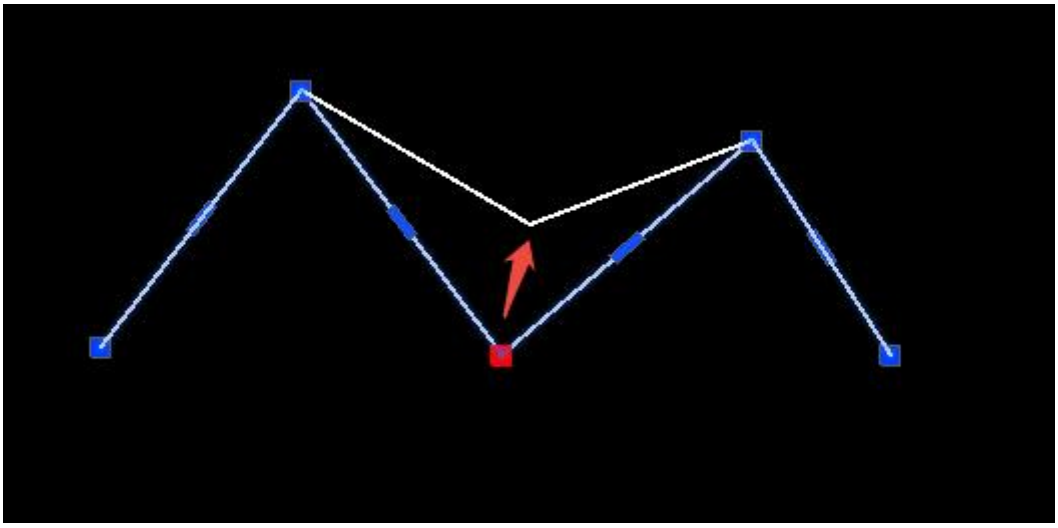


Figure: Move Point

2. Click the desired target location in the view to complete the vertex mov e.

3. Select a vector, then click on a midpoint grip. The grip turns red. Move the mouse; the vertex follows the mouse movement.

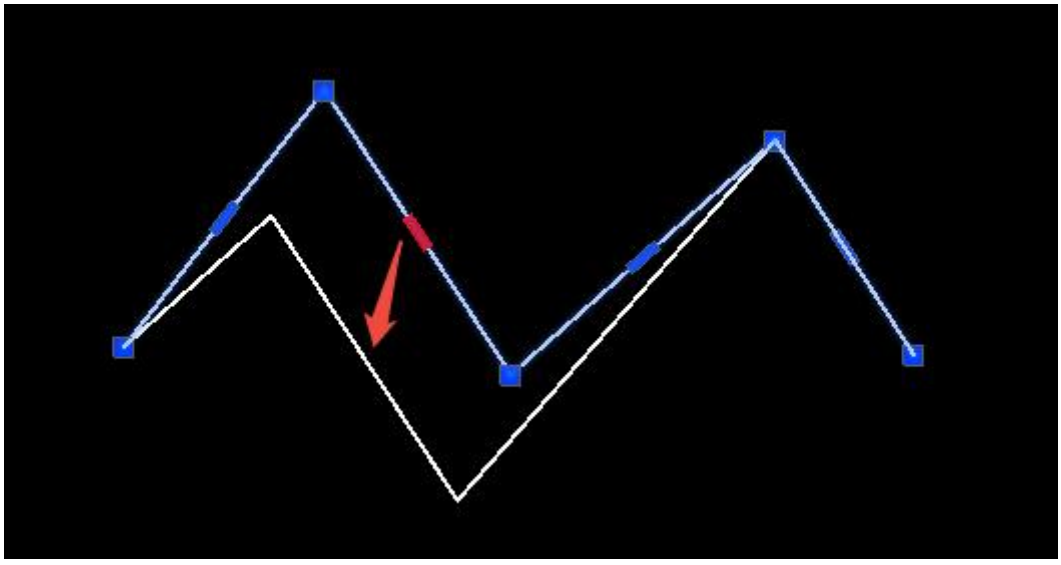


Figure: Move MidPoint

4. Click the desired target location in the view to complete the vertex mov e.

2.4.5.14 Align

Function Description:

Moves selected vectors based on the vector between Source Point 1 and D estination Point 1, and rotates them based on the angle between the lines Source Point 1-2 and Destination Point 1-2.

Operation Steps:

1. Click Vector -> Align.

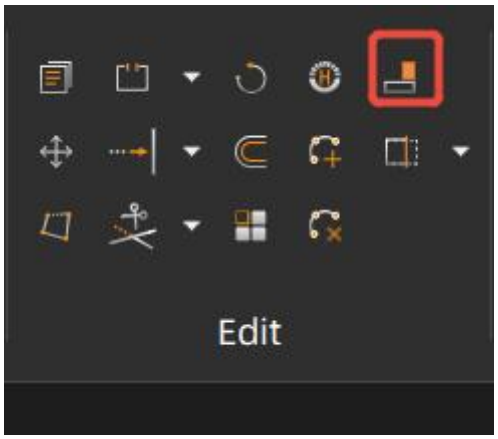


Figure: Align

2. In the view, select the vector(s) to align (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

3. Left-click to sequentially select Source Point 1, Destination Point 1, Sourc e Point 2, and Destination Point 2. After selection, the selected vectors will be moved based on the vector between Source Point 1 and Destination Poi

nt 1, and rotated based on the angle between the lines Source Point 1-2 a nd Destination Point 1-2.

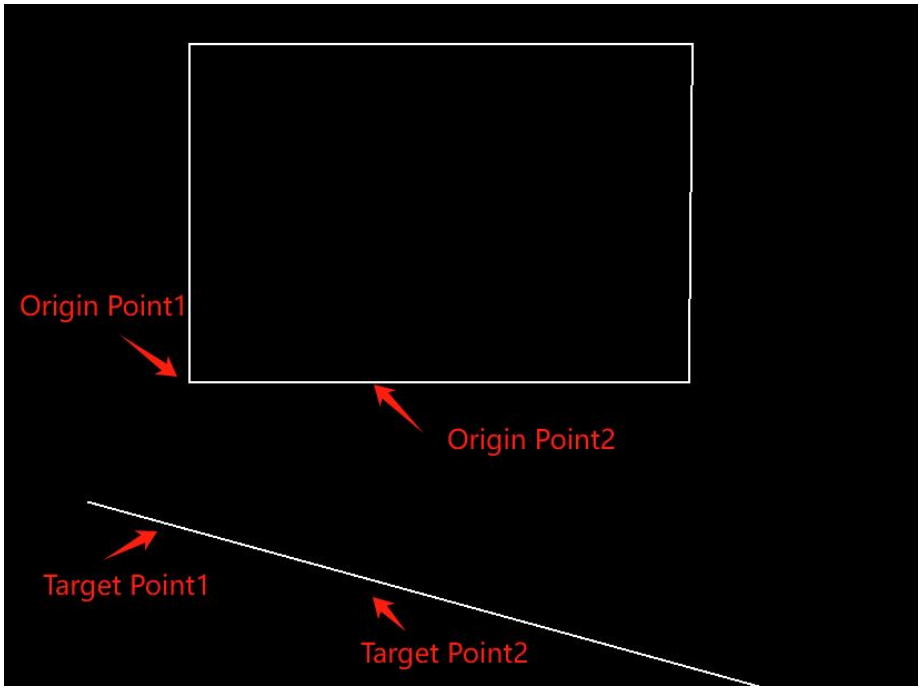


Figure: Select Points to Align

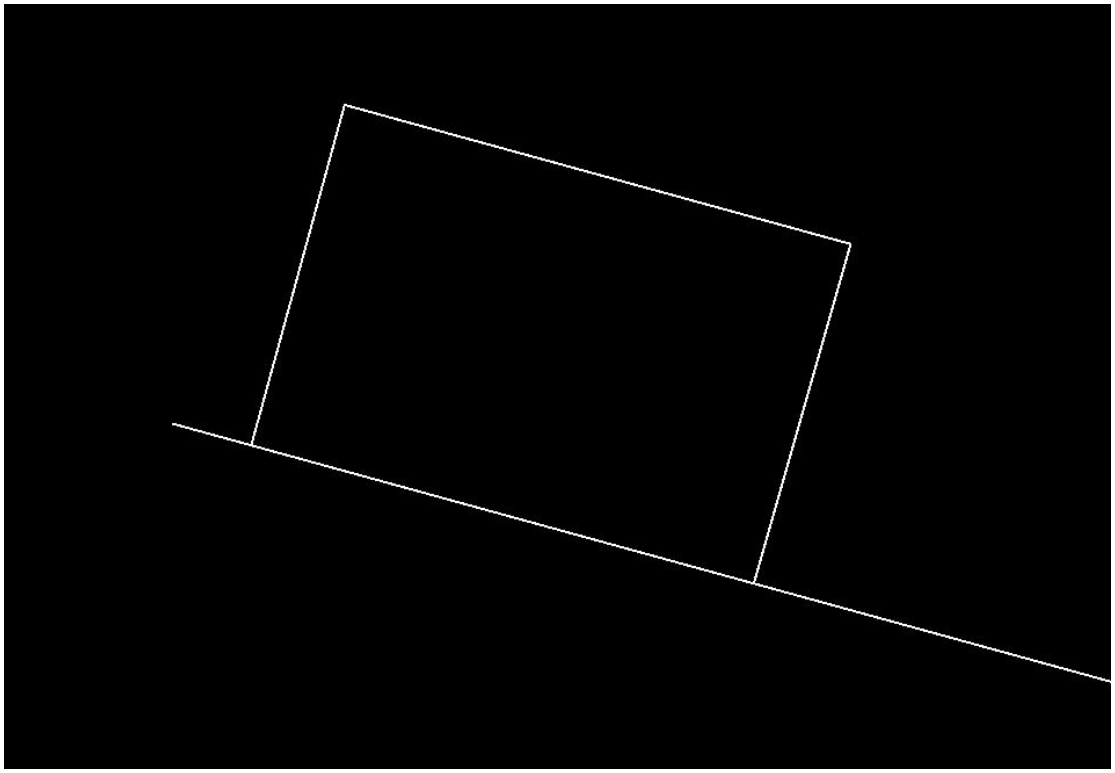


Figure: Effect of Alignment

4. Double-click left mouse button / right-click / press Esc to exit the Align function.

Note:

Source Point 1 and Source Point 2 cannot coincide. Destination Point 1 and Destination Point 2 cannot coincide.

2.4.5.15 Mirror

Function Description:

Creates a mirrored copy of selected vectors symmetrically about a mirror line. The original selected vectors are retained.

Operation Steps:

1. Click Vector -> Mirror.

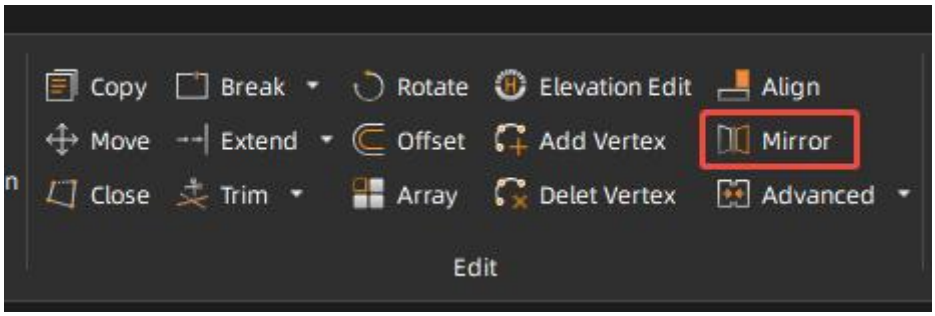


Figure: Mirror

2. In the view, select the vector(s) to align (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

3. Left-click to sequentially select the first point of the mirror line and the second point of the mirror line. After selection, the selected vectors are mirrored symmetrically about the chosen line, creating a mirrored copy.

4. Right-click / press Esc to exit the Mirror function.

Note:

The first and second points of the mirror line cannot coincide.

2.4.5.16 Advanced

2.4.5.16.1 Unite

Function Description:

Merges multiple selected vectors in the active drawing into a single vector.

Operation Steps:

1. Click Vector -> Edit -> Advanced -> Unite.

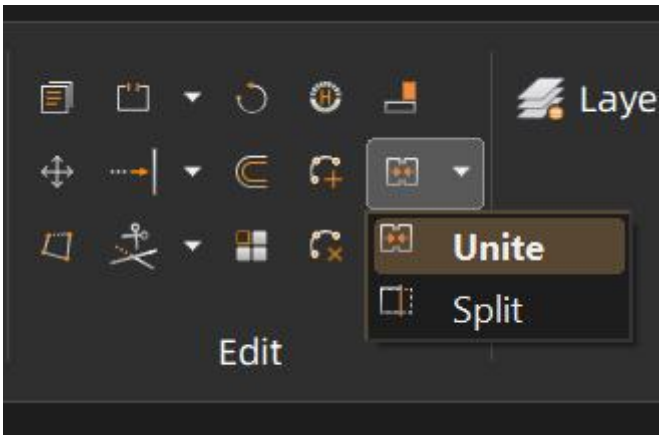


Figure: Unite

2. In the view, select multiple vectors whose endpoints are connected to be merged (supports selecting multiple groups for separate merging). The selected vectors are merged into one vector feature. Supports continuous merging.

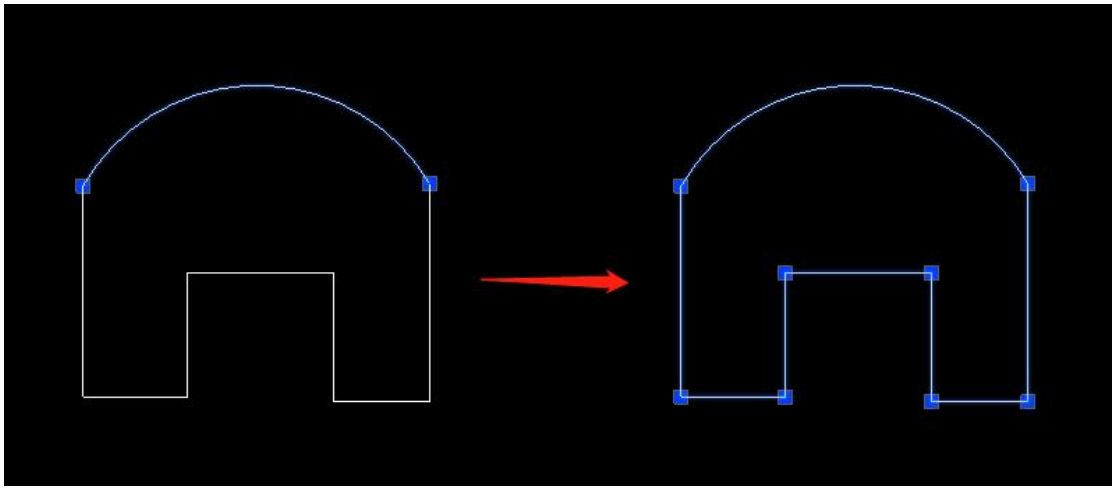


Figure: Merge Vector

Note:

Only vectors with connected endpoints can be merged into one vector element. In addition, collinear lines can be merged into a single line, and arcs on the same circle can be merged into a single arc or circle.

Objects not supported for merging:

1. Spline curves, elliptical arcs, spiral curves, etc.

2. Currently, merging arcs with 3D polylines is not supported.

2.4.5.16.2 Split

Function Description:

Divides selected vectors into multiple parts by drawing a splitting line.

Operation Steps:

1. Click Vector -> Advanced -> Split to activate Split. Output message: Please select the features to split first, then click the right-click menu "Confirm" or press Enter to end selection.

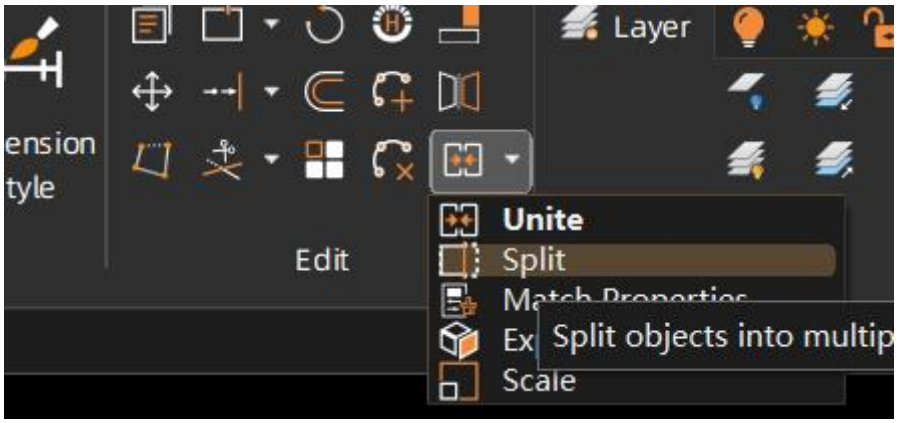


Figure: Split

2. In the view, select the vector(s) to split (multi-select supported). Click the right-click menu "Confirm" or press Enter to confirm the selection set.

3. Set the parameters. Selecting "Split Only" cuts the split object into multiple parts. Selecting "Generate New Graphics" generates new graphics for the split object and the parts intersecting the split line.

4. Draw a polyline as the split line. Double-click to end. The split takes effect. The selection set can be split multiple times.

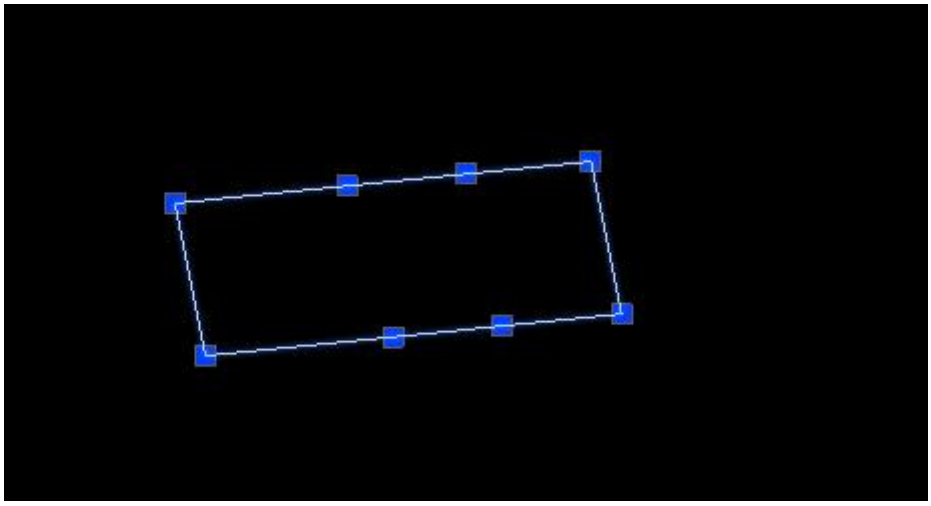


Figure: Split Only Result

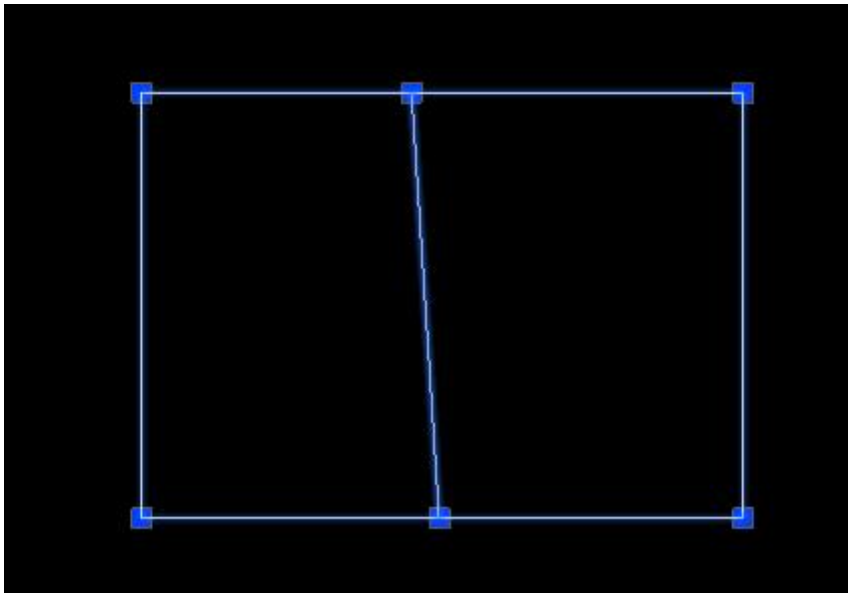


Figure: Generate New Entites Split Result

Note:

Objects that cannot be split: Points, blocks, groups, text, dimensions, and tables.

Split supports selecting vectors first, then clicking the Split button. The selected vectors become the objects to split, and the split function is activated.

2.4.5.16.3 Match Properties

Function Description:

Applies the properties of a selected source object to other target objects.

Operation Steps:

1. Click Vector -> Advanced -> Match Properties to activate Match Properties.

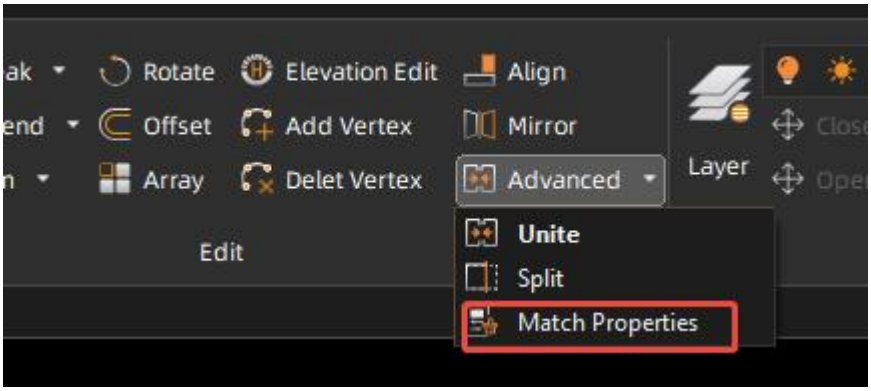


Figure: Match Properties

2. In the view, select the source object (single selection only).

3. Set the parameters. Right-click -> Settings to open the Property Settings dialog box. Checked properties will be applied to the target objects. Unchec ked properties will not be applied. If special properties are unchecked, only the checked basic properties will be applied to the target objects.

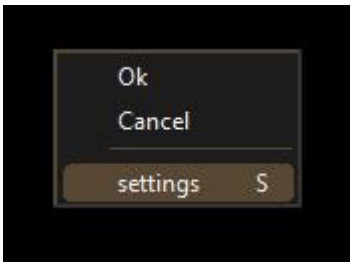


Figure: Right Menu

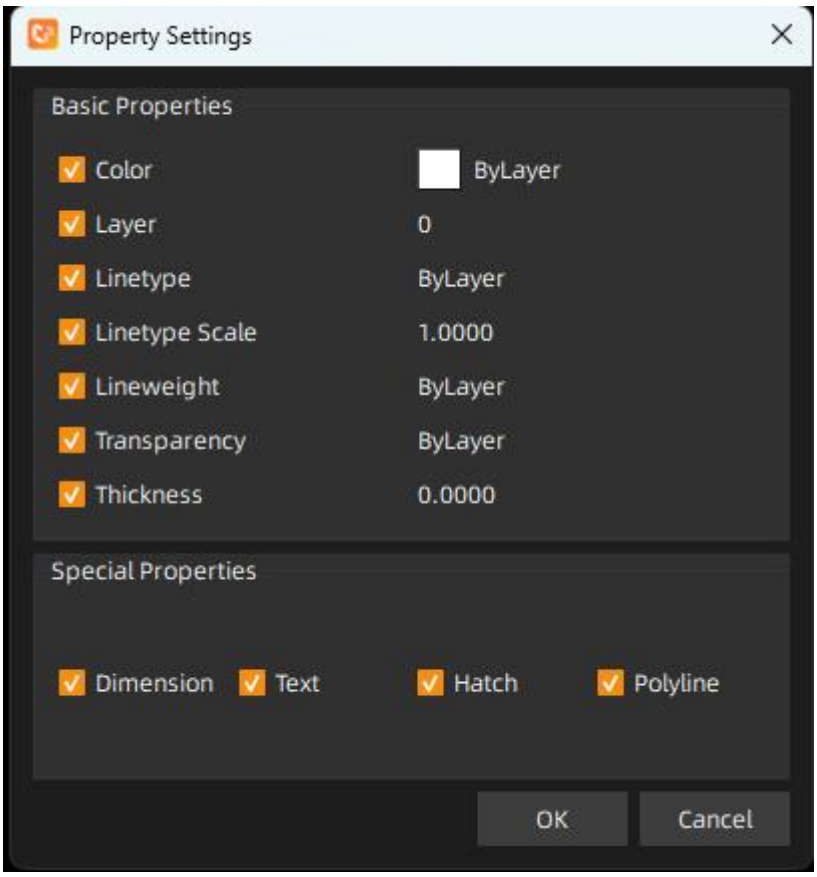


Figure: Properties Settings

4. In the view, select the target object(s) (multi-select supported). After selection, the target object(s) properties are refreshed.

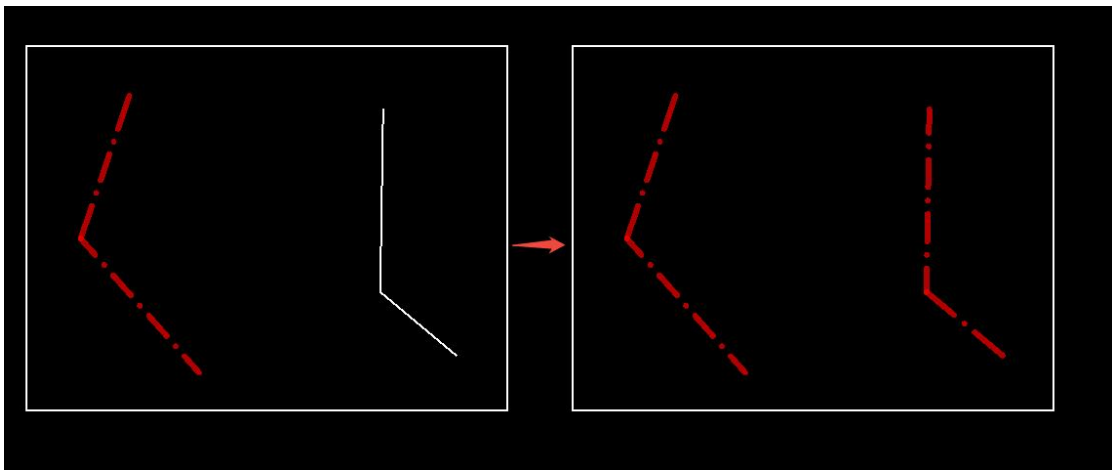


Figure: Properties Matching Result

2.4.5.16.4 Explode

Function Description:

Explodes a compound object into its component objects.

Operation Steps:

1. Click Vector -> Advanced -> Match Properties to activate Match Properties.

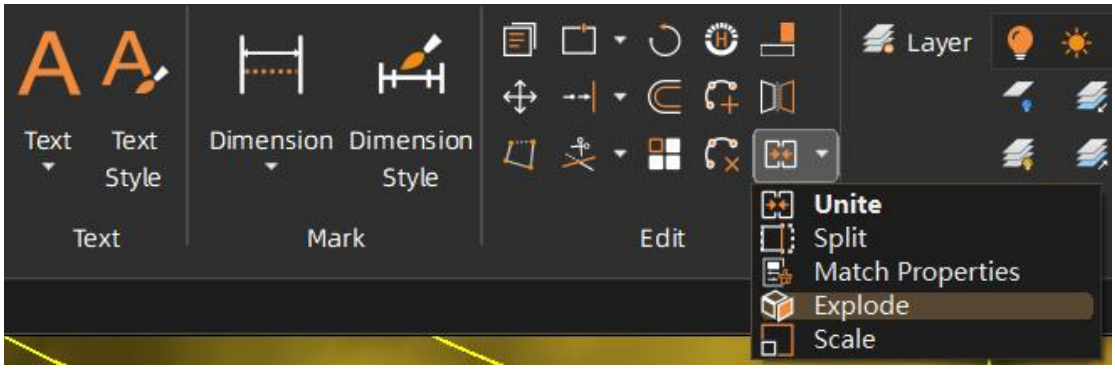


Figure: explode

2. Select the vector to explode, right-click to confirm or press Enter. The selected vector is exploded.

3. After explosion, the selected compound object is decomposed into its component objects.

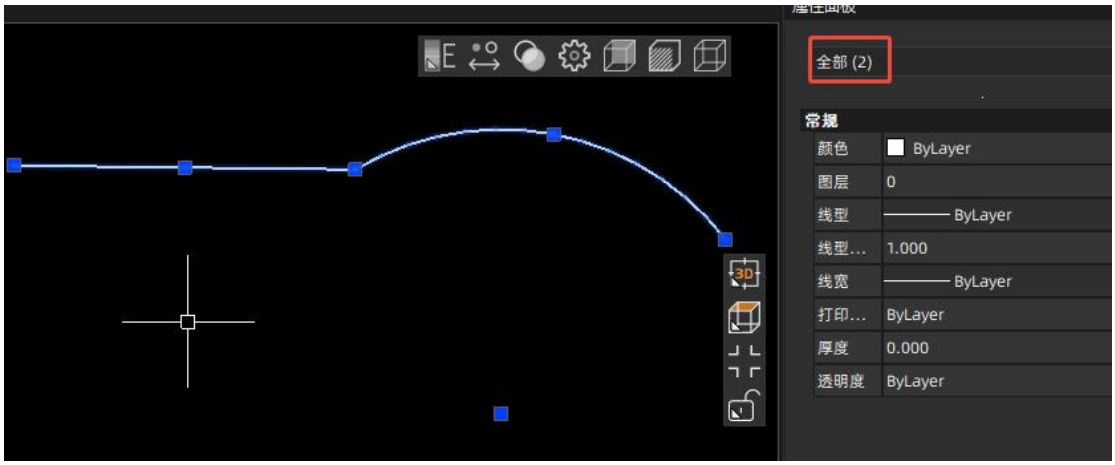


Figure: Explode Effect

4. Composite Vector Explosion Correspondence Table:

Entity Type	Explodable	Explosion Result	Property Changes
Point	No	\	\
Line	No	\	\
Ray	No	\	\
Construction Line	No	\	\
Circle	No	\	\
Arc	No	\	\
Ellipse	No	\	\
Elliptical Arc	No	\	\
Spline Curve	No	\	\
Polyline	Yes	Lines, Arcs	Global width lost
Region	Yes	Base objects (basic elements forming the closed area)	\
3D Polyline	Yes	Lines	\
Helix	Yes	Spline curve	\
Wipeou	Yes	Lines	\
Revision Cloud	Yes	Arcs	\
Single Line Text	Yes	\	\
Multiline Text	Yes	Single line text	\
Dimension	Yes	Lines, multiline text, arrows	If the arrow is a user-defined block, the block will not be exploded further.
Table	Yes	Lines, text	\
Block Reference	Yes	Basic elements	1. Cannot explode if the block reference is

			set as non-explodable. 2. External block references cannot be exploded. 3. Multiple insert blocks cannot be exploded. 4. Anonymous blocks can be exploded.
Hatch Pattern	Yes	Basic elements	Solid and gradient fills cannot be exploded.
Array	Yes	Copies of the original object	\
Polyface Mesh	Yes	Single vertex meshes explode to points. Double vertex meshes explode to lines. Triple vertex meshes explode to 3D faces.	\
Solid	Yes	A single surface body (non-planar surface), region, or curve.	\

Table: Vector Explosion Correspondence Table

2.4.5.16.5 Scale

Function Description:

Scales selected vectors.

Operation Steps:

1. Click Vector -> Advanced -> Scale to activate the Scale function.

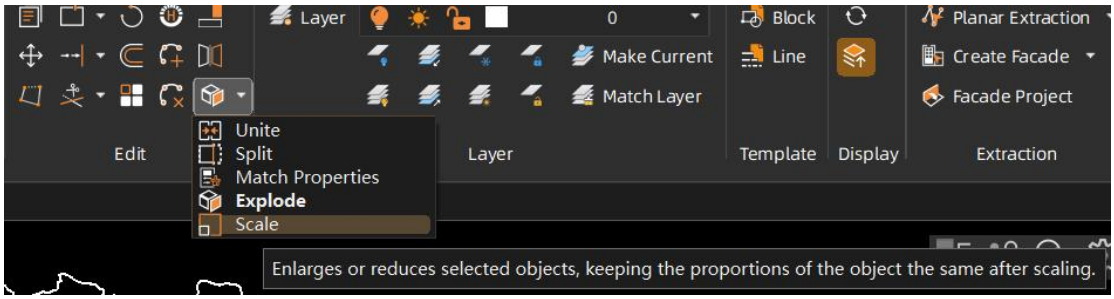


Figure: Scale

2. Select the vector(s) to scale (multi-select supported). Right-click "Confirm" or press Enter to confirm.

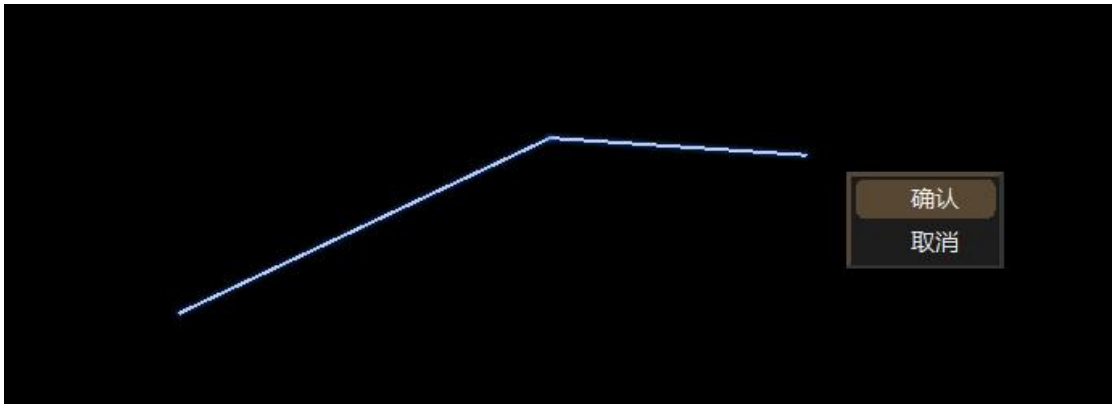


Figure: Select Vectors to Scale

3. Select a base point.

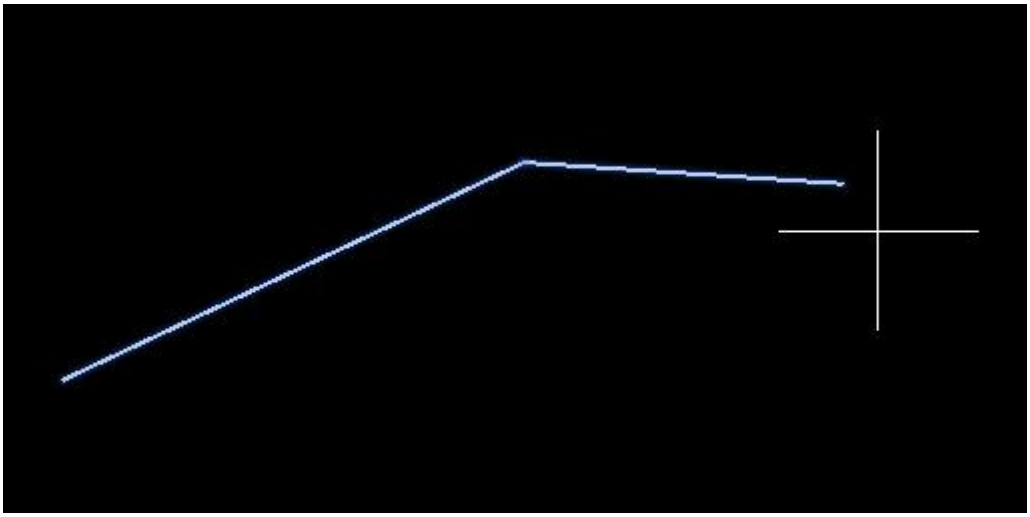


Figure: Select Base Point

4. Select the scaling method:

a. "Parameter" mode: Enter the scale factor.

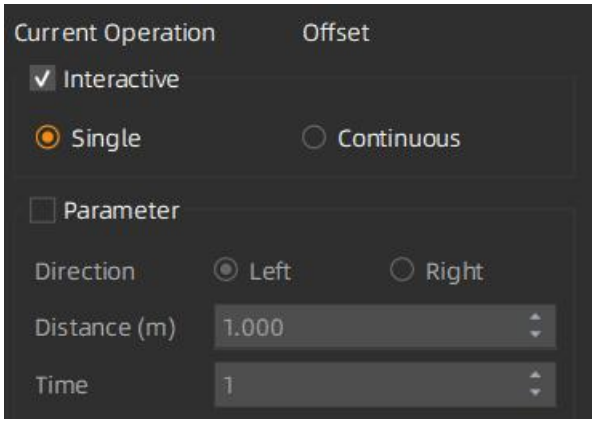


Figure: Parameter Mode

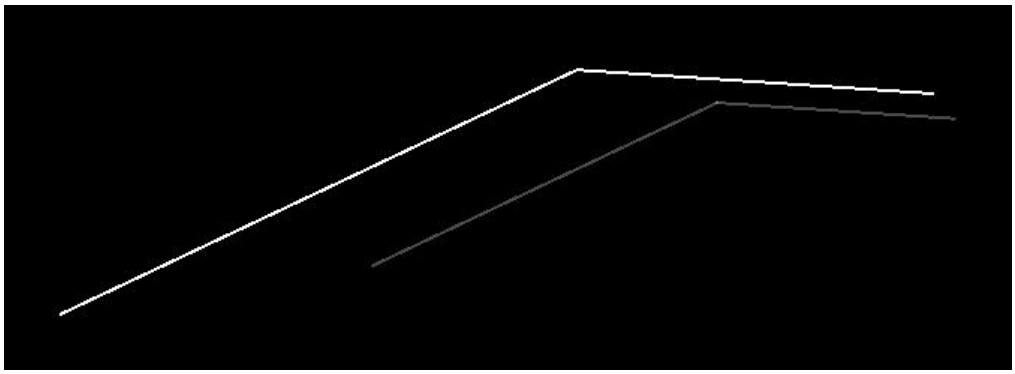


Figure: Interactive Mode Scaling

b. "Interactive" mode: Click two points in the view as the reference line for scaling. Move the mouse to specify the desired scaled position.

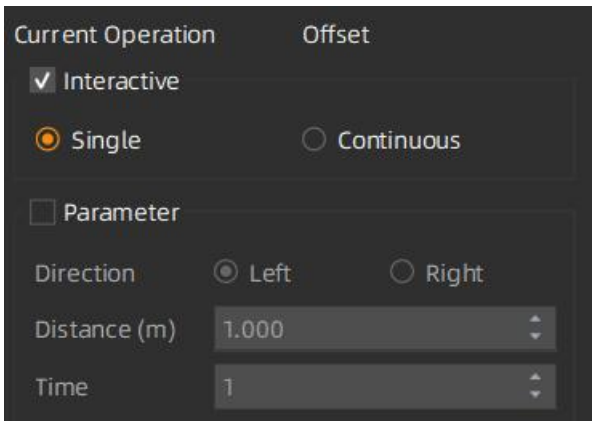


Figure: Interactive Mode

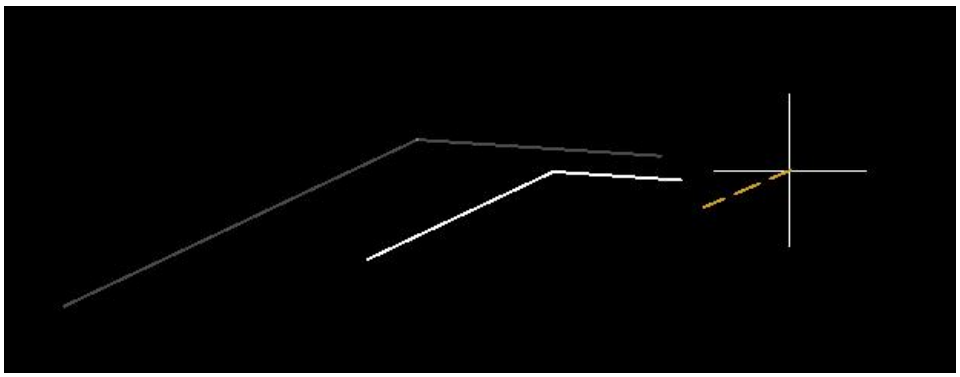


Figure: Interactive Mode Scaling

c. "Copy Scale": Scales a copy instead of the original. When unchecked, the selected vectors are scaled directly.

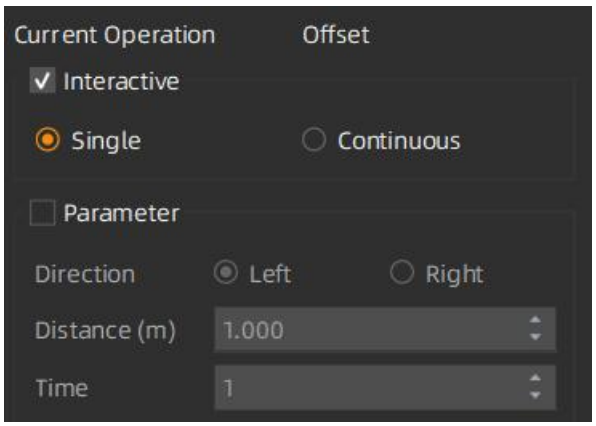


Figure: Copy Scale

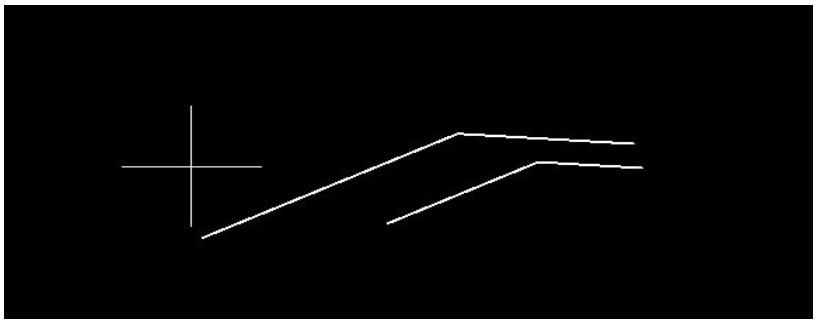


Figure: Copy Scale Result

5. Click "Confirm" in the parameter panel or right-click menu, or press Enter to submit and complete the vector scaling.



Figure: Confirm and Complete Scaling

2.4.5.17 Vector Selection

2.4.5.17.1 Single Select

Function Description:

Selects a vector feature displayed in the view window by clicking on it.

Operation Steps:

1. Left-click on a vector in the view.

2. If the clicked vector belongs to the active drawing and is on a non-locke d layer, the single selection effect is that the vector is highlighted and its g rips are displayed.

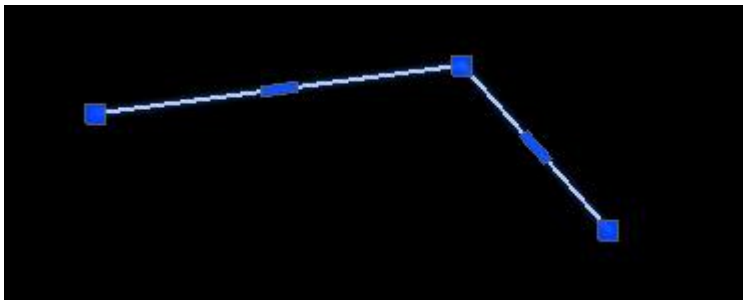


Figure: Single Selection

3. If the clicked vector belongs to an inactive drawing or a locked layer of

the active drawing, the single selection effect is that the vector is highlighte d, but grips are not displayed.

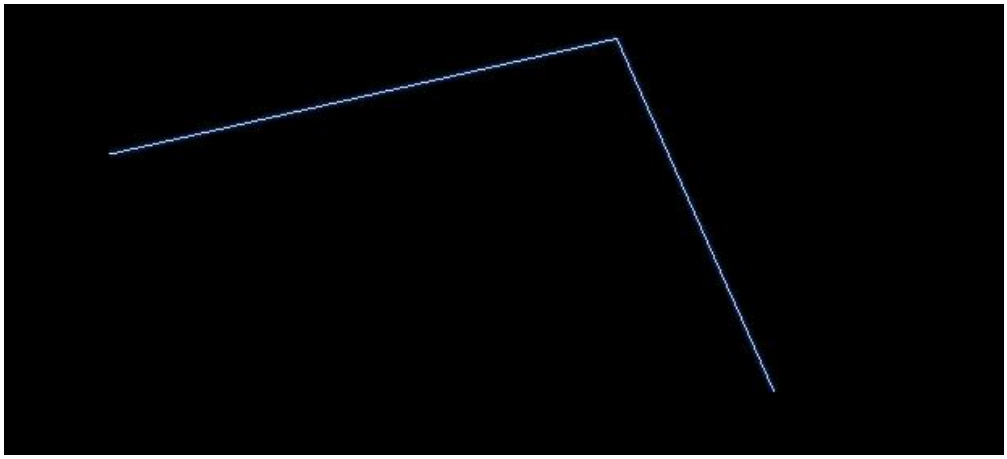


Figure: Single Selection of Vector in Non-Active Drawing or Locked La yer of Active Drawing

2.4.5.17.2 Box Select - Left to Right

Function Description:

Draws a selection area from left to right. Vectors completely covered by th e selection area are selected.

Operation Steps:

1. Left-click a point to the left of the vector(s). Move the mouse to the righ t, drawing a selection area that completely covers the desired vector(s).

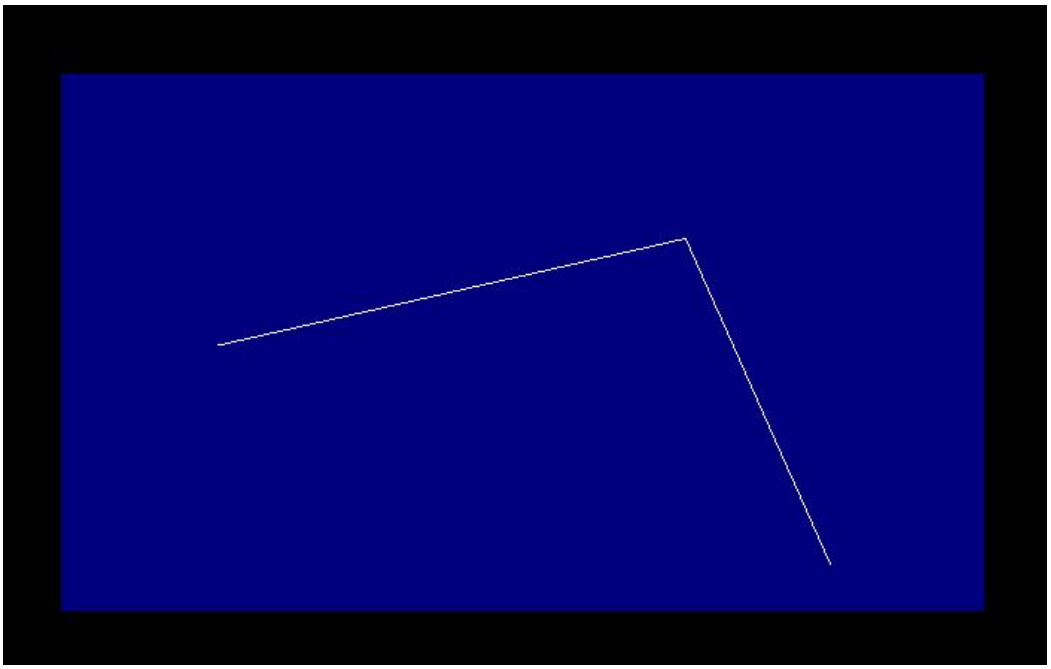


Figure: Selection Vector from Left to Right

2. Left-click to end the selection. If the selected vector(s) completely covere d by the area belong to a non-locked layer of the active drawing, they are highlighted and show grips. Otherwise, they are only highlighted.

2.4.5.17.3 Box Select - Right to Left

Function Description:

Draws a selection area from right to left. Vectors partially or completely co vered by the selection area are selected.

Operation Steps:

1. Left-click a point to the right of the vector(s). Move the mouse to the lef t, drawing a selection area that partially or completely covers the desired v ector(s).

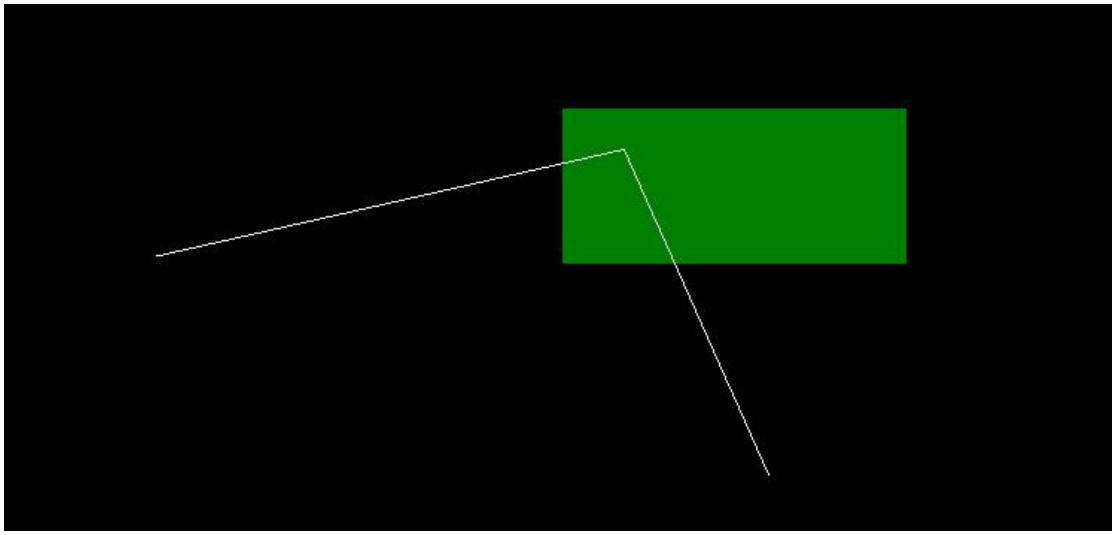


Figure:Selection Vector from Right to Left

2. Left-click to end the selection. If the selected vector(s) partially or completely covered by the area belong to a non-locked layer of the active drawing, they are highlighted and show grips. Otherwise, they are only highlighted.

2.4.5.17.4 Deselect

Function Description:

Changes the state of a currently selected vector to non-selected.

Operation Steps:

1. Shift + Single Select: Hold Shift, left-click a currently selected vector. The clicked vector is deselected.

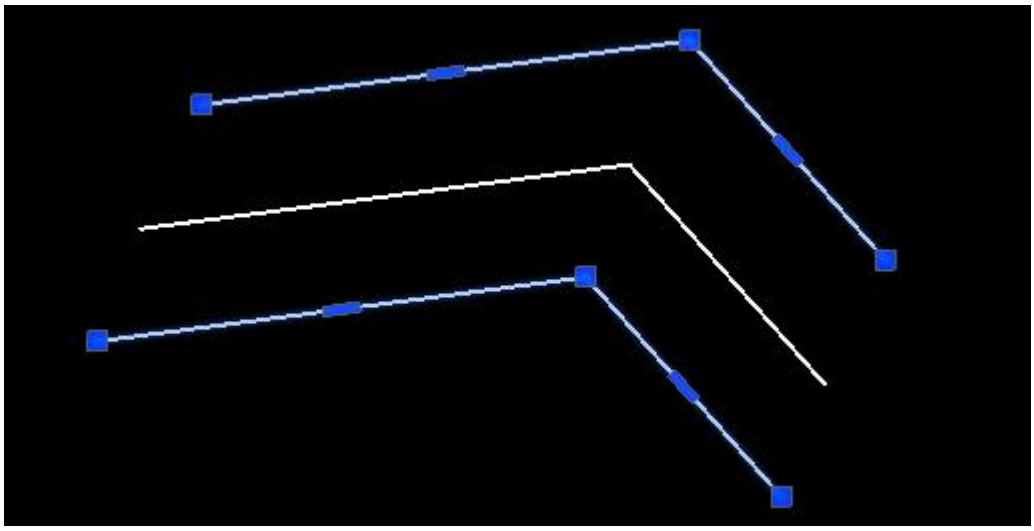


Figure: Deselection + Single Selection

2. Shift + Box Select Left to Right: Hold Shift, left-click and drag a box to t he right. When the box completely covers the vectors to deselect, click left mouse button to end the box selection. The vectors completely covered by the box are deselected.

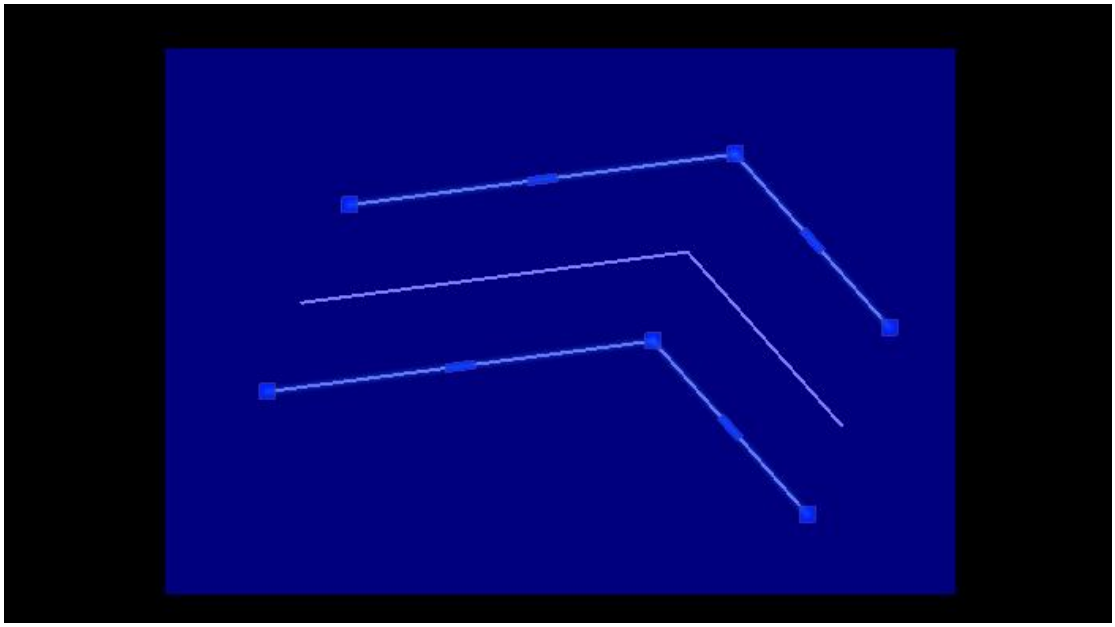


Figure: Deselection + Selection vector from Left to Right

3. Shift + Box Select Right to Left: Hold Shift, left-click and drag a box to t he left. When the box partially or completely covers the vectors to deselect, click left mouse button to end the box selection. The vectors partially or c

ompletely covered by the box are deselected.

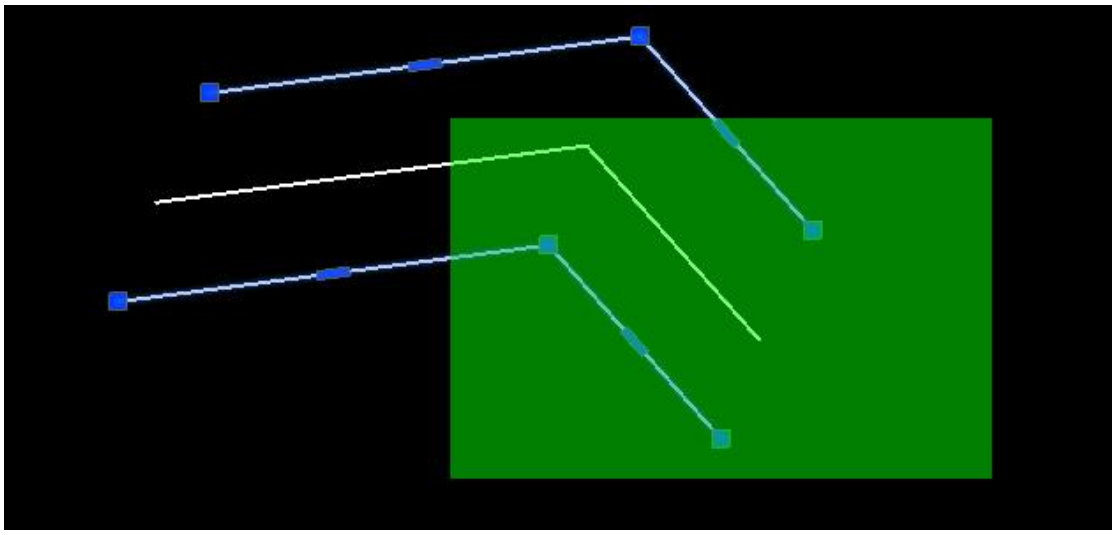


Figure: Deselection + Selection vector from Right to Left

2.4.5.18 Hatch Editing

Function Description:

When only a hatch pattern is selected, the Hatch Editing panel appears on the right side of the software, allowing editing of the selected hatch patter n.

Operation Steps:

1. Click to select a hatch pattern in the active drawing. The "Hatch Editing" panel appears on the right side of the software.

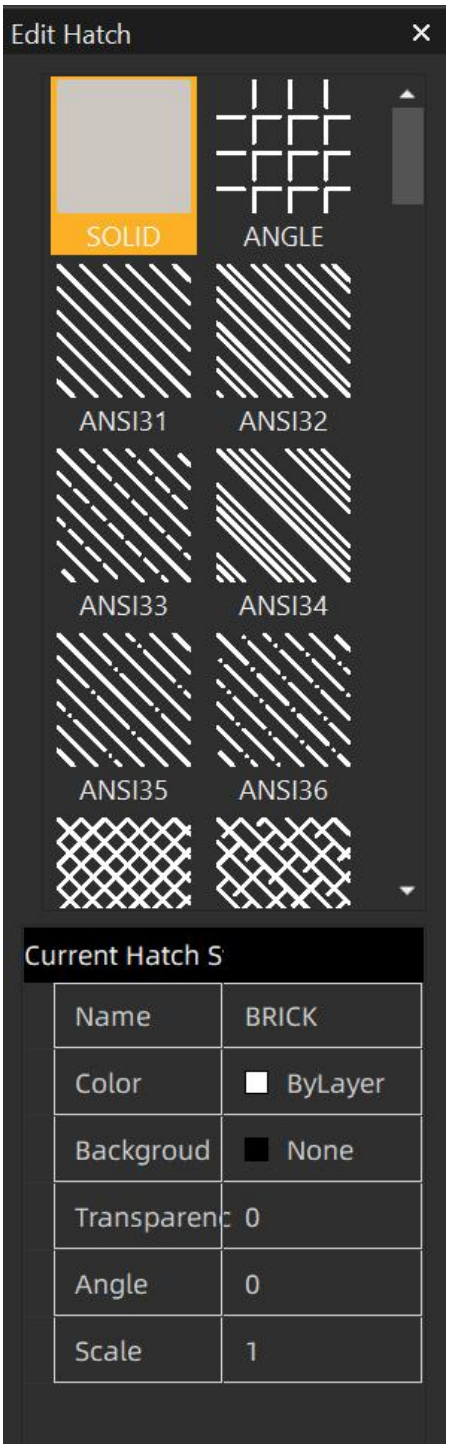


Figure: Edit Hatch Panel

2. In the Hatch Editing panel, you can modify the selected hatch vector's Pattern, Color, Background Color, Hatch Transparency, Angle, and Hatch Pattern Scale properties.

Parameter Settings:

Hatch Pattern Scale: The scale factor for the hatch pattern. Default is 1 (no scaling). Larger values make the pattern appear sparser; smaller values make it appear denser.

2.4.6 Layer

Function Description:

Layer Management allows viewing the layer name, group, color, linetype, lineweight, element count, transparency, description, as well as showing the current status (set current, on/off, frozen/thawed, locked/unlocked).

Operation Steps:

1. Ensure the Layer Manager currently exists in the software.

2. Click the Layer button in the Vector ribbon area. The Layer Manager dialog box appears.

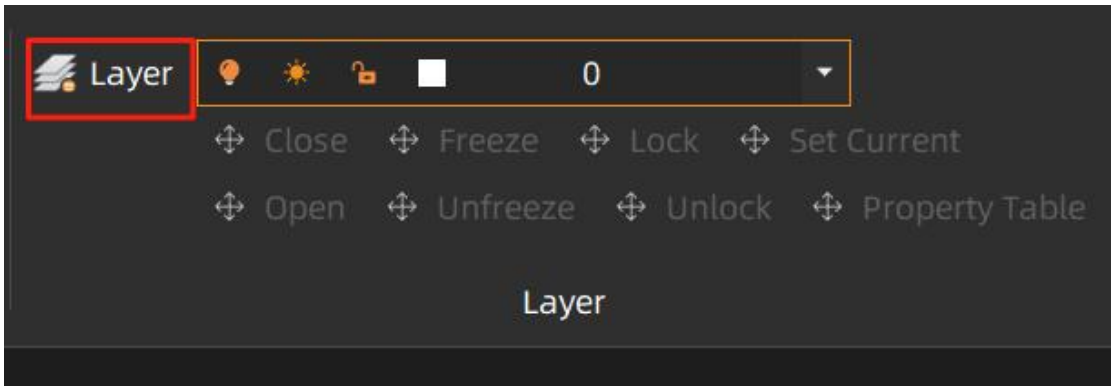


Figure: Open Layer Manager

3. In the Layer Manager, you can create new layers, delete layers, set the current layer, delete all layers except layer 0, select all elements in the selected layer, clear all elements from the selected layer, select empty layers, show empty layers, rename layers, turn layers on/off, freeze/thaw layers, and lock/unlock layers.

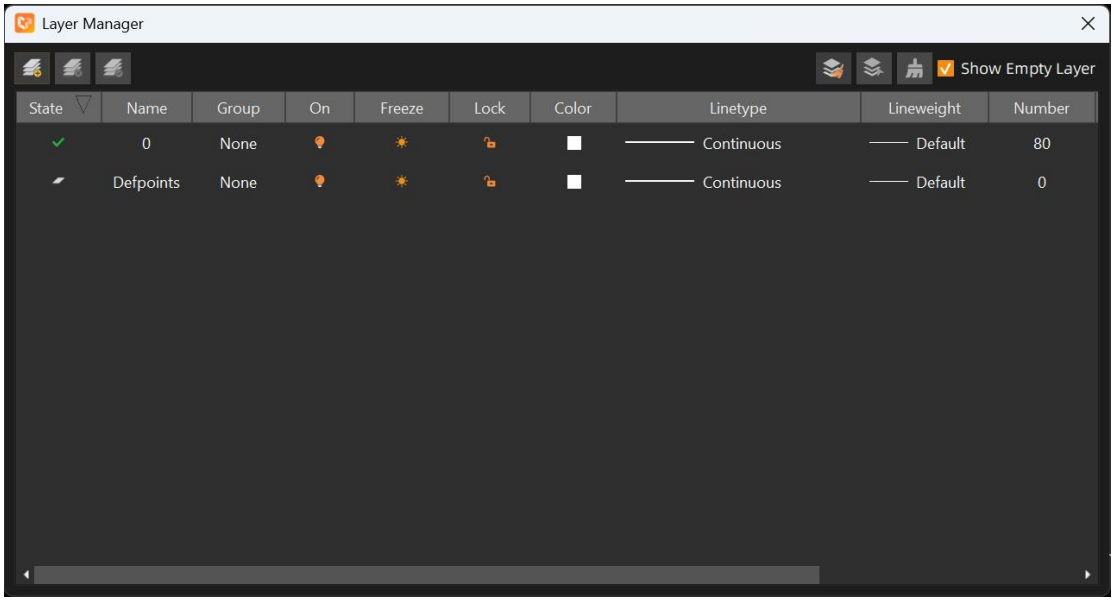


Figure: Layer Manager List

2.4.6.1 Above Layer List

Function Description:

Functions above the layer list from left to right: New Layer, Delete Layer, S et Current, Delete all layers except layer 0, Select all elements in selected l ayer, Clear all elements from selected layer, Show empty layers.



Figure: Buttons Above Layer List

Operation Steps:

Left-click the buttons to achieve the corresponding functions.

2.4.6.1.1 New Layer

Function Description:

Creates a new layer.

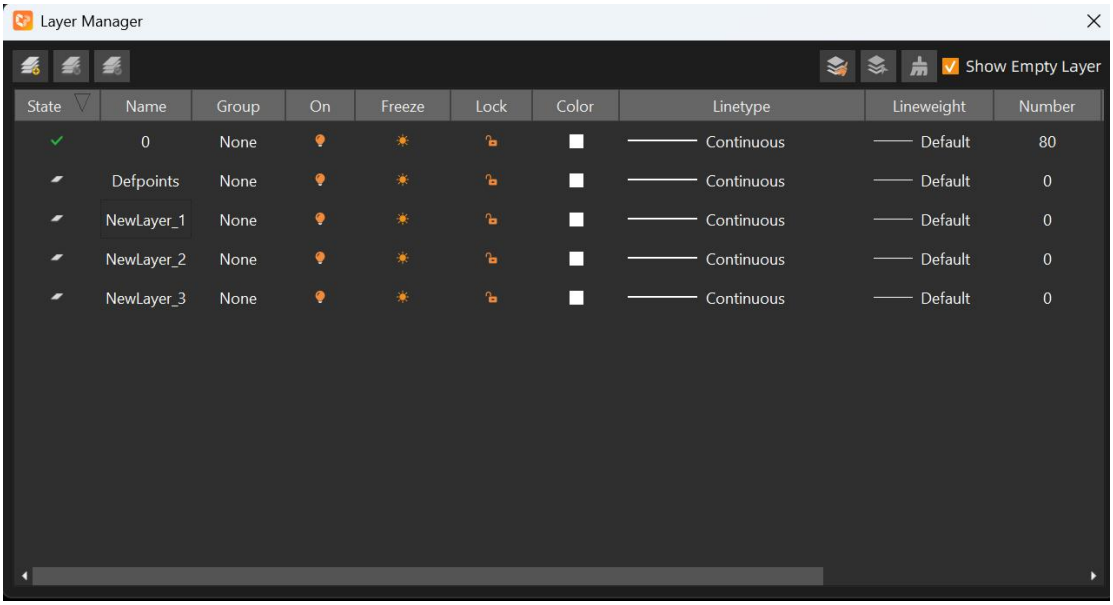


Figure: New Layer

Operation Steps:

Left-click New Layer. A new layer is created at the bottom of the layer list.

2.4.6.1.2 Delete Layer

Function Description:

Deletes an existing layer.

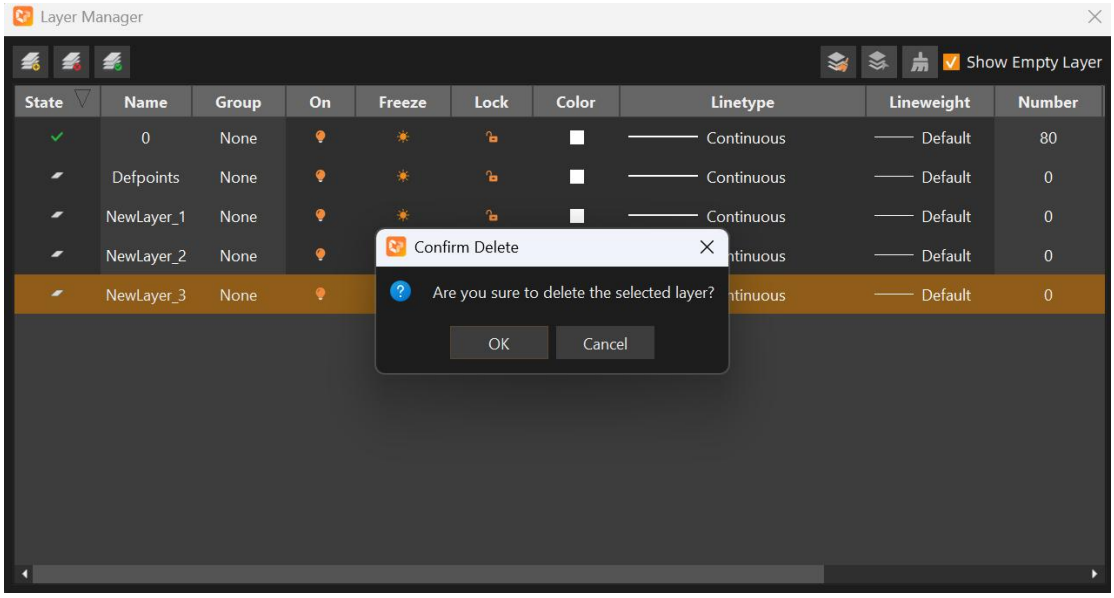


Figure: Delete Layer

Operation Steps:

Select a layer in the list. Left-click Delete Layer. Click OK in the popup mes sage window. The selected layer is deleted (Layer 0 and the current layer c annot be deleted).

2.4.6.1.3 Activate Layer

Function Description:

Sets a non-current layer as the current layer.

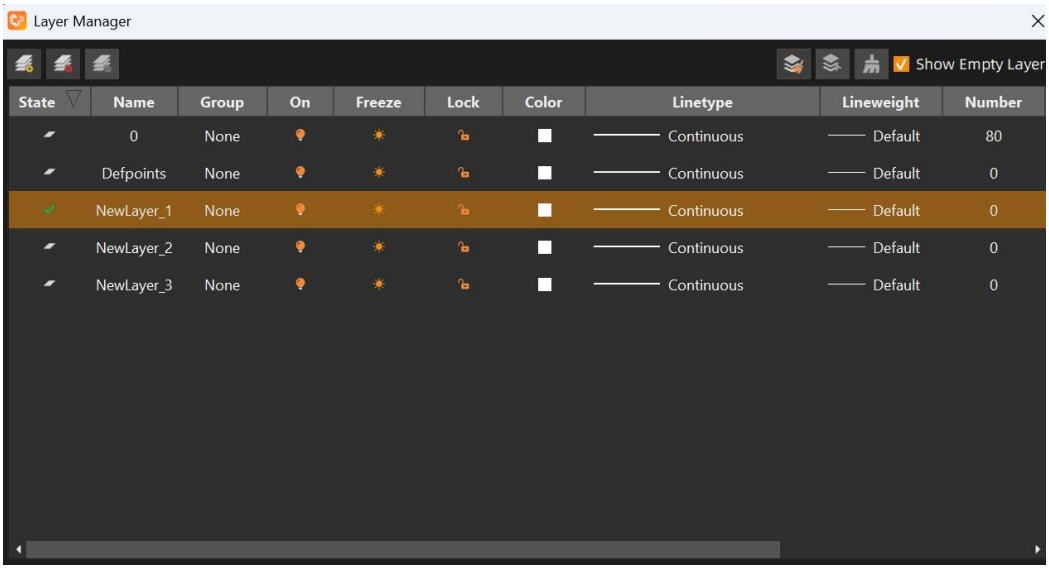


Figure: Activate Layer

Operation Steps:

Select a layer in the list. Left-click Set Current. The selected layer becomes the current layer, and its status changes to checked (the Set Current butto n is disabled if the current layer is selected).

2.4.6.1.4 Delete all layers except layer 0

Function Description:

Deletes all layers except layer 0 and the current layer.

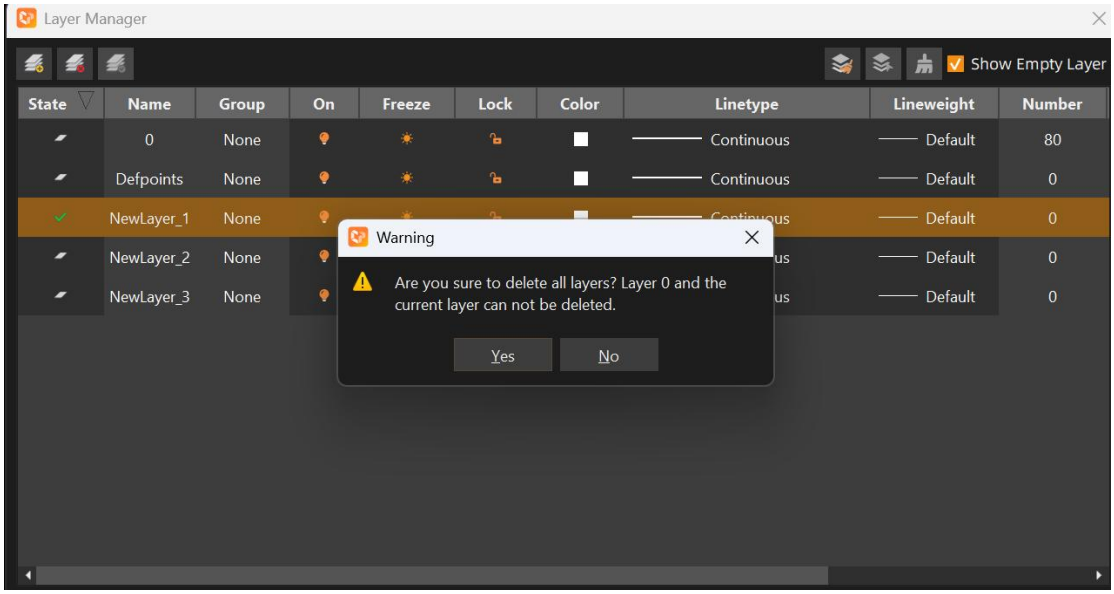


Figure: Delete All Layers Except Layer 0 and Current Layer

Operation Steps:

Left-click the "Delete all layers except layer 0" button. Click Yes in the popup message window. All layers except the current layer and layer 0 are deleted.

2.4.6.1.5 Select all elements in selected layer

Function Description:

Selects all elements in the selected layer.

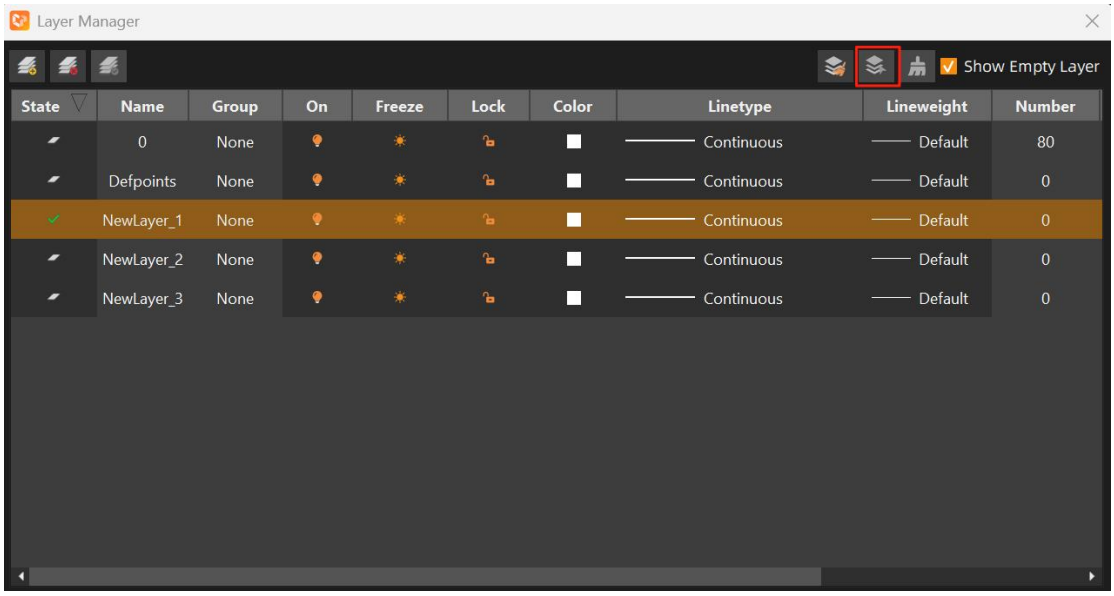


Figure: Select All Entities in Selected Layer

Operation Steps:

Select a layer in the list. Left-click the "Select all elements in selected layer" button. All elements in that layer are selected.

2.4.6.1.6 Clear all elements from selected layer

Function Description:

Deletes all elements in the selected layer.

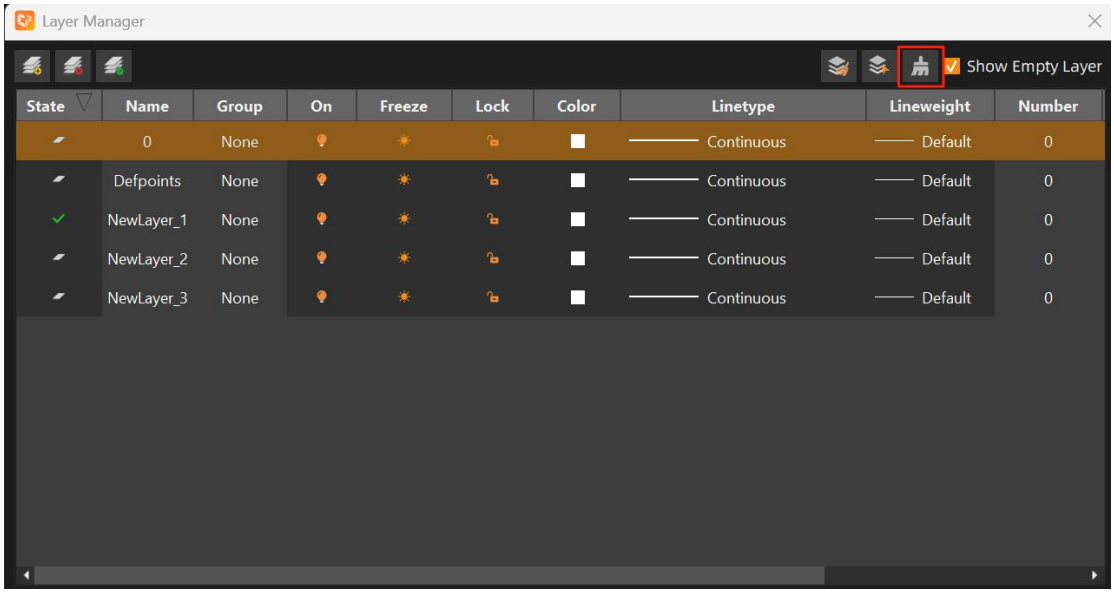


Figure: Clear All Entities in Selected Layer

Operation Steps:

Select a layer in the list. Left-click the "Clear all elements from selected lay er" button. All elements in that layer are deleted.

2.4.6.1.7 Show Empty Layers

Function Description:

Displays layers with zero elements in the drawing (Layer 0 will not be hidd en).

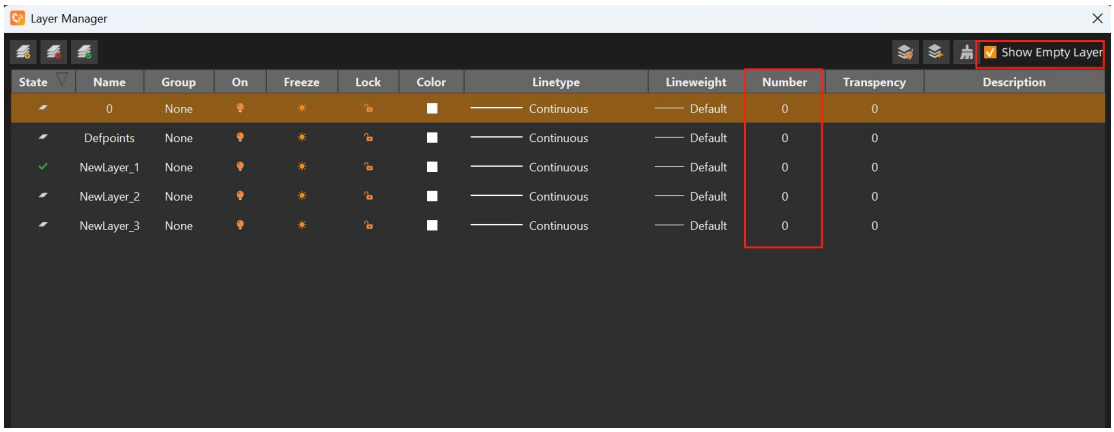


Figure: Show Empty Layer

Operation Steps:

Left-click the "Show empty layers" checkbox to display layers with zero elements in the drawing.

2.4.6.2 Layer List Right-click Menu

Function Description:

Functions in the layer list right-click menu from top to bottom: Show Empty Layers, Set Current, New Layer, Rename Layer, Delete Layer, Freeze All Layers, Thaw All Layers, Turn On All Layers, Turn Off All Layers, Select Empty Layers, Select Non-Empty Layers, Select all elements in selected layer, Delete all layers except layer 0, Clear all elements from selected layer.

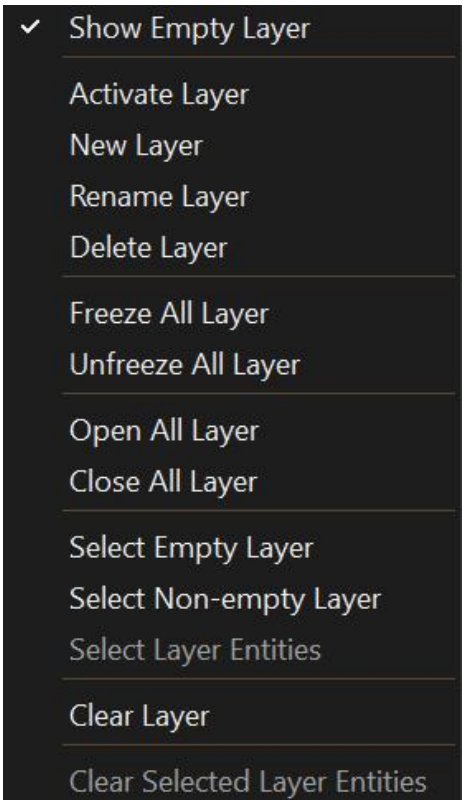


Figure: Right-Click Menu of Layer List

Operation Steps:

Right-click on the layer list to open the menu. Left-click a function to execute it.

2.4.6.2.1 Show Empty Layers

Function Description:

Displays layers with zero elements in the drawing.

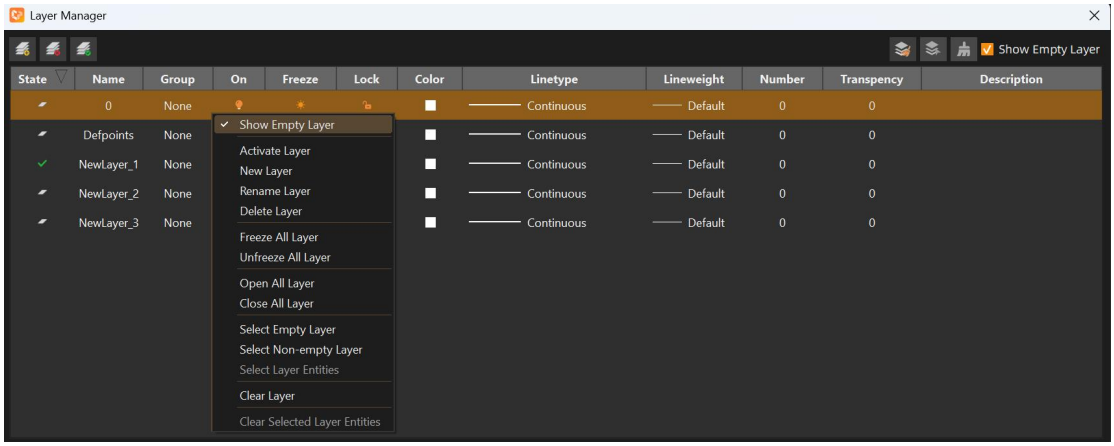


Figure: Show Empty Layers

Operation Steps:

Left-click Show Empty Layers to display layers with zero elements in the dr awing.

2.4.6.2.2 Set Current

Function Description:

Sets a non-current layer as the current layer.

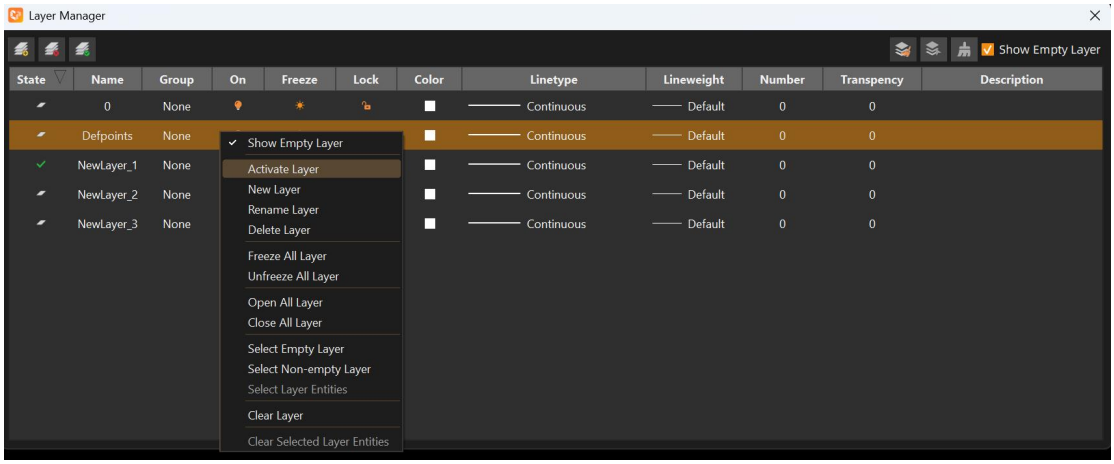


Figure: Activate Layer

Operation Steps:

Select a layer in the list. Right-click to open the menu. Left-click Set Curren t. The layer's status changes to checked (the Set Current option is disabled when right-clicking the current layer).

2.4.6.2.3 New Layer

Function Description:

Creates a new layer.

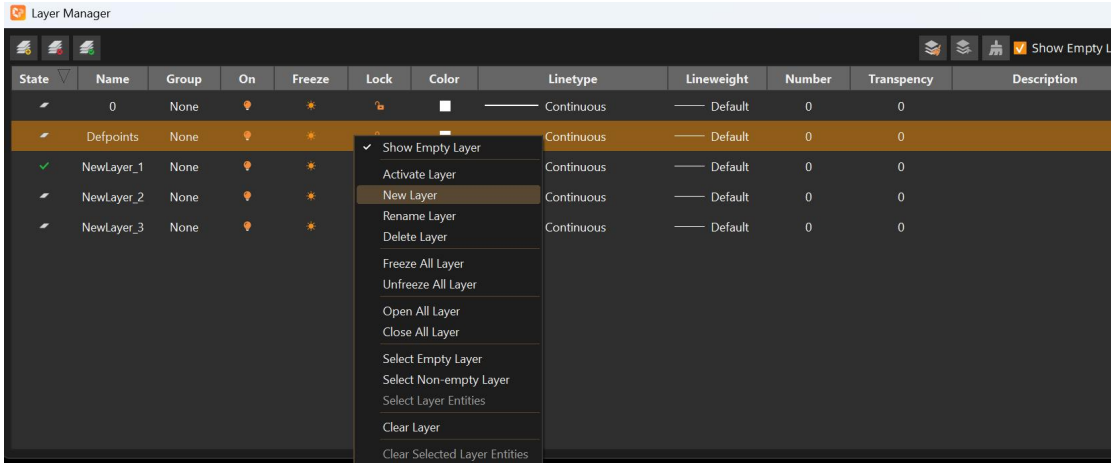


Figure: New Layer

Operation Steps:

Left-click New Layer. A new layer is created at the bottom of the layer list.

2.4.6.2.4 Rename Layer

Function Description:

Renames a layer.

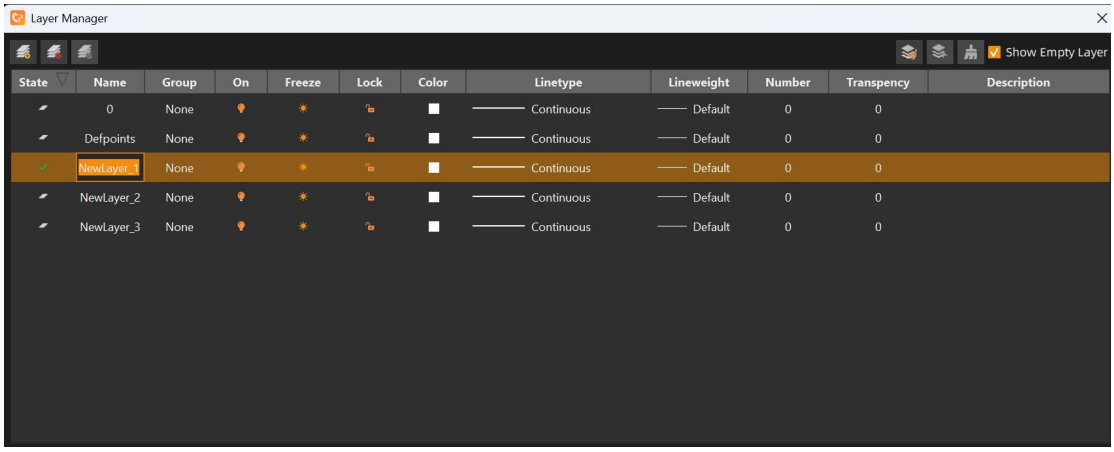


Figure: Rename Layer

Operation Steps:

Select the layer to rename. Right-click to open the menu. Select Rename La yer. The layer name becomes editable. Enter the new name to rename the layer.

2.4.6.2.5 Delete Layer

Function Description:

Deletes an existing layer.

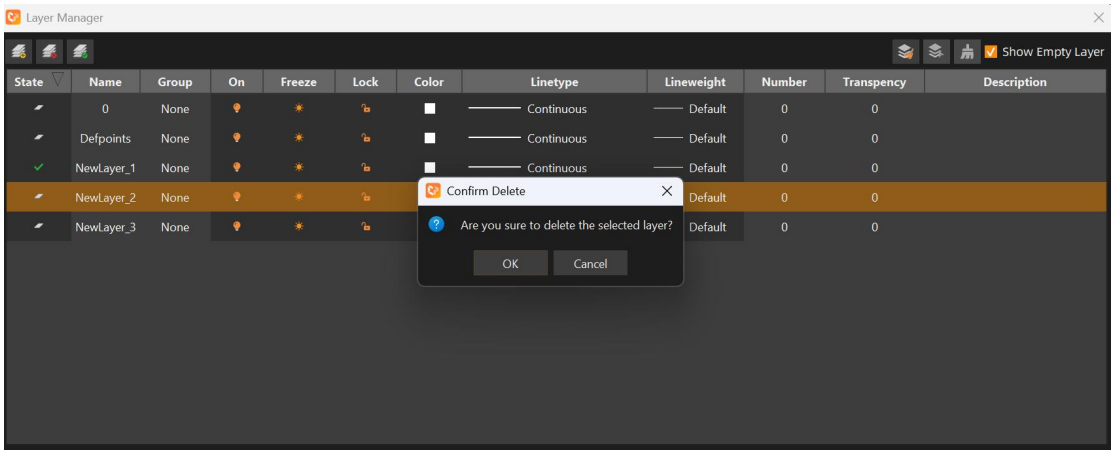


Figure: Delete Layer

Operation Steps:

Select a layer in the list. Right-click to open the menu. Left-click Delete Lay er. Click OK in the popup message window. The selected layer is deleted.

2.4.6.2.6 Freeze All Layers

Function Description:

Freezes all layers except the current layer.

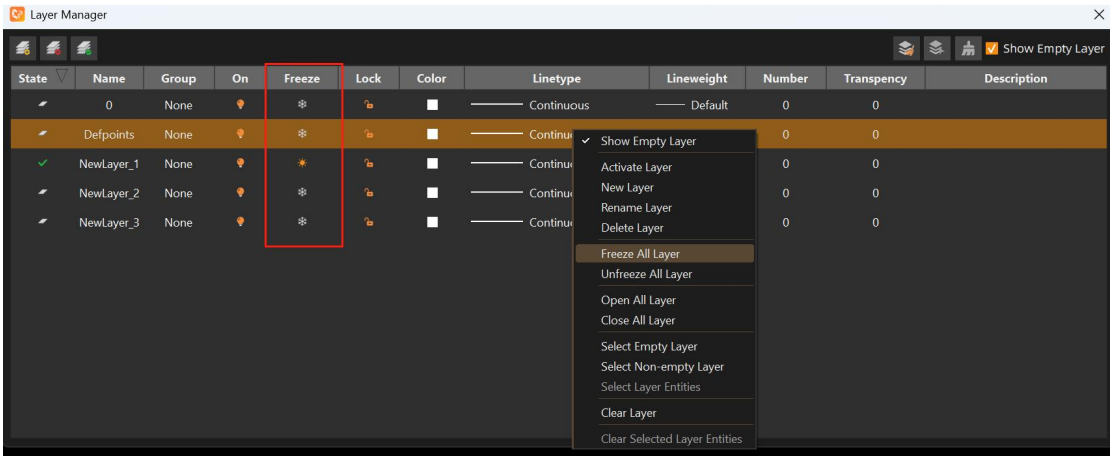


Figure: Freeze All Layer

Operation Steps:

Right-click in the layer list to open the menu. Left-click Freeze All Layers. Al l layers except the current layer are frozen. The freeze column property ch anges to a gray snowflake.

2.4.6.2.7 Thaw All Layers

Function Description:

Thaws all layers.

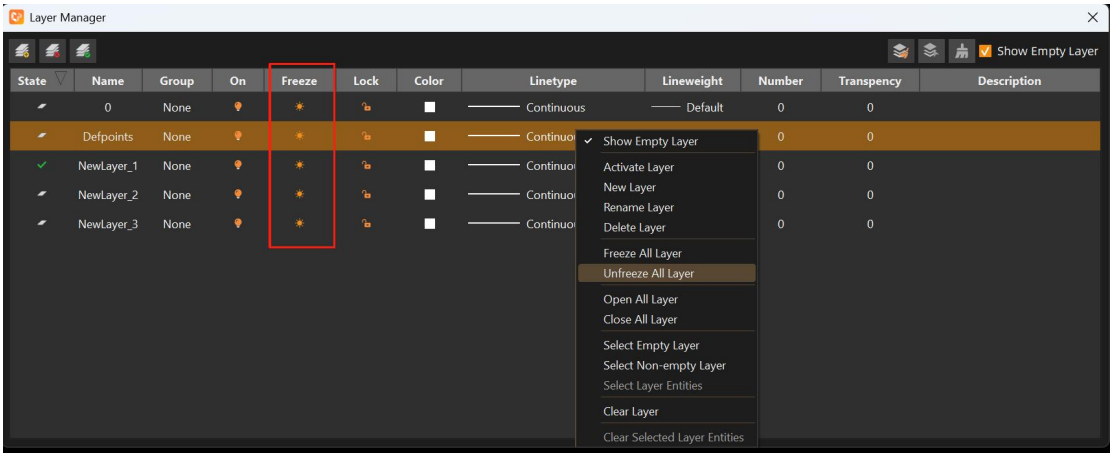


Figure: Unfreeze All Layer

Operation Steps:

Right-click in the layer list to open the menu. Left-click Thaw All Layers. All layers are thawed. The freeze column property changes to an orange sun.

2.4.6.2.8 Turn On All Layers

Function Description:

Turns on all layers.

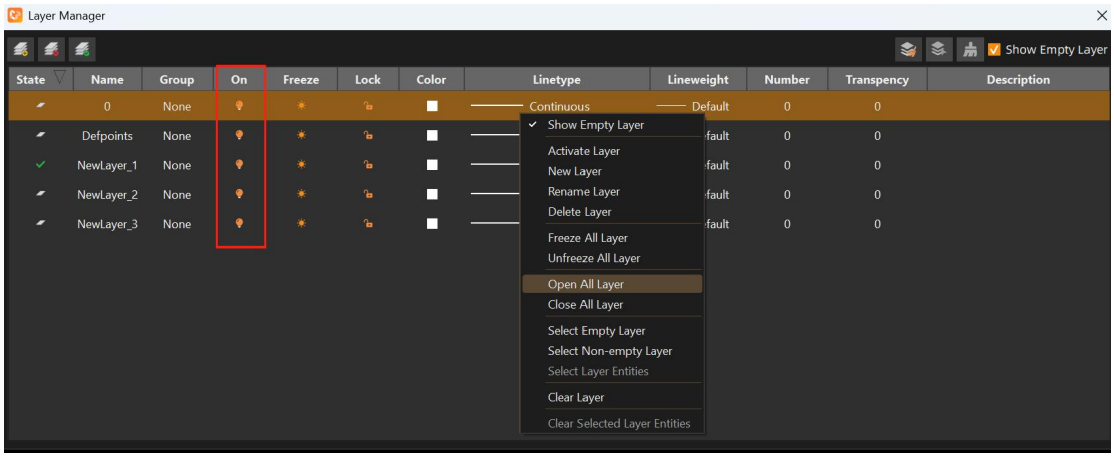


Figure: Open All Layer

Operation Steps:

Right-click in the layer list to open the menu. Left-click Turn On All Layers. All layers are turned on. The on/off column property changes to an orange light bulb.

2.4.6.2.9 Turn Off All Layers

Function Description:

Turns off all layers.

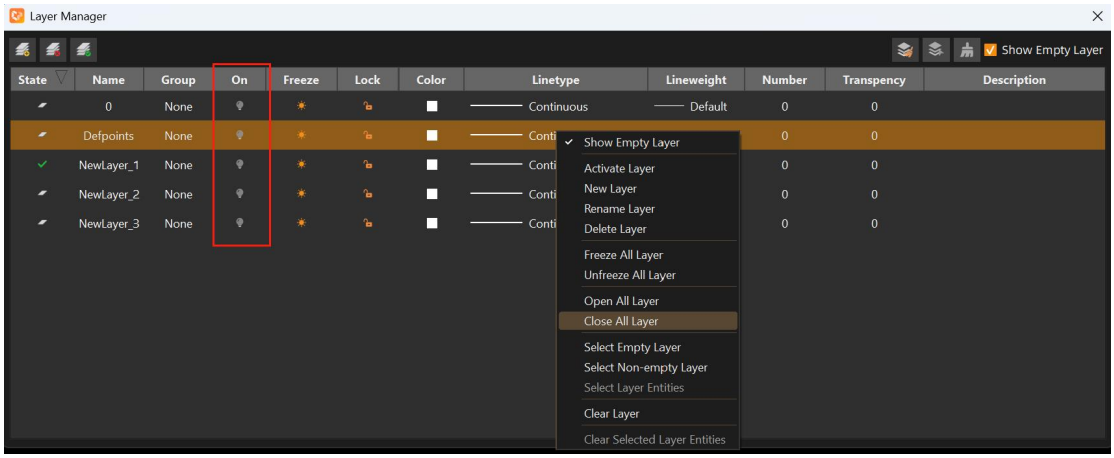


Figure: Close All Layer

Operation Steps:

Right-click in the layer list to open the menu. Left-click Turn Off All Layers. All layers are turned off. The on/off column property changes to a gray lig ht bulb.

2.4.6.2.10 Select Empty Layers

Function Description:

Selects all empty layers.

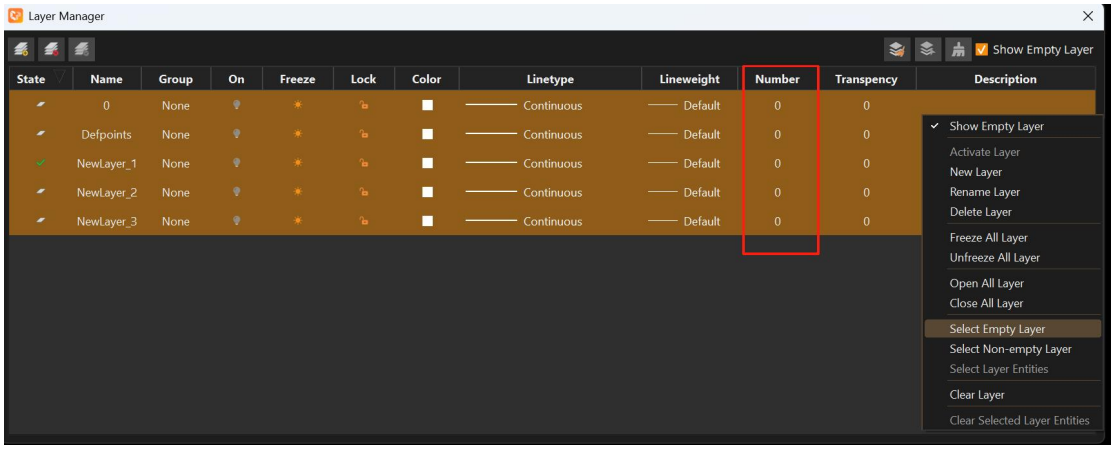


Figure: Select Empty Layer

Operation Steps:

Right-click in the layer list to open the menu. Left-click Select Empty Layers. All empty layers are selected.

Note: You need to check Show Empty Layers first.

2.4.6.2.11 Select Non-Empty Layers

Function Description:

Selects all non-empty layers.

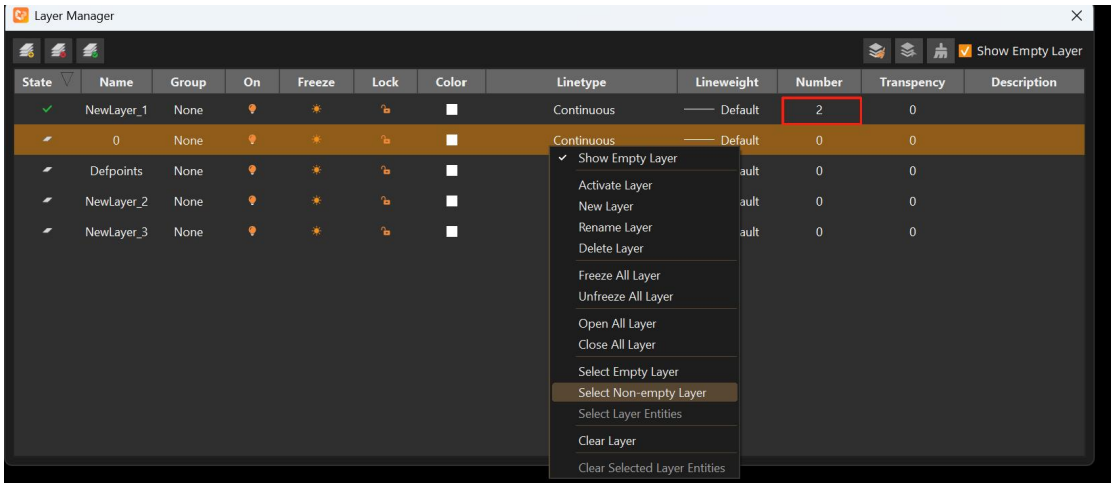


Figure: Select Non-Empty Layer

Operation Steps:

Right-click in the layer list to open the menu. Left-click Select Non-Empty La yers. All non-empty layers are selected.

2.4.6.2.12 Select Layer Entities

Function Description:

Selects all elements in the selected layer.

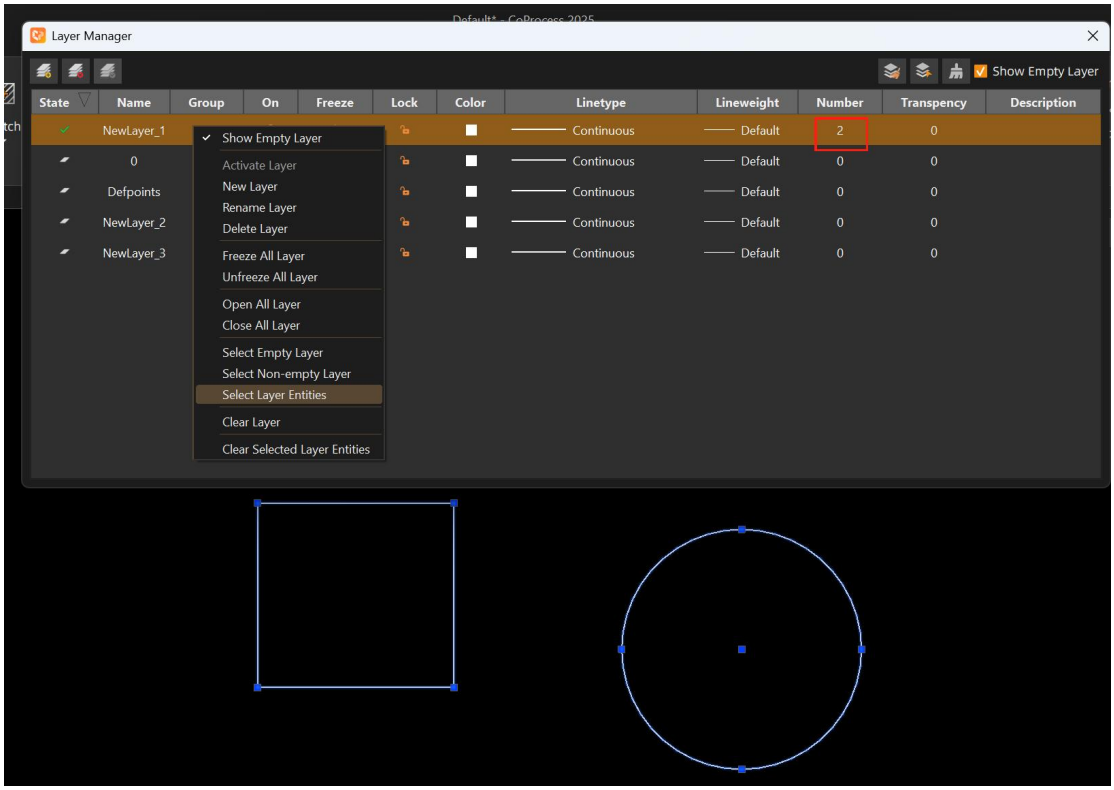


Figure: Select Layer Entities

Operation Steps:

Select a layer in the list. Right-click to open the menu. Left-click Layer Selec t. All elements in that layer are selected.

2.4.6.2.13 Delete all layers except layer 0

Function Description:

Deletes all layers except layer 0 and the current layer.

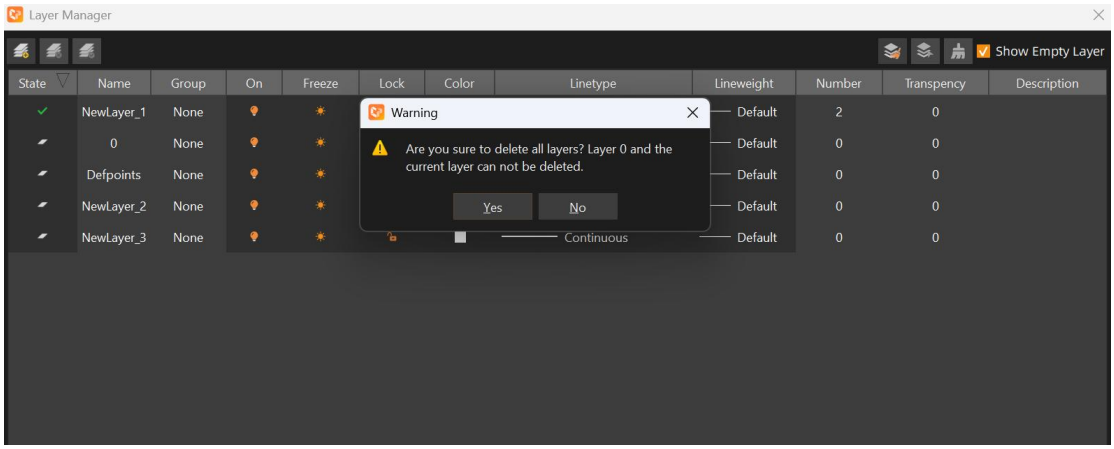


Figure: Clear Layer

Operation Steps:

Right-click in the layer list to open the menu. Left-click the "Delete all layers except layer 0" button. Click Yes in the popup message window. All layers except the current layer and layer 0 are deleted.

2.4.6.2.14 Clear all elements from selected layer

Function Description:

Deletes all elements in the selected layer.

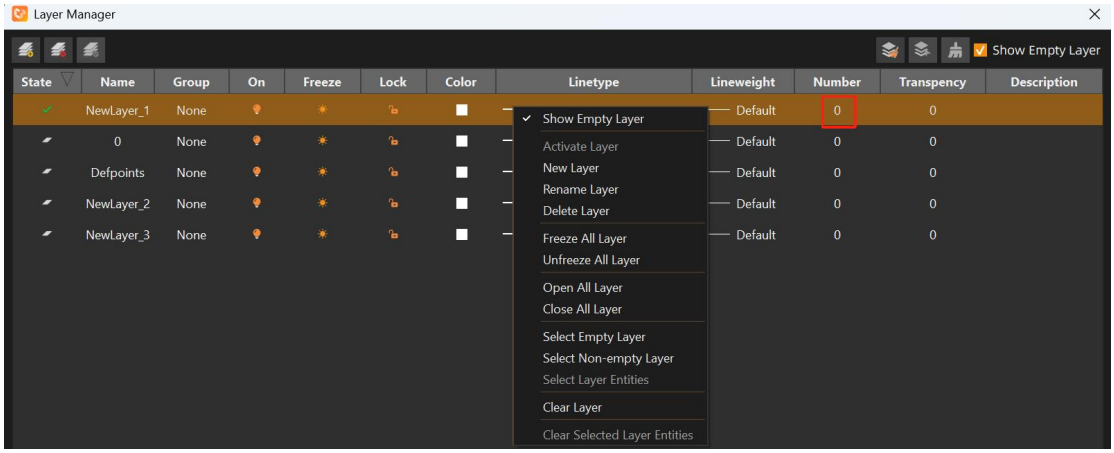


Figure: Clear Selected Layer Entities

Operation Steps:

Select a layer in the list. Right-click to open the menu. Left-click the "Clear all elements from selected layer" button. All elements in that layer are deleted.

2.4.6.3 Layer Dropdown

Function Description:

Allows quick modification of the current layer, layer on/off, freeze, lock stat

us, and layer color via the layer dropdown in the Vector ribbon menu.

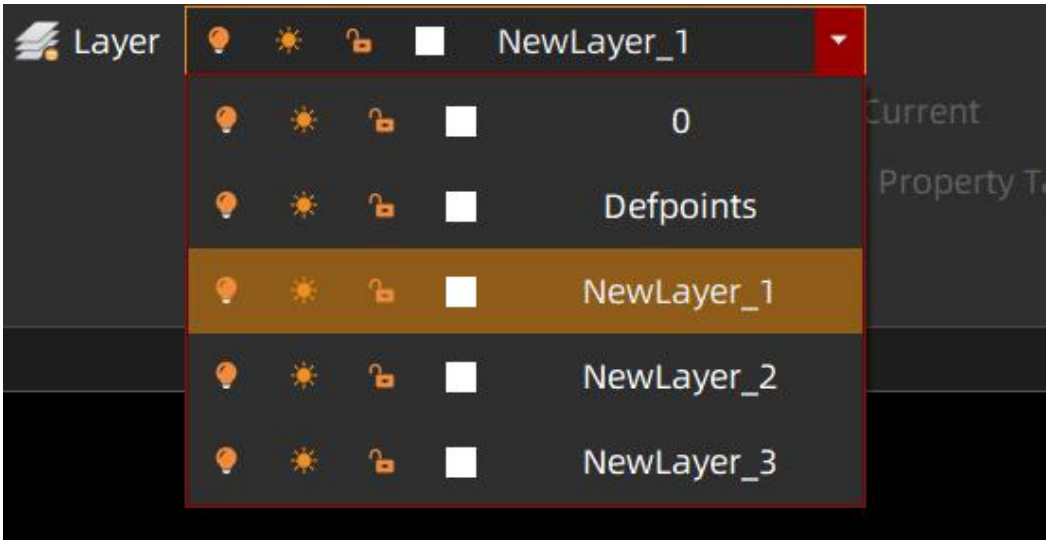


Figure: Layer Drop-down Box

Operation Steps:

Left-click the layer dropdown control in the Vector ribbon. The layer dropdown list appears.

2.4.6.3.1 Switch

Function Description:

Allows quickly adjusting the on/off state of a specific layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Dropdown -> Layer On/Off button to toggle the on/off state of the corresponding layer.

Button highlighted orange indicates the layer is currently on. Button not highlighted indicates the layer is currently off. When a layer is off, all vectors in that layer are invisible and unselectable in the view window. However, vectors can be modified to an off layer via the Properties panel, and an off layer can be set as the current layer.

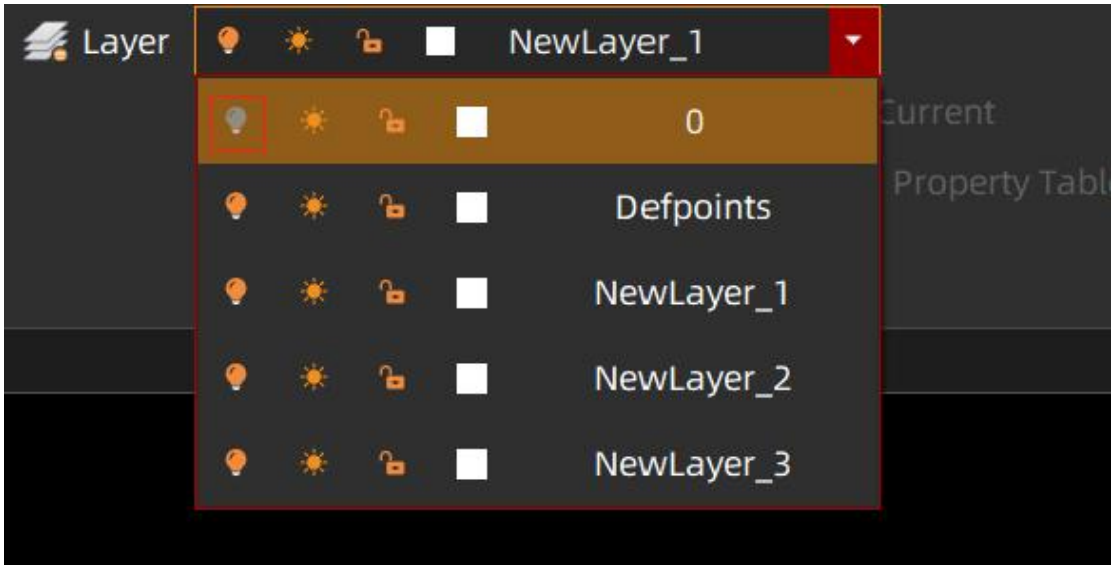


Figure: Layer On/Off in Layer Drop-down Box

2.4.6.3.2 Freeze

Function Description:

Allows quickly adjusting the freeze state of a specific layer during vector dr awing and editing.

Operation Steps:

Click Vector -> Layer Dropdown -> Layer Freeze button to toggle the thawe d/frozen state of the corresponding layer.

Button shows an orange sun for thawed state. Button shows a dark snowfl ake for frozen state. When a layer is frozen, all vectors in that layer are in visible and unselectable in the view window. Additionally, vectors cannot be modified to a frozen layer via the Properties panel, and the current layer cannot be frozen.

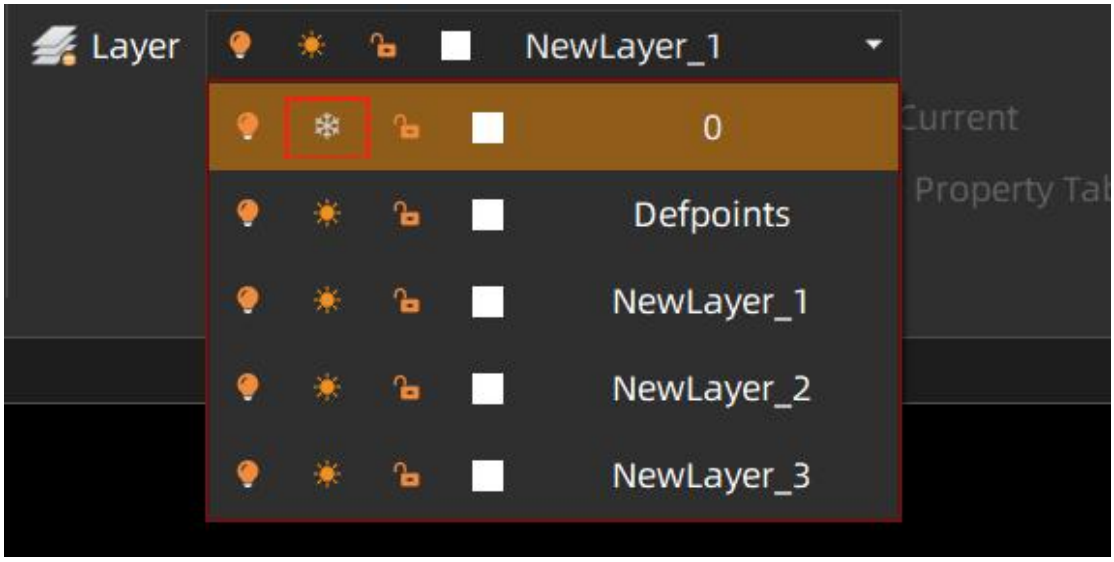


Figure: Layer Freeze in Layer Drop-down Box

2.4.6.3.3 Lock

Function Description:

Allows quickly adjusting the lock state of a specific layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Dropdown -> Layer Lock button to toggle the unlocked/locked state of the corresponding layer.

Button shows an orange open lock for unlocked state. Button shows a dark closed lock for locked state.

Vectors in a locked layer can be selected via point or box selection.

Unselected vectors in a locked layer appear grayed out. When selected, they show a blue highlight combined with the grayed-out effect, and no grips are displayed.

Vectors can be added to a locked layer, but cannot be edited or deleted.

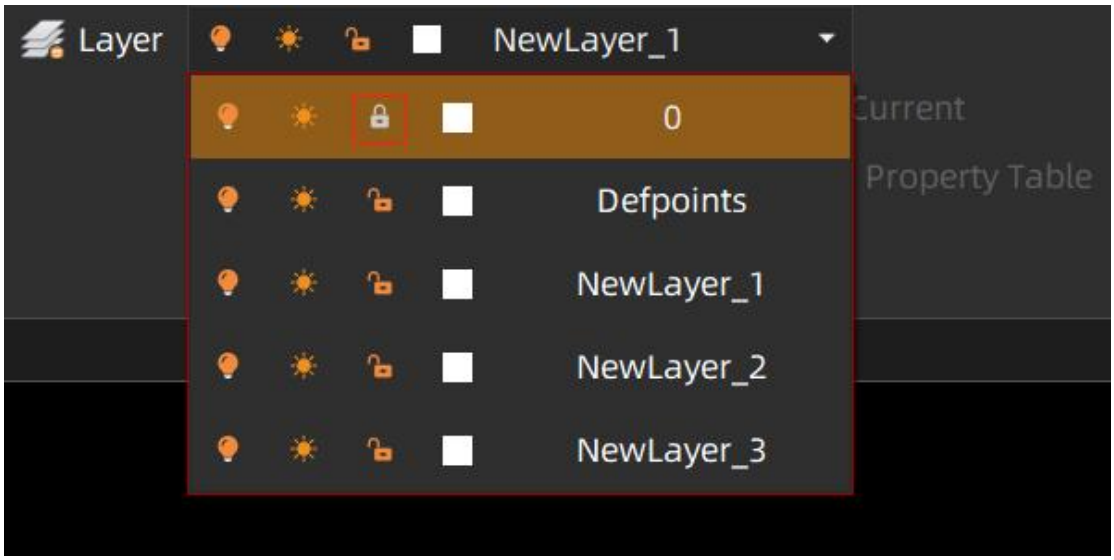


Figure: Layer Lock in Layer Drop-down Box

2.4.6.3.4 Color

Function Description:

Allows quickly adjusting the color property of a specific layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Dropdown -> Color. The Color Selector appears. Select the desired color in the Color Selector and click OK. The corresponding la yer will change to the selected color.

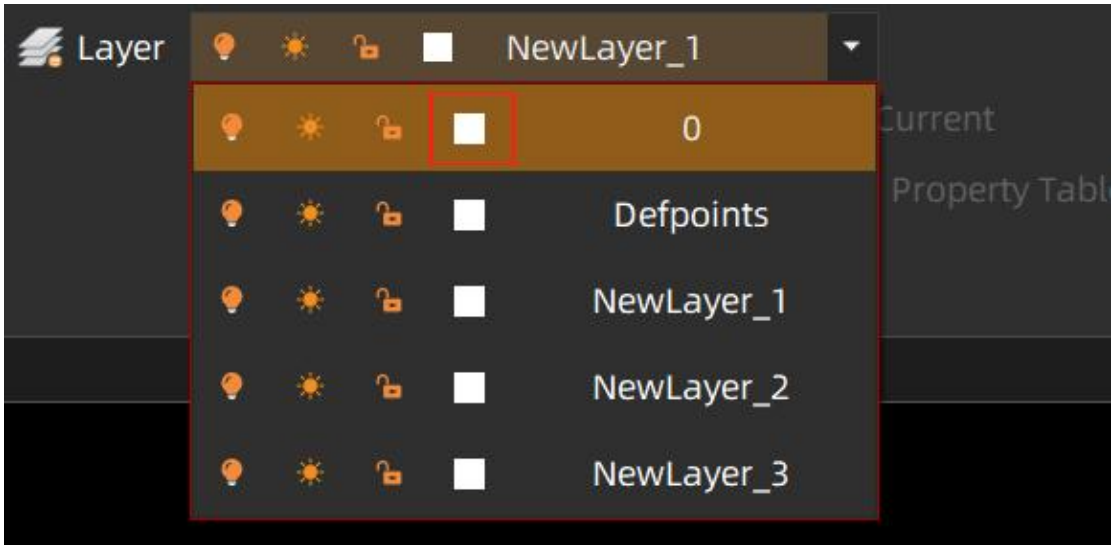


Figure: Layer Color in Layer Drop-down Box

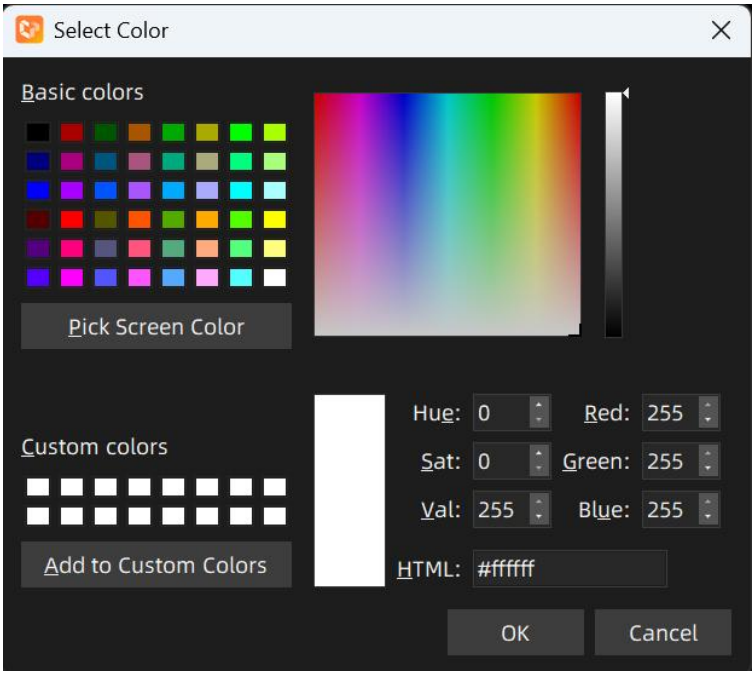


Figure: Color Picker

2.4.6.3.5 Current Layer

Function Description:

Allows quickly adjusting the current layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Dropdown -> Layer Name. Clicking the layer name sets the clicked layer as the current layer (layers that are frozen cannot be set as current). New vectors will be drawn on the current layer.

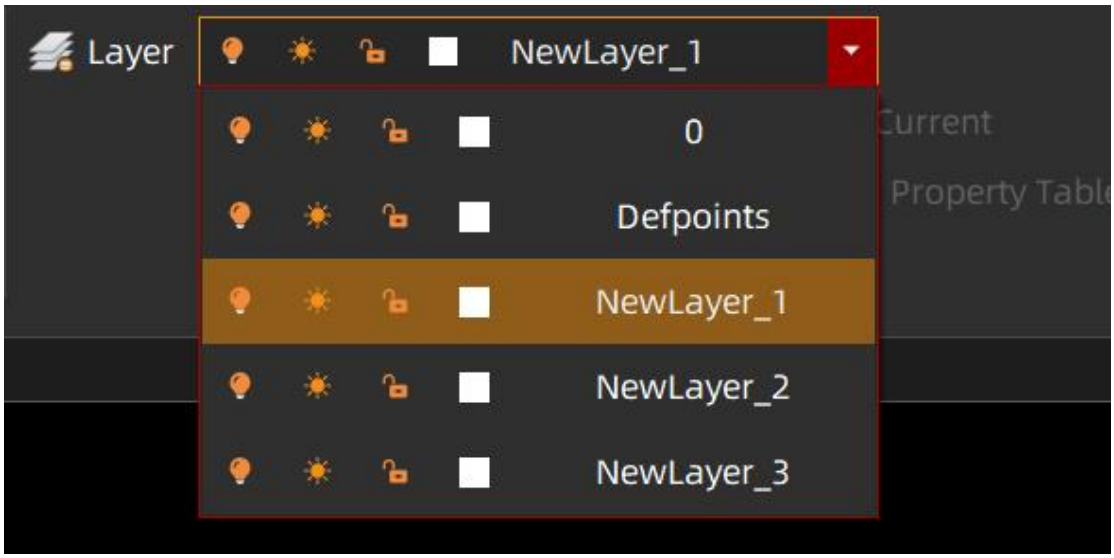


Figure: Set as Current Layer

2.4.6.3.6 Layer State Switching

Function Description:

Users can change the state of the layer containing selected vectors. These states include: On/Off, Isolate/Unisolate, Freeze/Thaw, Lock/Unlock, Set Current, Match Layer. There are 10 functions in total.

Turn On Layer Operation Steps:

Click Vector -> Layer -> Turn On. Turns on all layers in the active drawing.

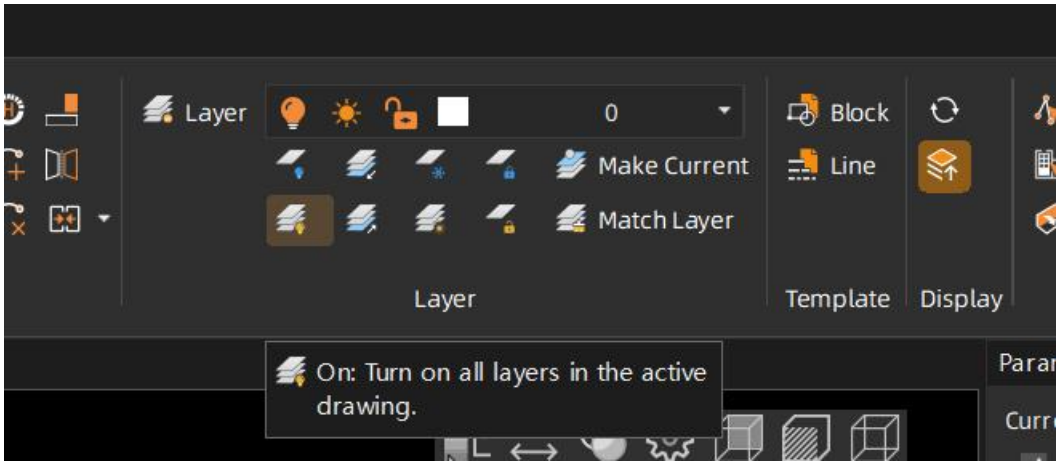


Figure: Turn Off Layer Operation Steps:

Select vectors. Click Vector -> Layer -> Turn Off. Turns off the layer of the selected vectors.

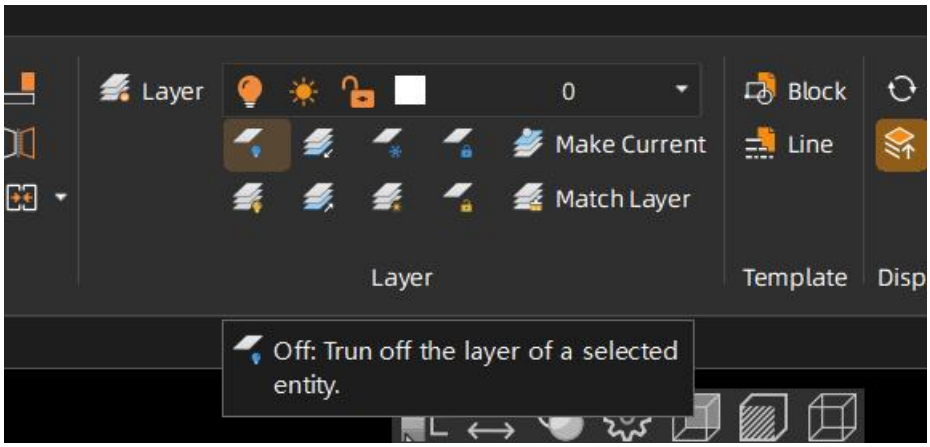


Figure: Isolate Layer Operation Steps:

Select vectors. Click Vector -> Layer -> Isolate. Turns off all layers except th e layer of the selected vectors.

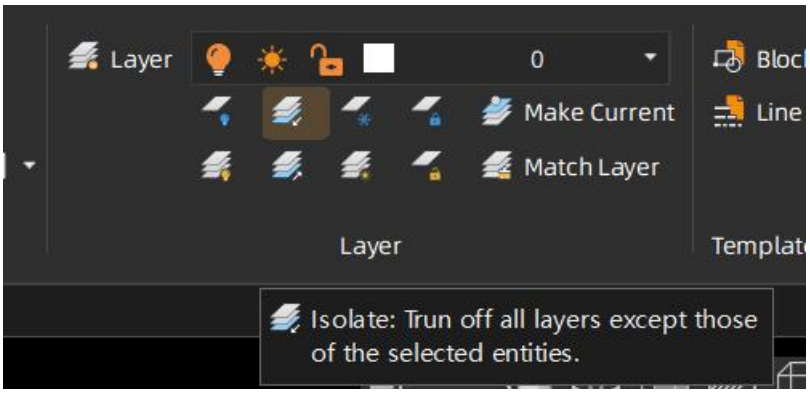


Figure: Unisolate Layer Operation Steps:

Select vectors. Click Vector -> Layer -> Unisolate. Restores layers to the stat e before the last isolation.

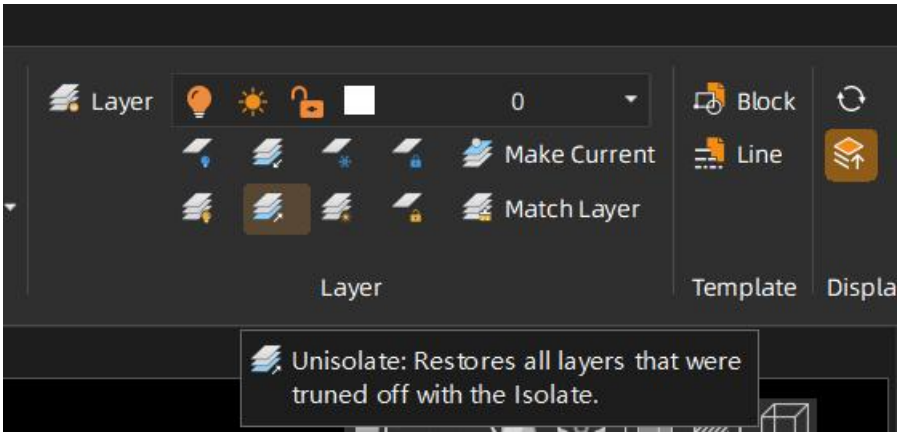


Figure: Freeze Layer Operation Steps:

Select vectors. Click Vector -> Layer -> Freeze. Freezes the layer of the sele cted vectors.

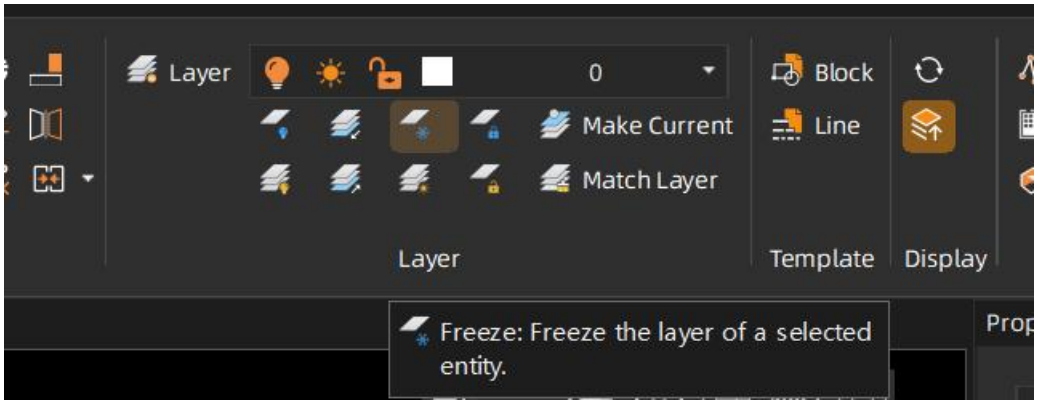


Figure: Thaw Layer Operation Steps:

Click Vector -> Layer -> Thaw. Thaws all layers in the active drawing.

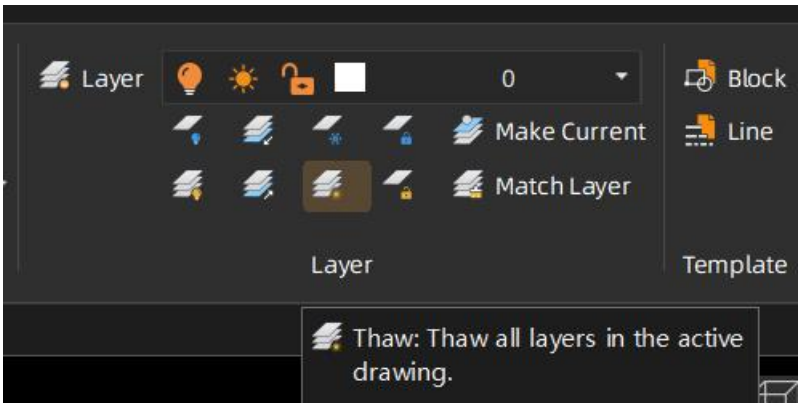


Figure: Lock Layer Operation Steps:

Select vectors. Click Vector -> Layer -> Lock. Locks the layer of the selected vectors.

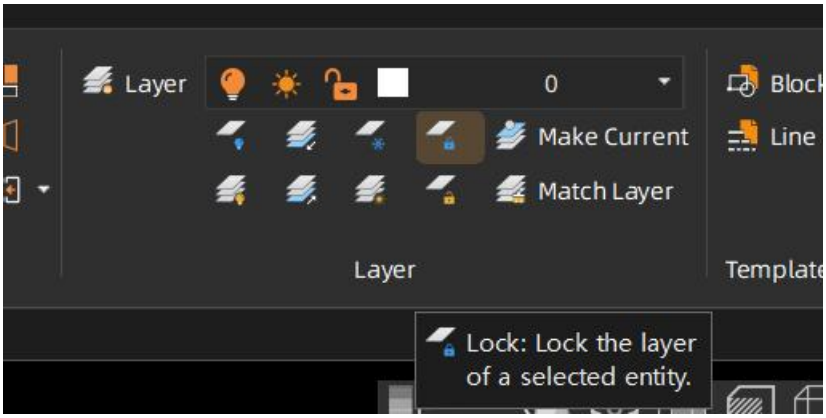


Figure: Unlock Layer Operation Steps:

Select vectors. Click Vector -> Layer -> Unlock. Unlocks the layer of the selected vectors.

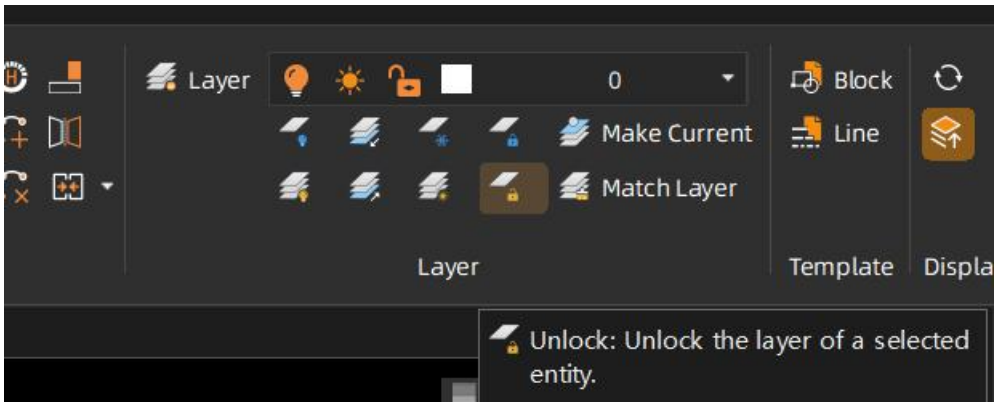


Figure: Set Current Operation Steps:

Select vectors. Click Vector -> Layer -> Set Current. Sets the current layer to the layer of the selected vectors.

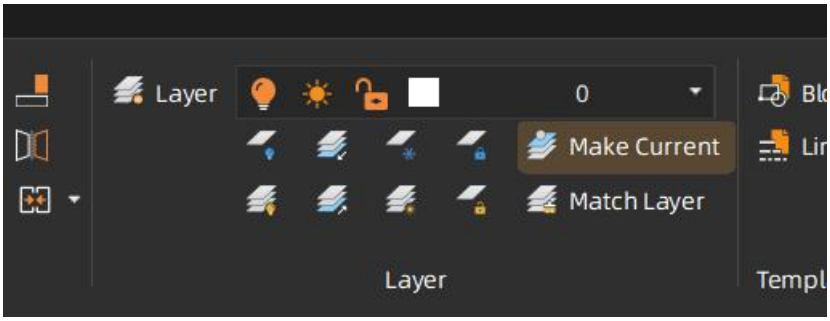


Figure: Match Layer Operation Steps:

Select vectors. Click Vector -> Layer -> Match Layer. Changes the layer of t

he selected vectors to the layer of a target vector.

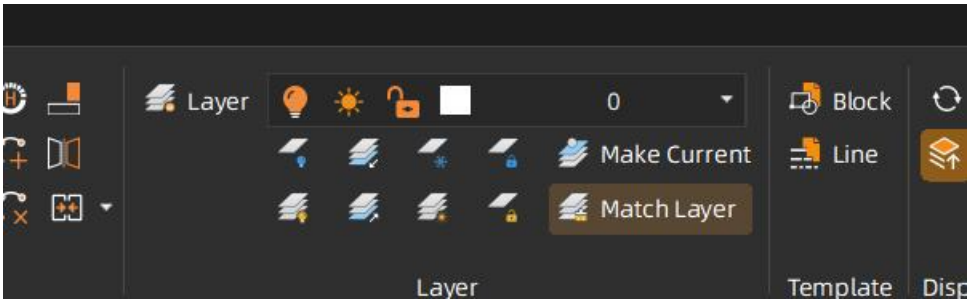


Figure: Match Layer

2.4.7 Template

2.4.7.1 Block

Function Description:

Uses existing templates to draw features in the drawing.

Operation Steps:

1. Click Vector -> Template -> Block. The Block Template drawing panel app ears, entering the "Default" template tab. Click to select a built-in block. Yo u can also click the "Import Custom Block" button in the "Active Drawing" t ab, select a .dwg block drawing, load the external block into the block list of the Active Drawing tab, and select the desired block template for drawin g.

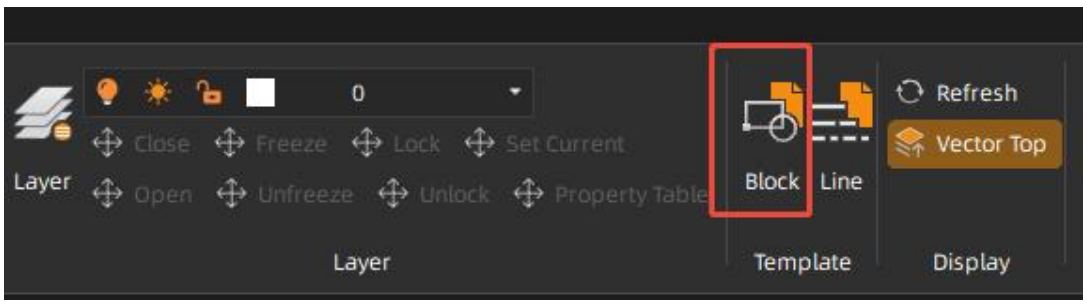


Figure: Block Template

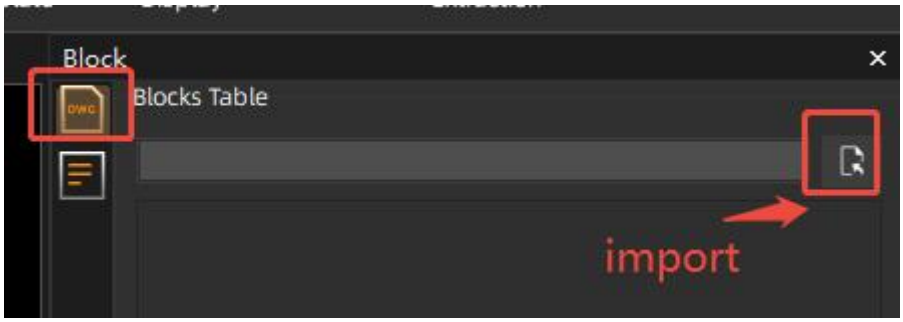


Figure: Import custom block button

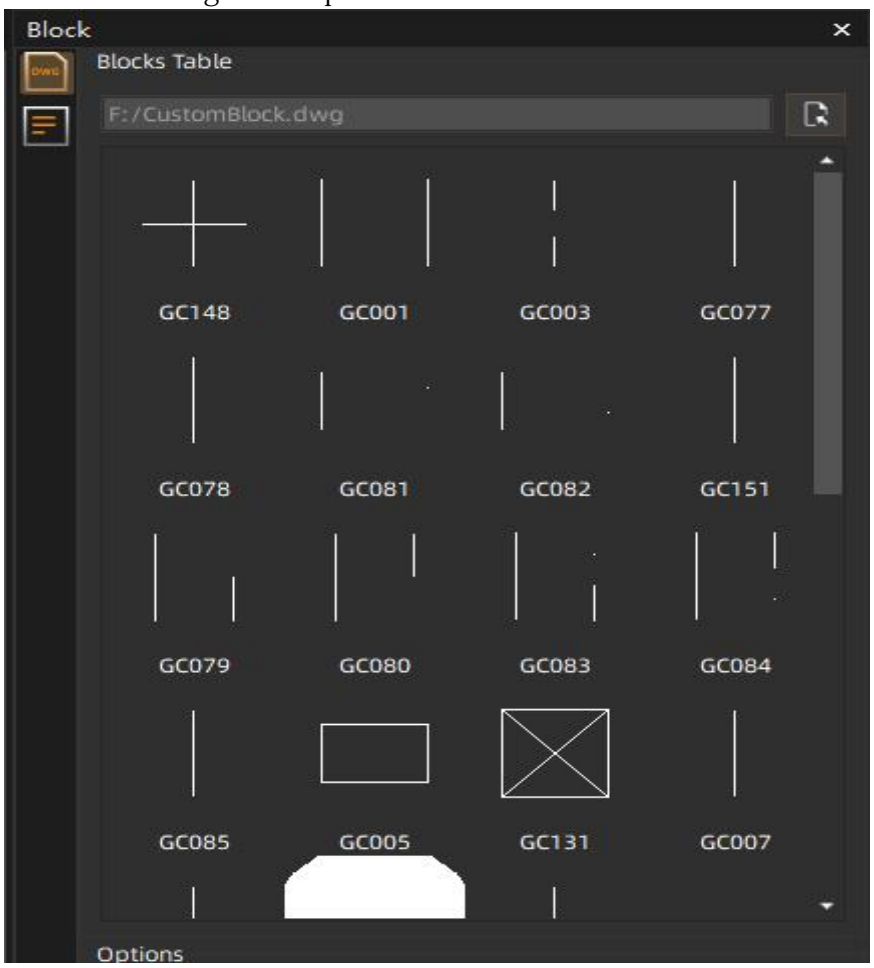


Figure: Custom Block



Figure: Default Blocks_x0005_

2. Select the drawing method in the Block Template drawing panel. Rotation and Scale are set to "Interactive" mode by default, and Scale mode is "Uniform Scale".

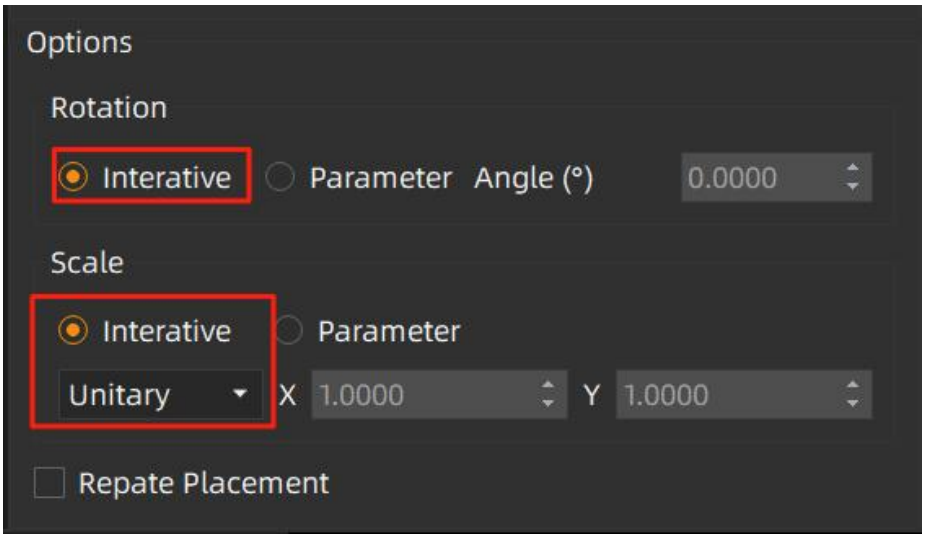


Figure: Default Option Settings

3. Click a point in the view as the insertion point for the block.

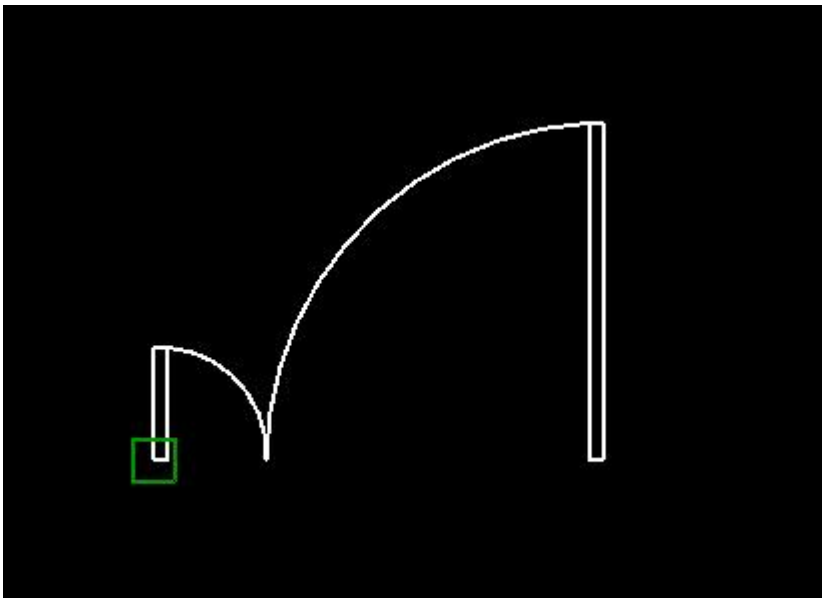


Figure: Insertion Point of the Block

4. Move the mouse to adjust the rotation angle. Click a point to set the rotation angle for the block. If "Parameter" mode is selected, the set angle value is used directly as the rotation angle, and no adjustment is needed in the view.

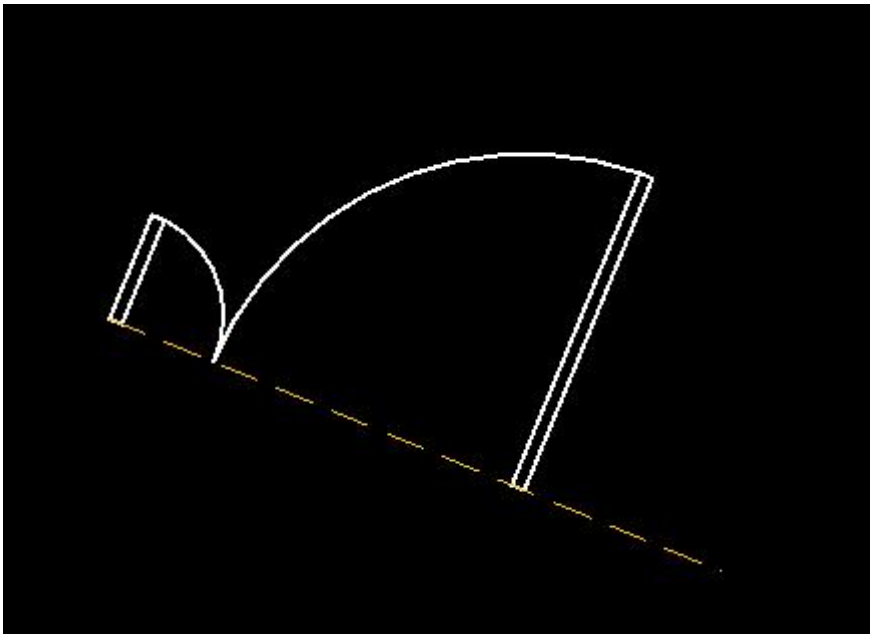


Figure: Adjust Rotation Angle

5. Move the mouse to adjust the scale factor. Click a point to set the scale factor for the block, completing the block drawing. If "Parameter" mode is selected, the set X and Y scale factors are used directly, and no adjustment is needed in the view.

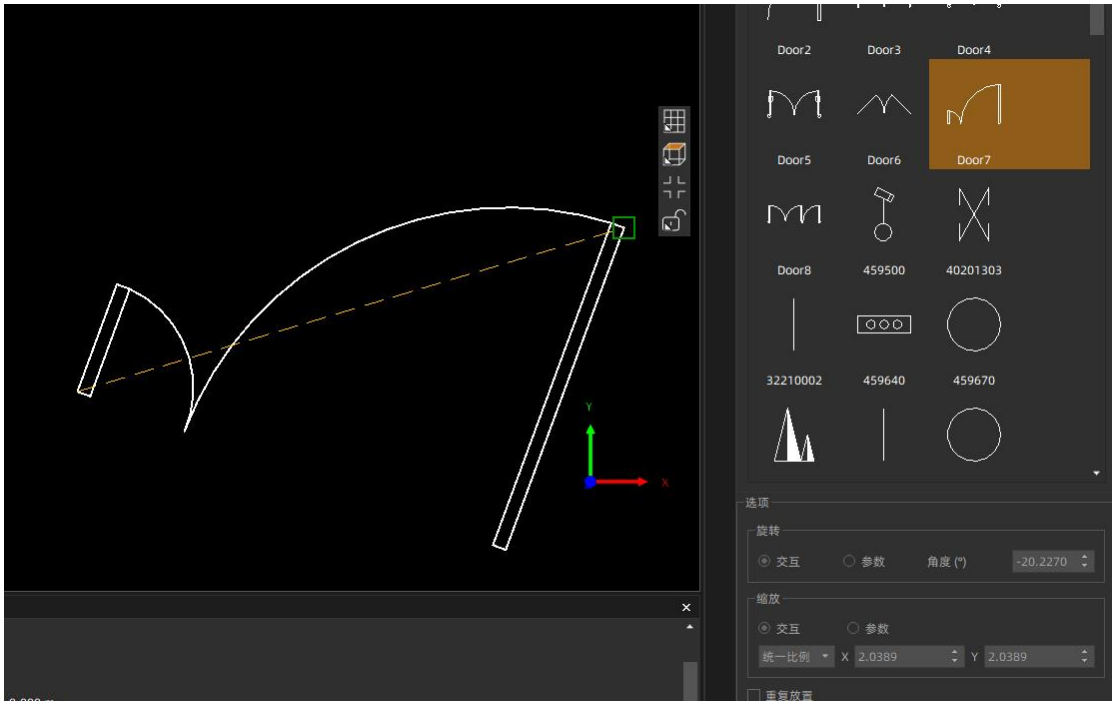


Figure: Adjust Scale

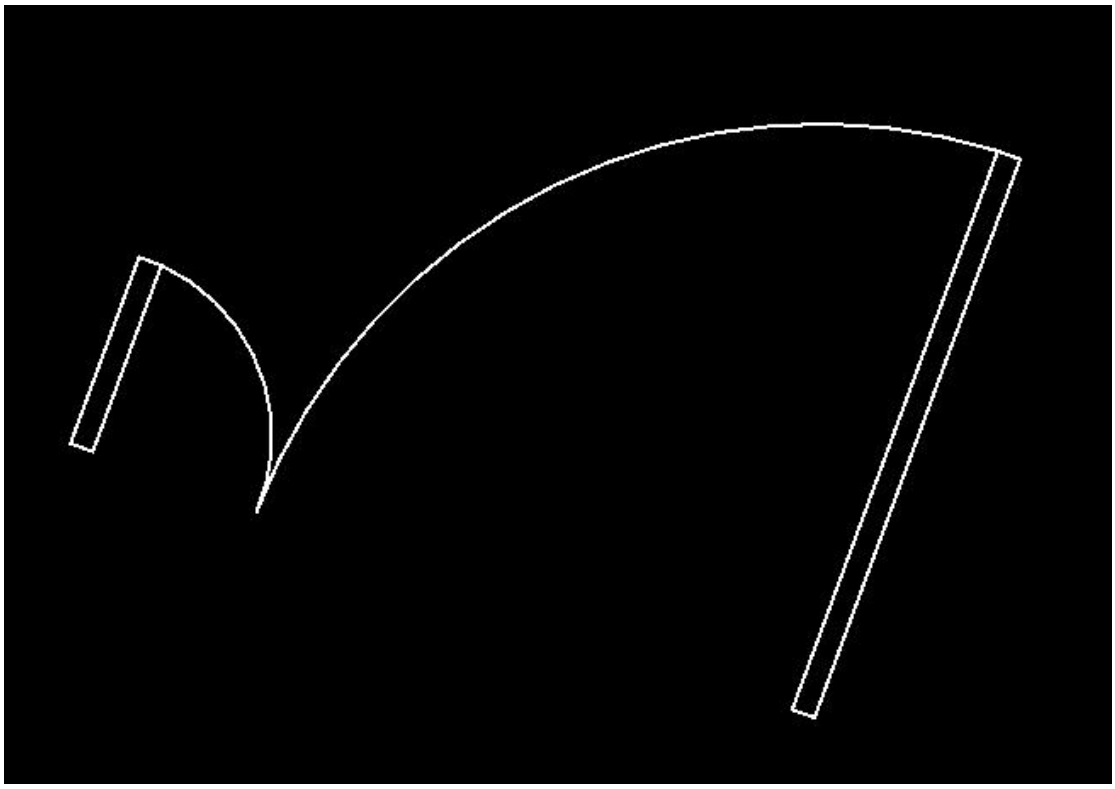


Figure: Completion

Parameter Settings:

Uniform Scale: The scale factors for the X and Y directions of the block m aintain a 1:1 ratio. Modifying either X or Y automatically changes the other. The sign of the value only represents the direction of the block.

Scale: When "Scale" is selected, the X and Y scale factors can be set indep endently. There is no synchronous change relationship between X and Y. T he sign of the value only represents the direction of the block.

The relationship between block direction and the sign of X/Y scale factors when the rotation angle is 0° is shown in the figure.

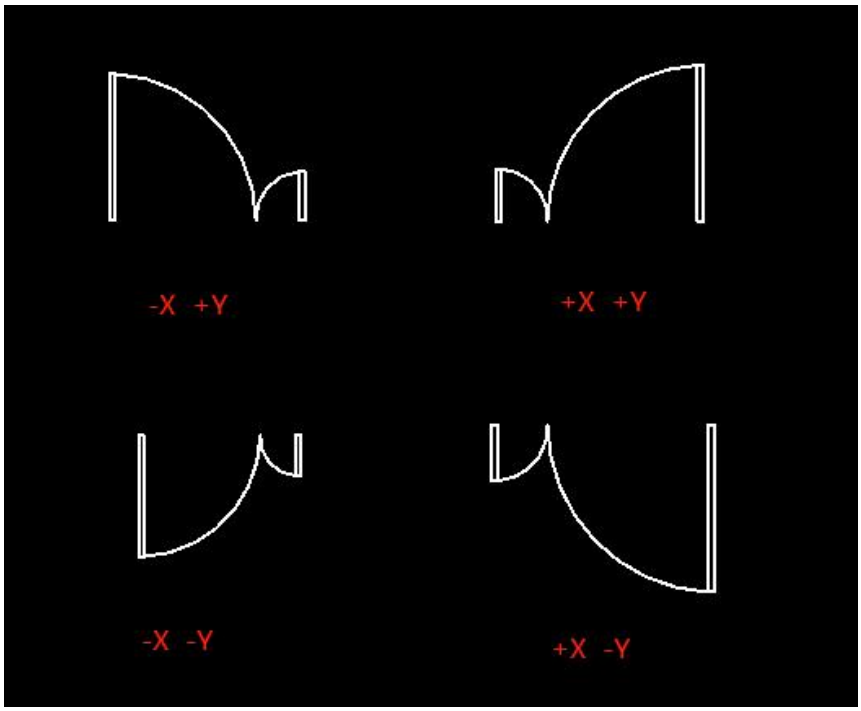


Figure: Direction of the Block

Repeat Placement: By default, "Repeat Placement" is unchecked. After drawing one block, the drawing function exits. If "Repeat Placement" is checked, after completing one block, the rotation angle and scale factor are retained. You can continue drawing the same block by only selecting insertion points in the view.

Note:

1. When drawing blocks, set the options in the Block Template drawing panel first, then go to the view to draw the block. After moving the mouse to the view, the options in the Block Template drawing panel become grayed out. To modify the options, reselect the block template.

2. In the "Active Drawing" tab, custom blocks can be deleted or renamed. However, note that:

(1) Before deleting a block, ensure that the corresponding block does not exist in the current active drawing.

(2) If a block name in the "Active Drawing" tab conflicts with a block name

in the "Default" tab, drawing the block from the "Default" tab will result in the block template style from the "Active Drawing" tab being drawn.

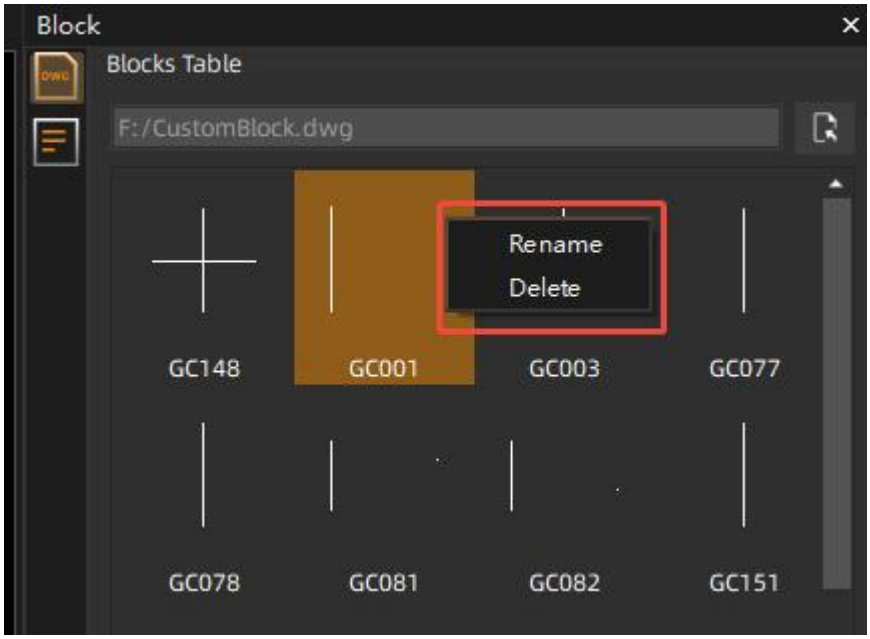


Figure: Block Menu_x0005_

2.4.7.2 Line

Function Description:

Selects a desired line style and draws a polyline.

Operation Steps:

1. Click Vector -> Template -> Line. In the Line Template drawing panel, select the desired line style to draw.

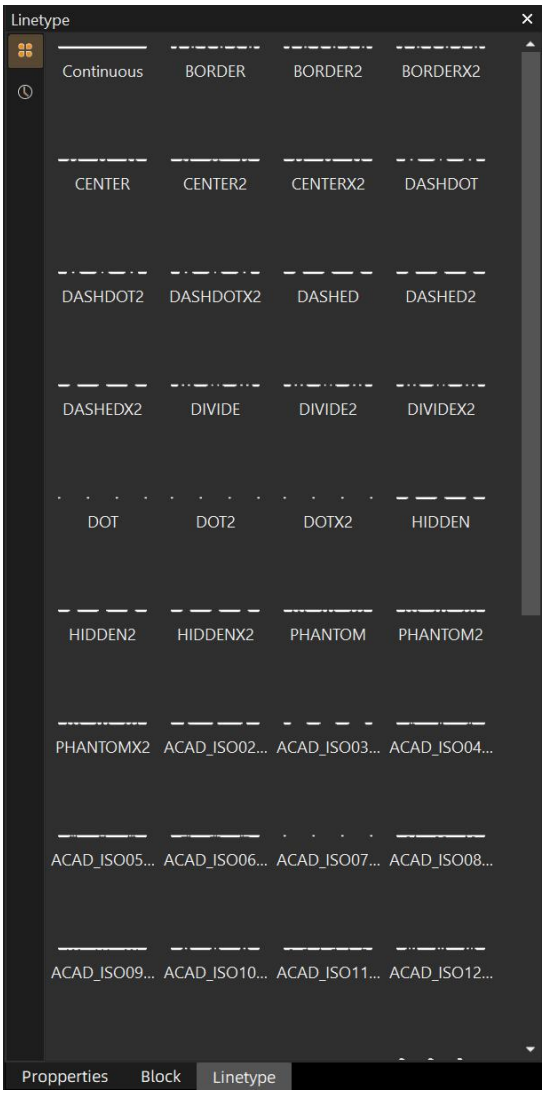


Figure: Line Type Panel

2. Draw in the view window. The drawing method is the same as for a pol yline. The line style is the chosen template style. If 3D drawing is used, the selected line style cannot be displayed.



Figure: Drawing Effect of Line Style

2.4.8 Display

2.4.8.1 Bring Vectors to Front

Function Description:

Brings vectors in the view to the topmost layer of all data, without affecting their actual position.

Operation Steps:

Click Vector -> Display -> Bring Vectors to Front to toggle the state (default is on).

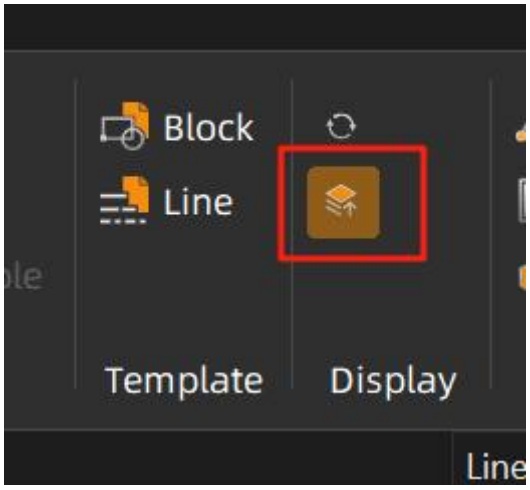


Figure: Vector to Top

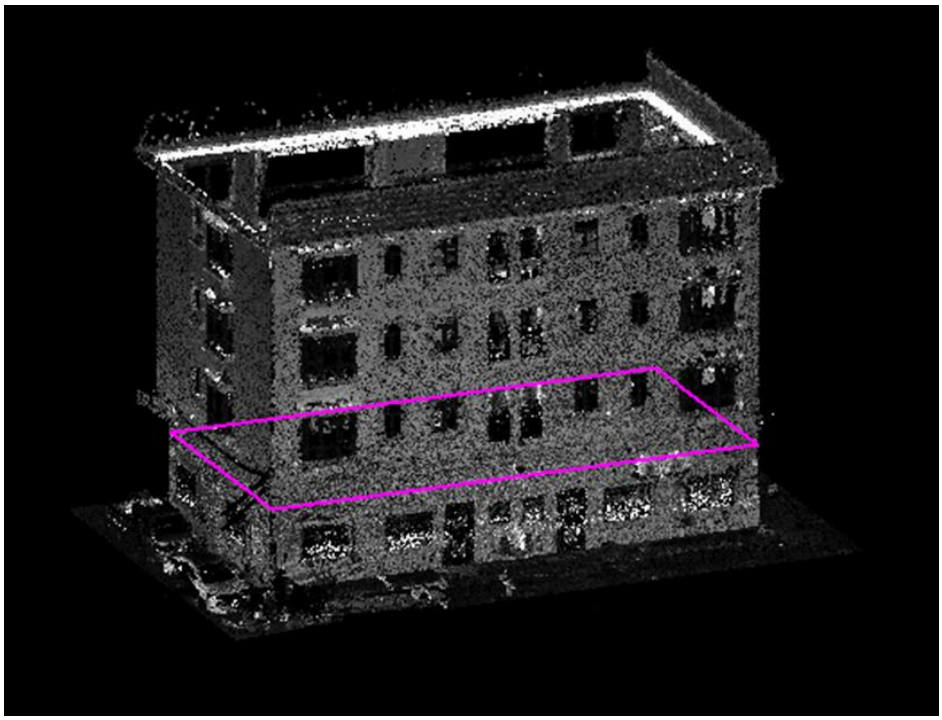


Figure: Effect of Vector to Top

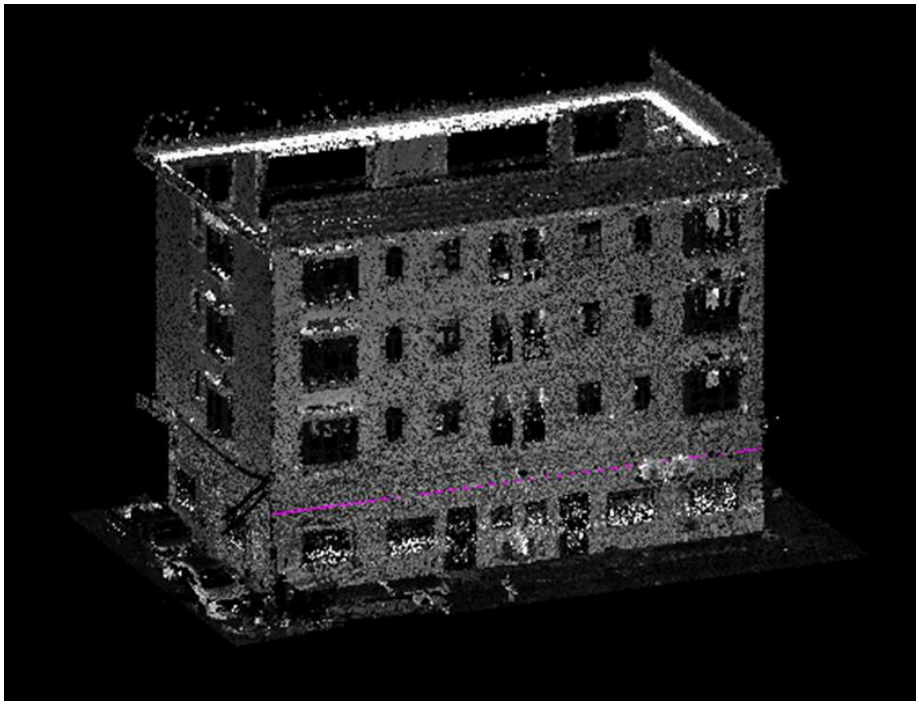


Figure: Effect of Vector Not to Top

2.4.9 Building Extraction

2.4.9.1 Planar Extraction

2.4.9.1.1 Trace

Function Description:

Click on a point cloud, automatically trace the direction of one edge of a p lanar outline. You can switch to manual drawing mode via the right-click m enu.

Operation Steps:

1. First, slice the point cloud. Click Basic -> Slice -> Horizontal.

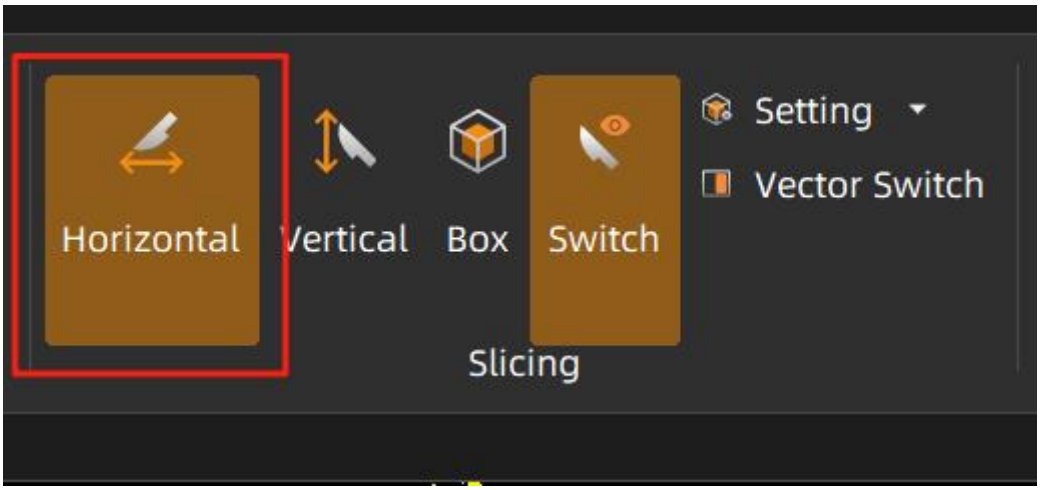


Figure: Horizontal Slice

2. In the view, click a point on the point cloud. Adjust the slice to an appr opriate thickness and position to display a clear and complete building outl ine point cloud.

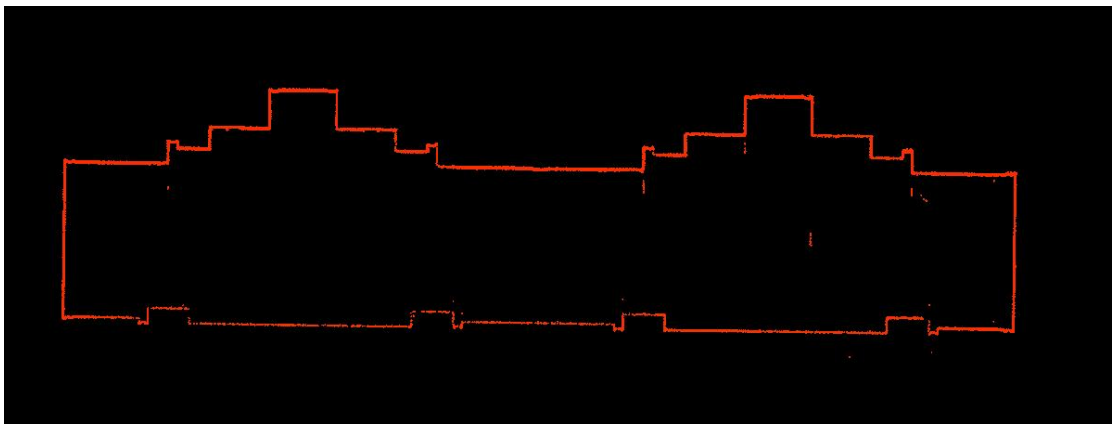


Figure: Building Contour Point Cloud

3. Click Vector -> Building Extraction -> Planar Extraction -> Trace.

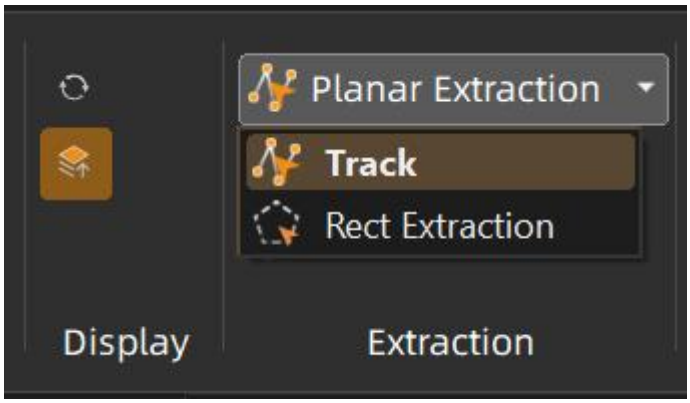


Figure: Track

4. In the view, click two points to determine the direction of the first edge of the planar outline.

5. In the view, click a point to determine the direction of the next edge, intersecting the previous edge. Continue drawing as needed.

6. In the view, press Enter or right-click and select "Confirm" to finish drawing the planar outline. The drawn vector is closed by default. To draw an open vector, right-click and uncheck "Auto Close".

7. During drawing, right-click and select "Undo Point" or use shortcut key U to undo one point.

8. The default is "2D Drawing". In Trace mode, the vector elevation is always constrained to the same plane during drawing for both "2D Drawing" and "3D Drawing".

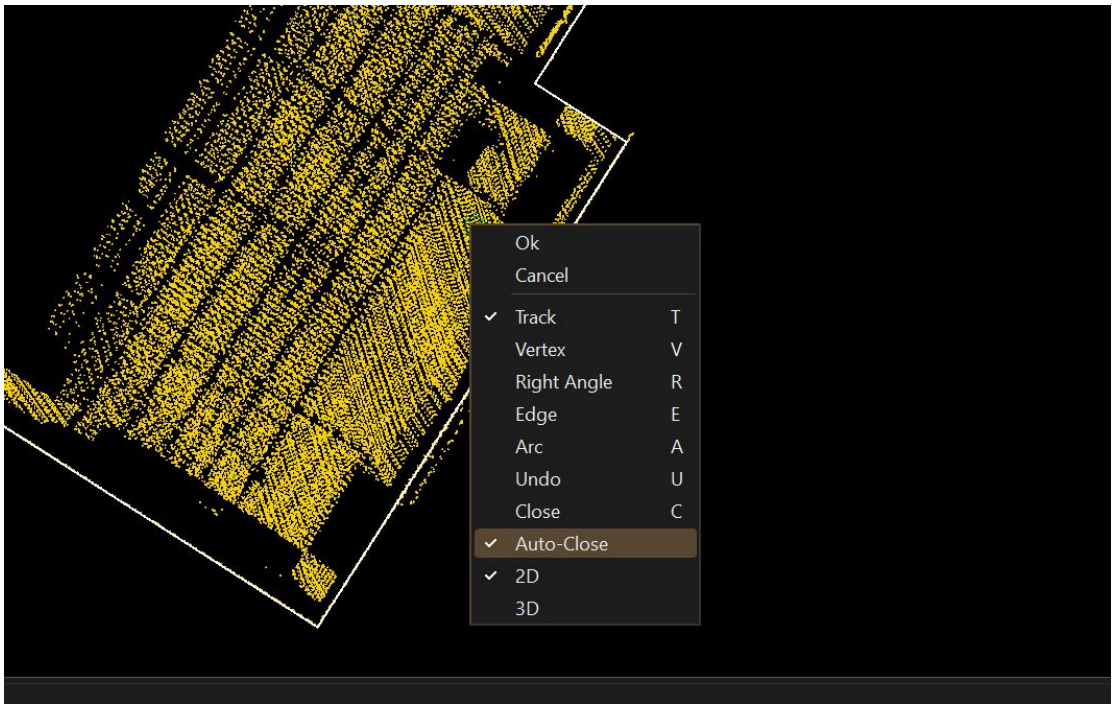


Figure: Right-Click in Track Mode

2.4.9.1.2 Box Selection

Function Description:

Draws a polygon to select point clouds, automatically extracting the planar building outline.

Operation Steps:

1. Load the point cloud. Slice the point cloud. Click Basic -> Slice -> Horizo ntal.

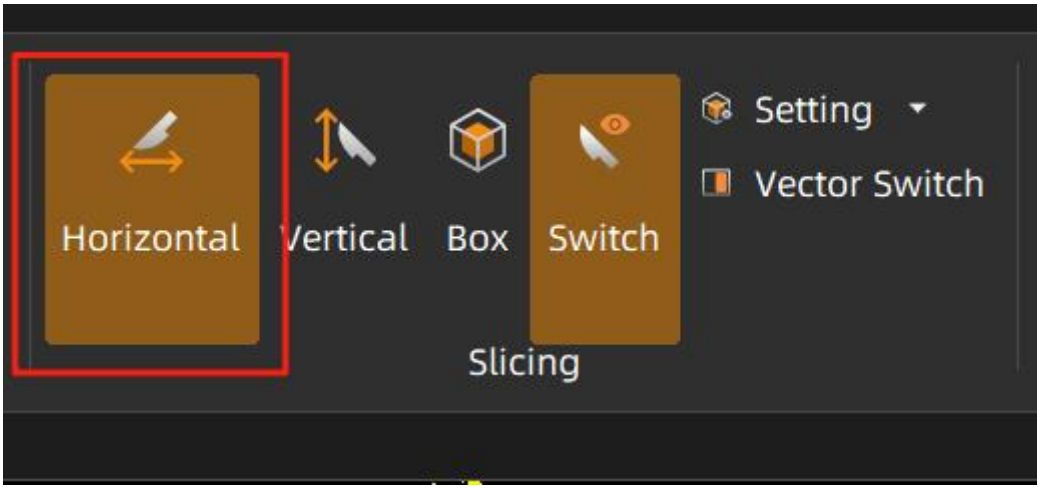


Figure: Horizontal Slice

2. In the view, click a point on the point cloud. Adjust the slice to an appr opriate thickness and position to display a clear and complete building outl ine point cloud.

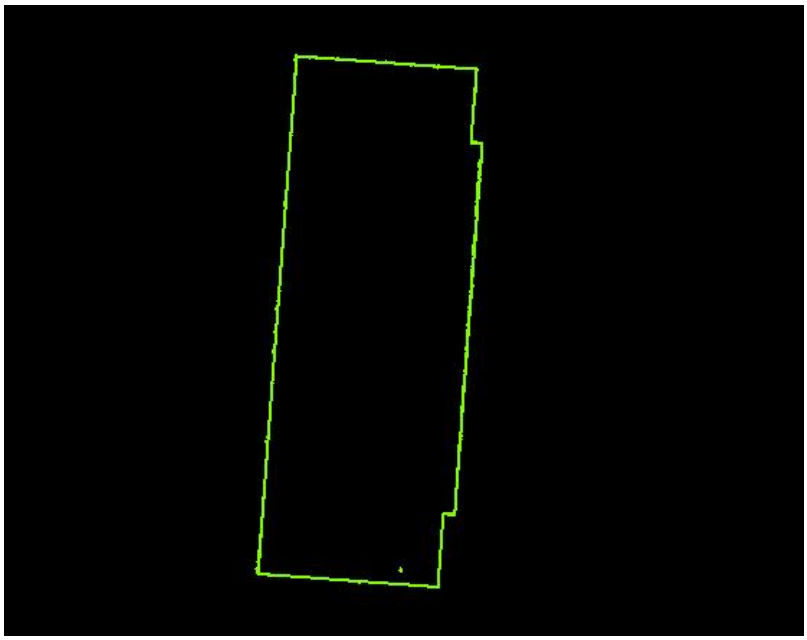


Figure: Building Contour Point Cloud

3. Click Vector -> Building Extraction -> Planar Extraction -> Box Selection.

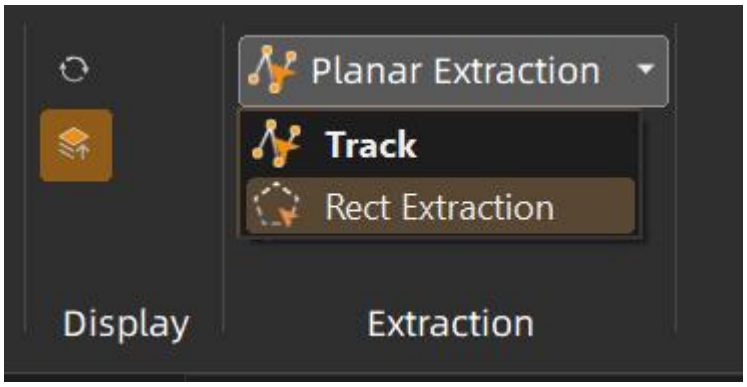


Figure: Frame Selection

4. In the view, click to draw a polygon, selecting the building outline point cloud. The software automatically recognizes and extracts the planar buildin g outline.

5. During drawing, right-click and select "Undo Point" or use shortcut key U to undo one point.



Figure: Right-Click in Rect Extraction

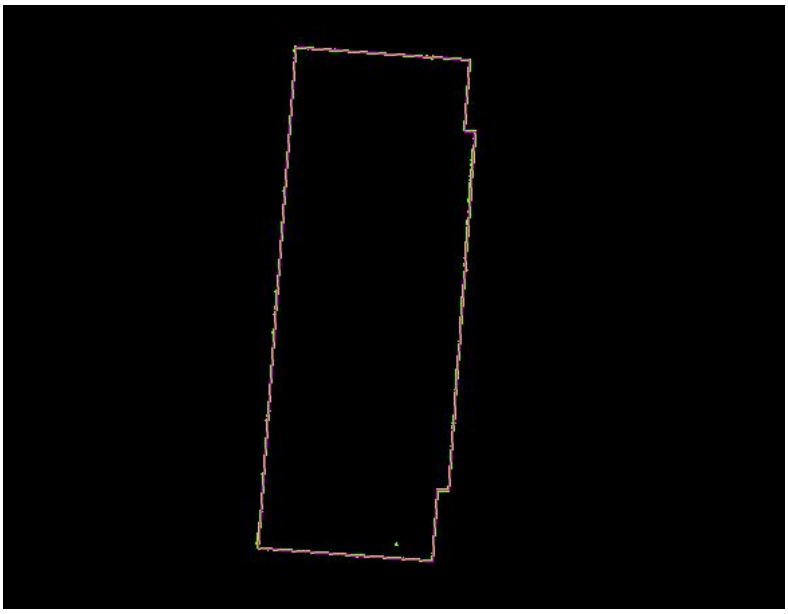


Figure: Result of Rect Extraction

2.4.9.2 Create Elevation

2.4.9.2.1 Select

Function Description:

Selects a vector line or elevation proxy line to create an elevation view.

2.4.9.2.1.1 Create Elevation - Four-View

Operation Steps:

1. Click Vector -> Building Extraction -> Create Elevation -> Select.

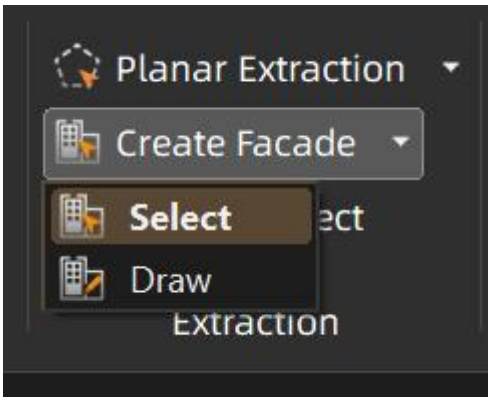


Figure: Selection

2. In the view, click to select a closed vector. The Create Elevation dialog box appears.

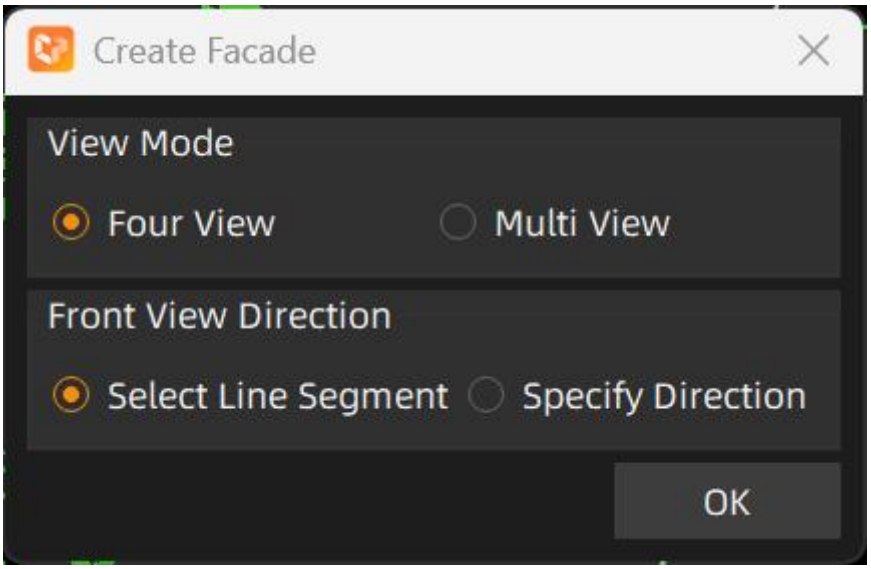


Figure: Create Facade Dialog Box

3. Select "Four-View" for "View Mode".

4. "Front View Confirmation Method" can be "Select Line Segment" or "Specify Direction". Click "OK".

(1) If "Select Line Segment" is chosen, after confirming, you need to select an edge on the chosen closed vector as the front view direction. The elevation proxy line is generated, and the elevation view is activated. The elevati

on view displays the point cloud and vector data for the current perspectiv e. Click the first button on the horizontal toolbar, and click "Front, Left, Bac k, Right" in the dropdown to switch the display of point clouds for differen t elevation views.

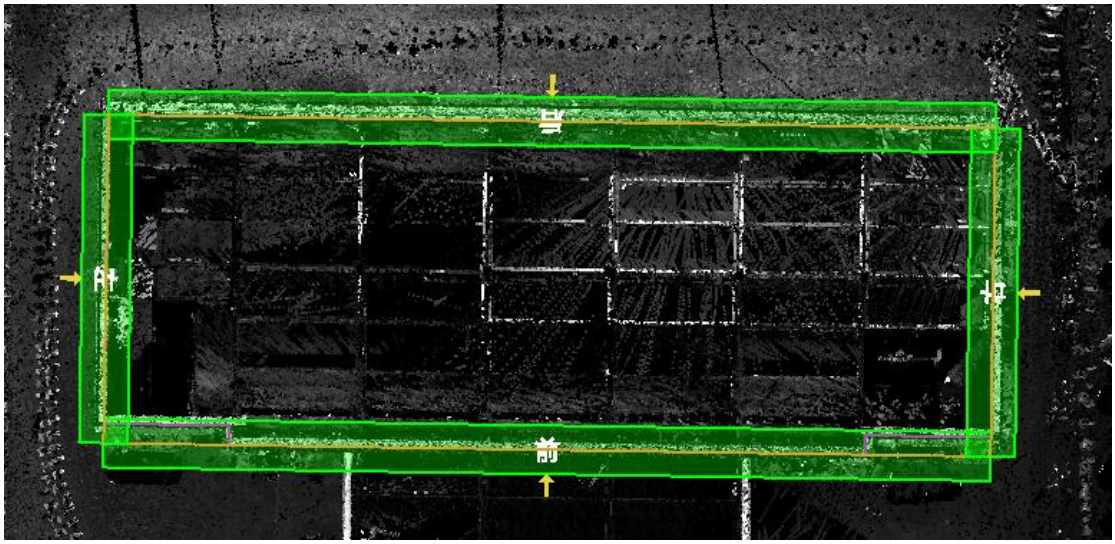


Figure: Four-View Facade Proxy Line

(2) If "Specify Direction" is chosen, after confirming, you need to draw a lin e by clicking two points in the view. The arrow direction confirms the front view direction. The elevation proxy line is generated, and the elevation vie w is activated. The elevation view displays the front view point cloud. Click the first button on the horizontal toolbar, and click "Front, Left, Back, Right " in the dropdown to switch the display of point clouds for different elevati on views.

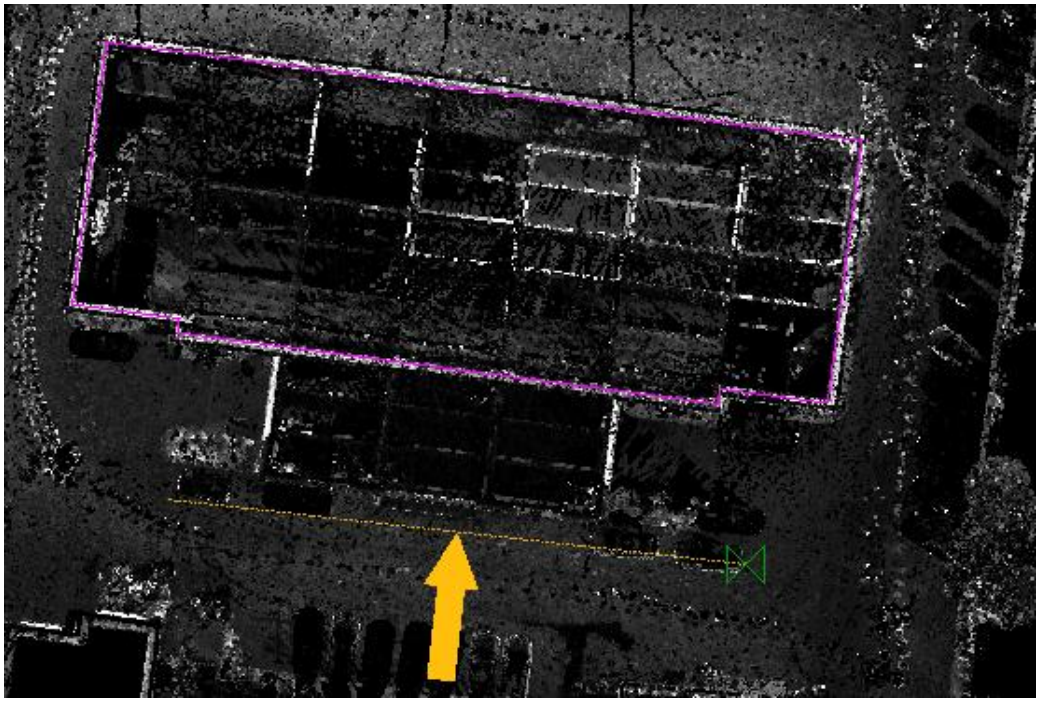


Figure: Specify Direction

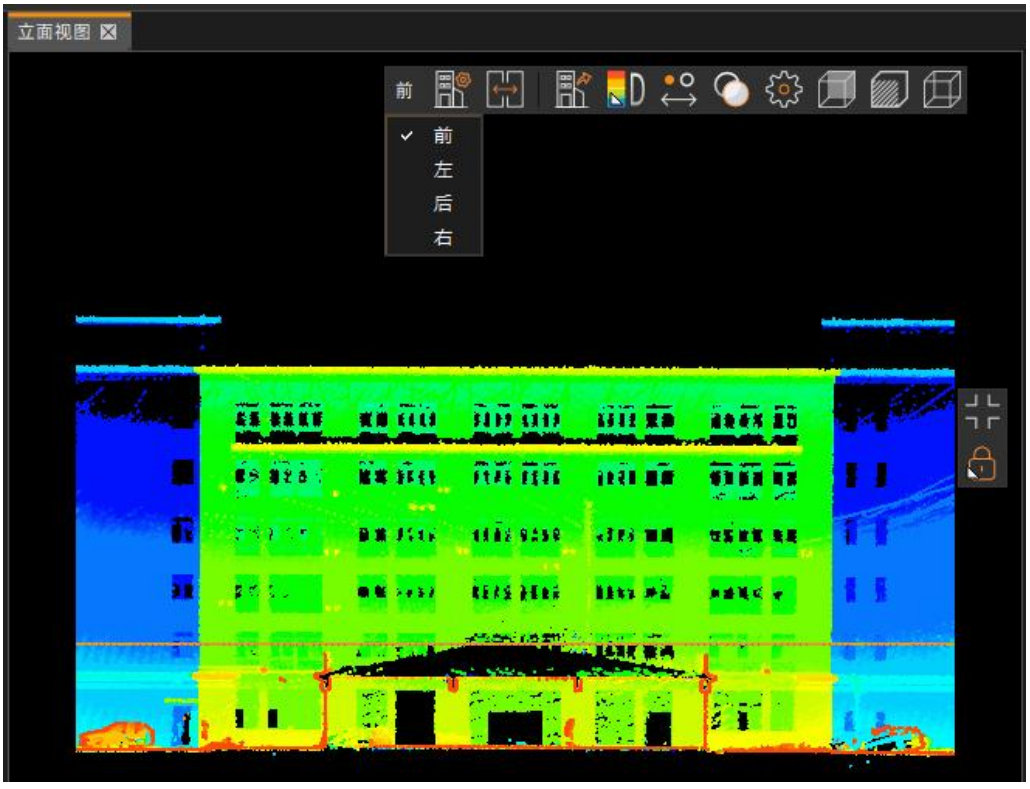


Figure: Facade View - Four-View

2.4.9.2.1.2 Create Elevation - Front View

Operation Steps:

1. Click Vector -> Building Extraction -> Create Elevation -> Select.

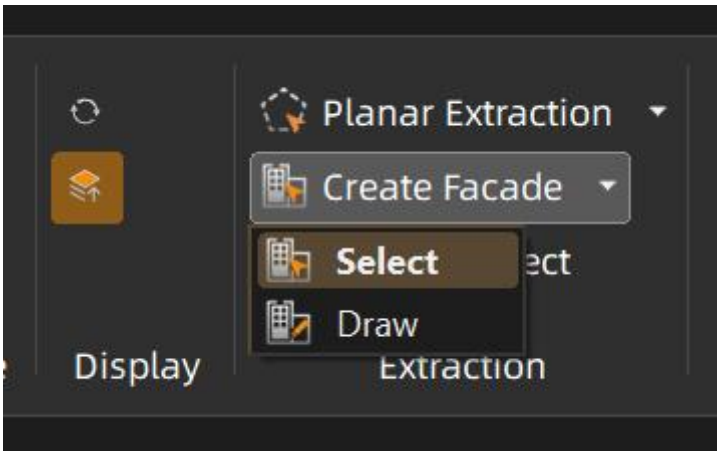


Figure: Select

2. In the view, click to select a closed vector. The Create Elevation dialog box appears. If a non-closed vector is selected, the dialog box is skipped, and the elevation view is created directly.

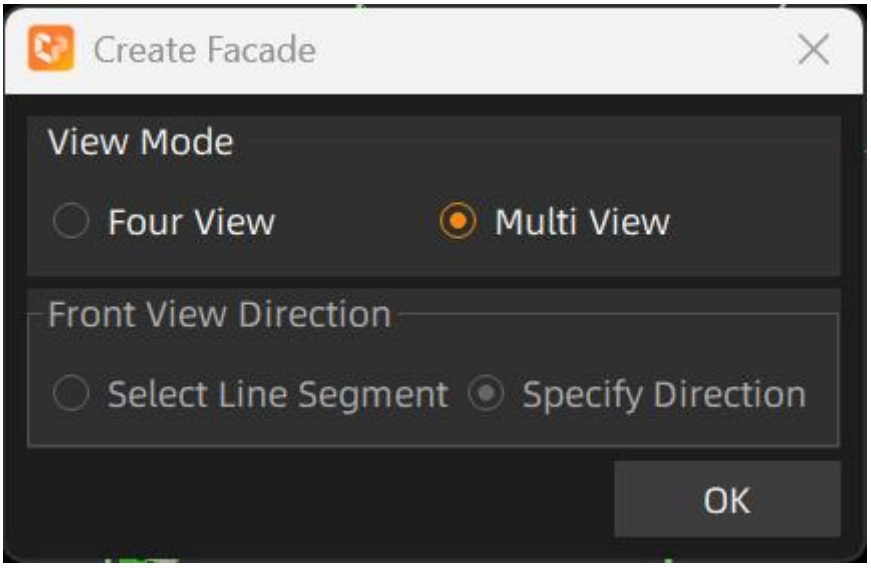


Figure: Create Facade Dialog Box

3. Select "Front View" for "View Mode". Click "OK". The elevation proxy line is generated, and the elevation view is activated. The elevation view displays the elevation view point cloud for the first vector segment. Click the first button on the horizontal toolbar, and click different numbers in the drop down to switch the display of point clouds for different sides.

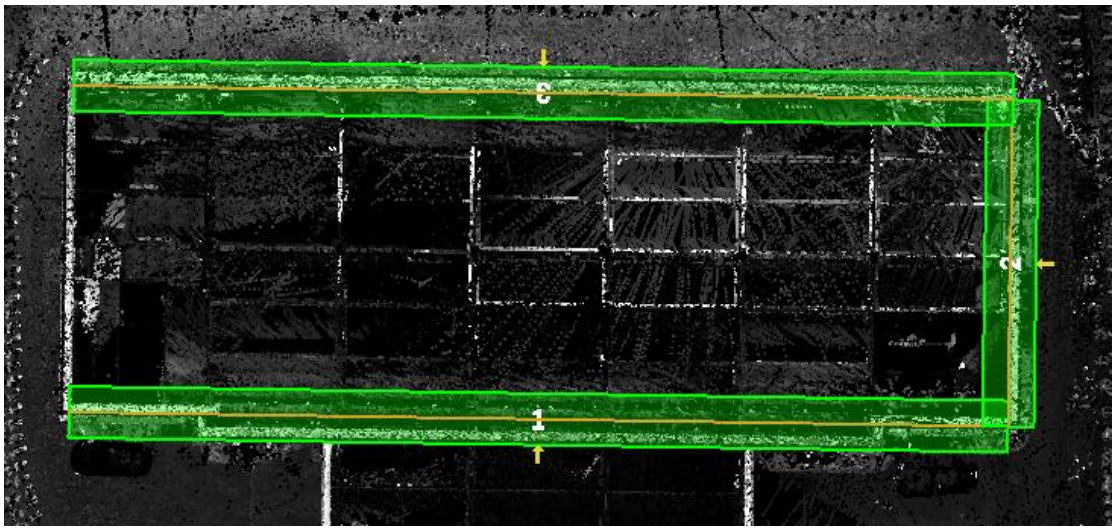


Figure: Multi-View Facade Proxy Line

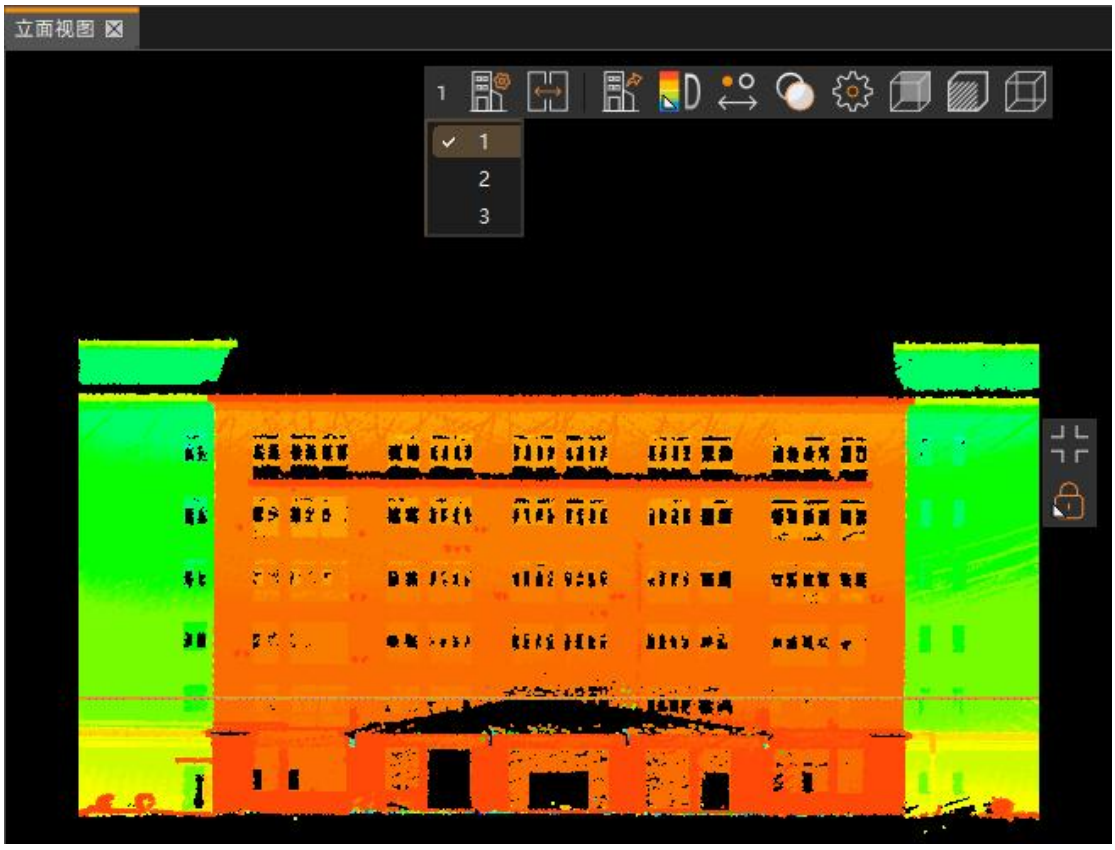


Figure: Facade View - Multi-View

Note:

1. If an elevation proxy line or its corresponding planar outline is selected, the software directly enters the elevation view corresponding to the existing

elevation proxy line.

2. The data display range of the current elevation view corresponds to the range covered by the corresponding elevation proxy line in the 3D view to p-down perspective.

3. To recreate an elevation view, you can delete the original elevation prox y line and then select the original vector again to create a new elevation vi ew. However, deleting an elevation proxy line will also delete all its corresp onding elevation vectors. Proceed with caution.

2.4.9.2.2 Draw

Function Description:

Draws a vector line to create an elevation view.

Operation Steps:

Click Vector -> Building Extraction -> Create Elevation -> Draw.

2.4.9.2.2.1 Create Elevation - Four-View

Operation Steps:

1. Click Vector -> Building Extraction -> Create Elevation -> Draw.

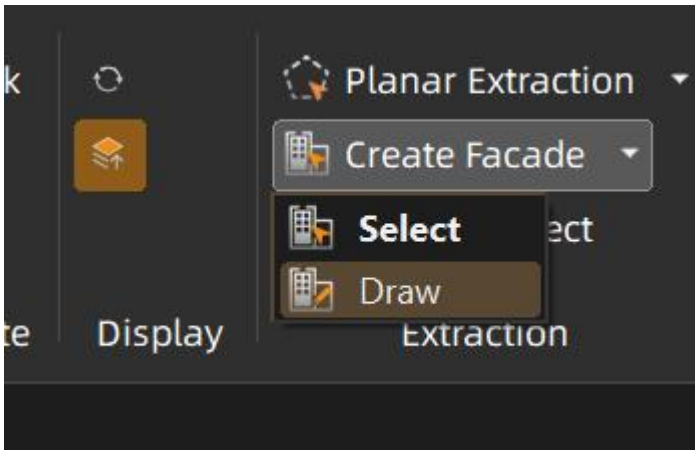


Figure: Draw

2. In the view, click to draw a polyline. The default is Vertex Mode. Right-click to switch other drawing modes. Check "Auto Close" or right-click "Close" to end drawing. The vector line is closed. The Create Elevation dialog box appears.



Figure: Right-Click in Drawing

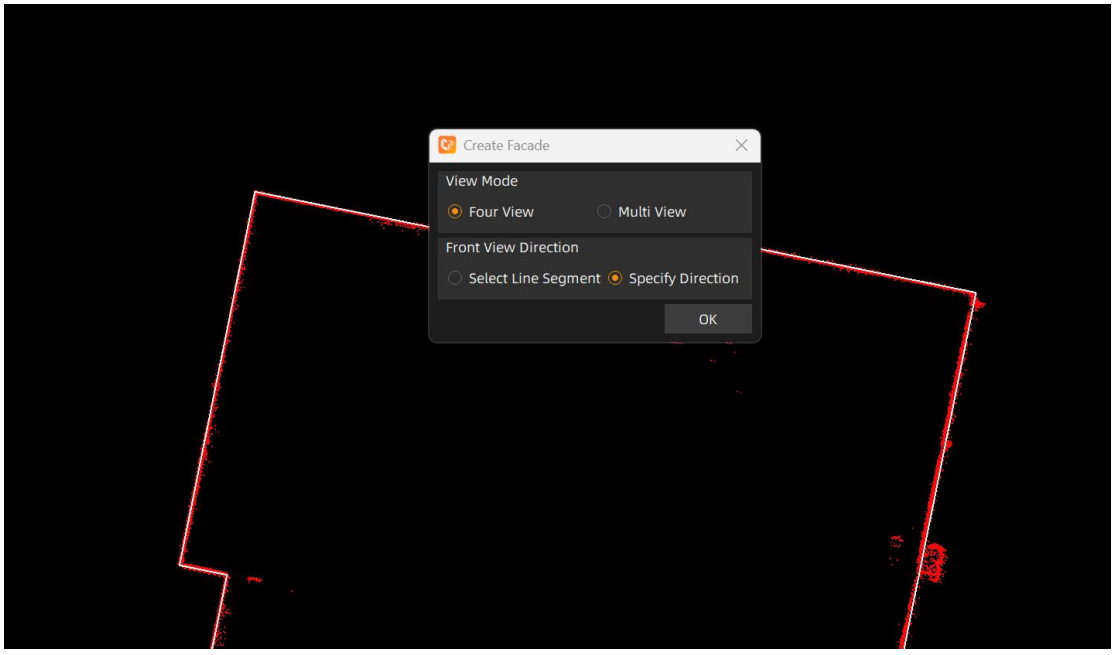


Figure: Create Facade Dialog Box

3. Select "Four-View" for "View Mode".

4. "Front View Confirmation Method" can be "Select Line Segment" or "Specify Direction". Click "OK".

(1) If "Select Line Segment" is chosen, after confirming, you need to select an edge on the drawn closed vector as the front view direction. The elevation proxy line is generated, and the elevation view is activated. The elevation view displays the front view point cloud. Click the first button on the horizontal toolbar, and click "Front, Left, Back, Right" in the dropdown to switch the display of point clouds for different elevation views.

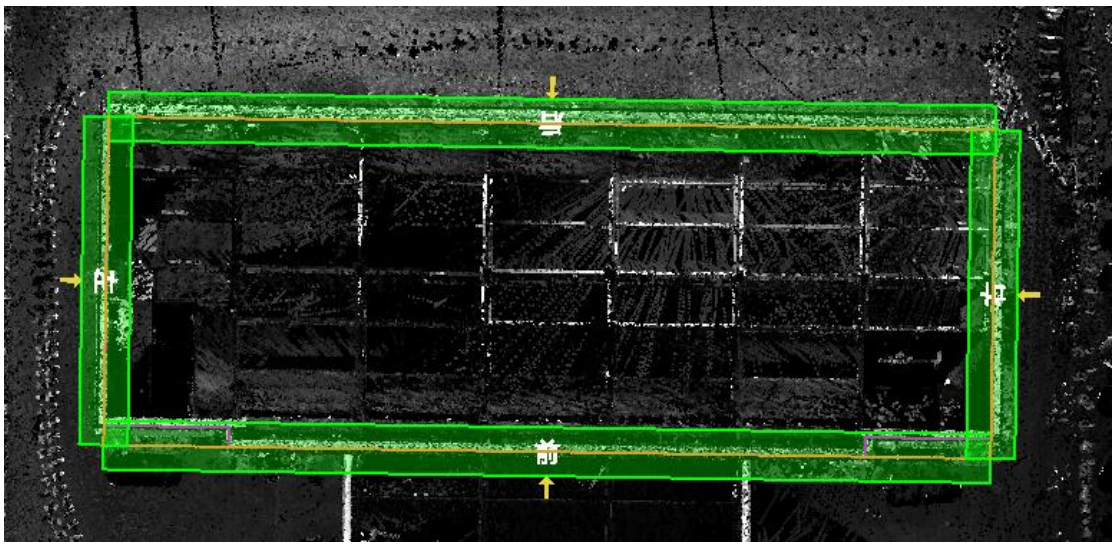


Figure: Four-View facade Proxy Line

(2) If "Specify Direction" is chosen, after confirming, you need to draw a line by clicking two points in the view. The arrow direction confirms the front view direction. The elevation proxy line is generated, and the elevation view is activated. The elevation view displays the front view point cloud. Click the first button on the horizontal toolbar, and click "Front, Left, Back, Right" in the dropdown to switch the display of point clouds for different elevation views.

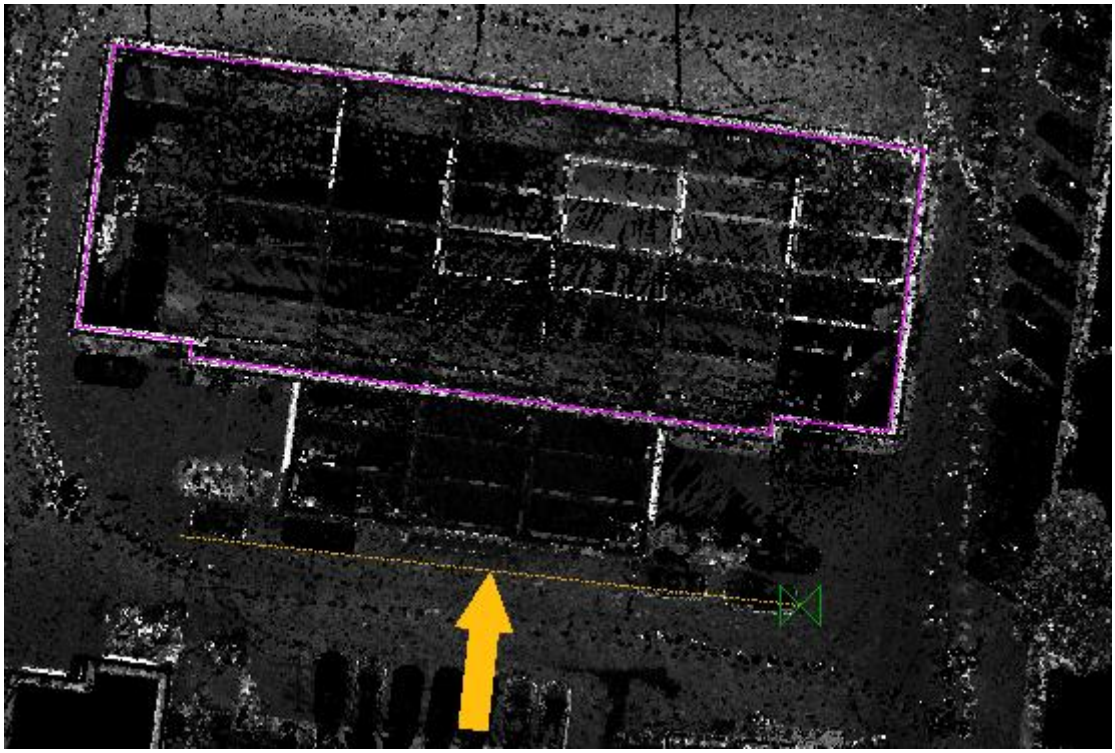


Figure: Specify Direction

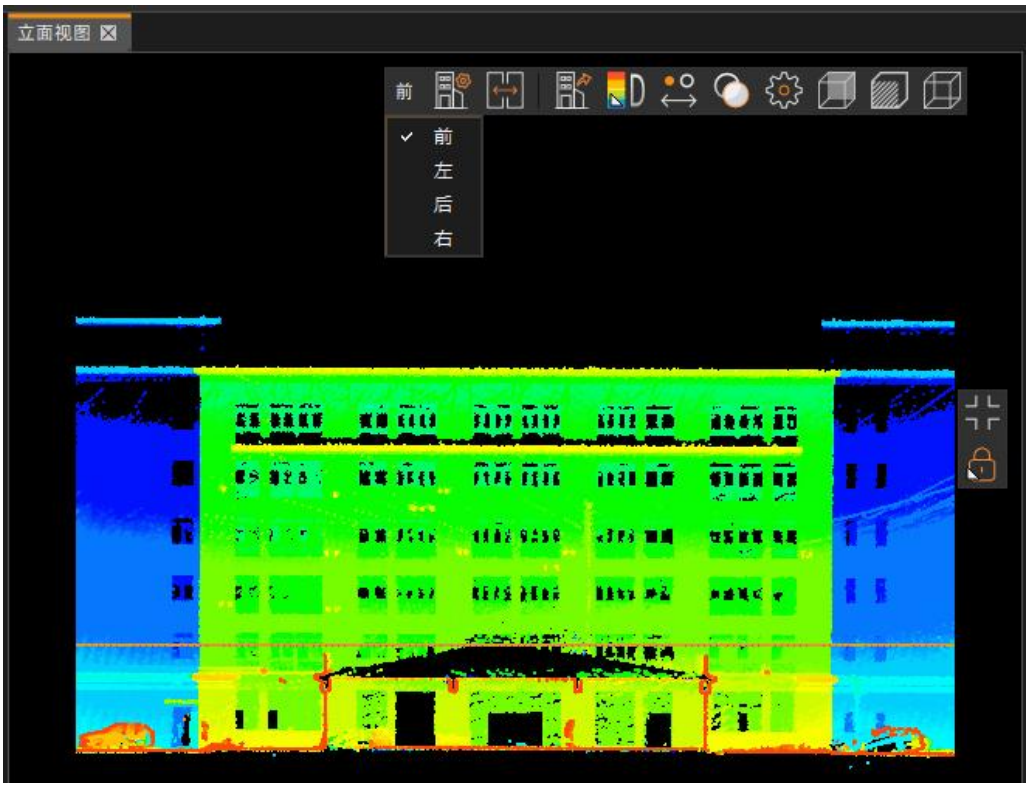


Figure: Facade View - Four-View

2.4.9.2.2.2 Create Elevation - Front View

Operation Steps:

1. Click Vector -> Building Extraction -> Create Elevation -> Select.

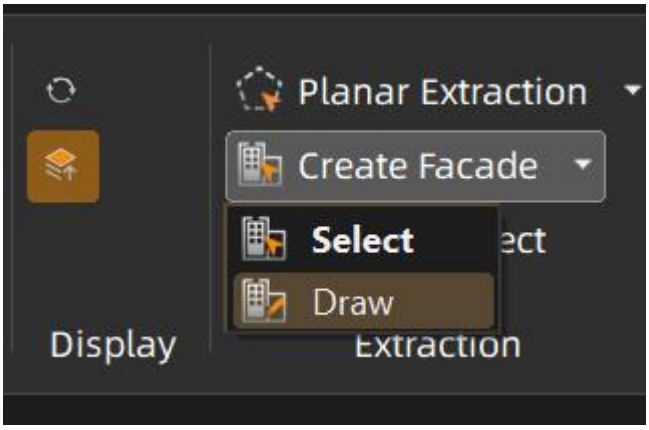


Figure: Draw

2. In the view, click to draw a closed vector. The Create Elevation dialog box appears. If a non-closed vector is drawn, the dialog box is skipped, and the elevation view is created directly.

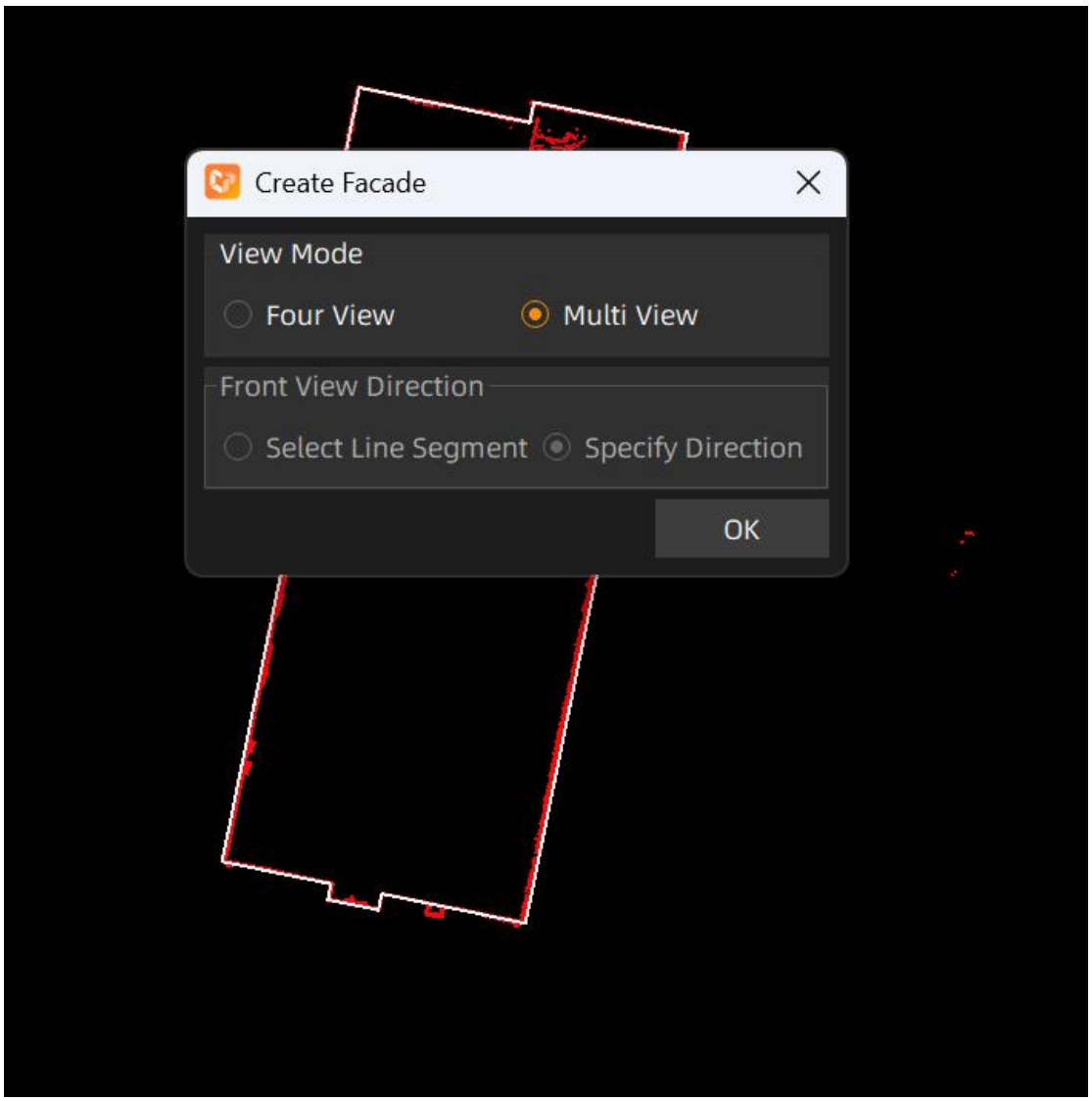


Figure: Create Facade Dialog Box

3. Select "Front View" for "View Mode". Click "OK". The elevation proxy line is generated, and the elevation view is activated. The elevation view displays the elevation view point cloud for the first vector segment. Click the first button on the horizontal toolbar, and click different numbers in the drop down to switch the display of point clouds for different sides.

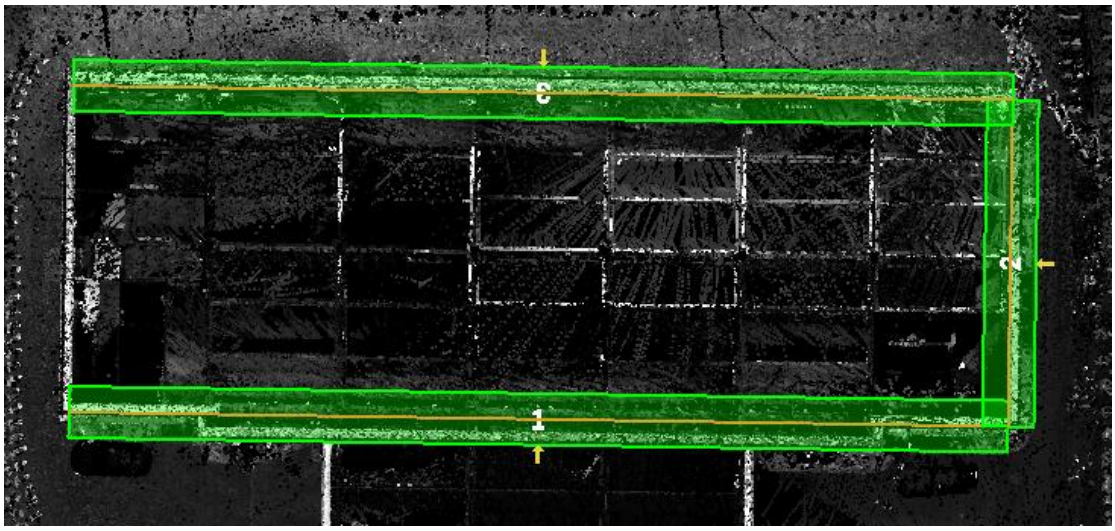


Figure: Multi-View Facade Proxy Line

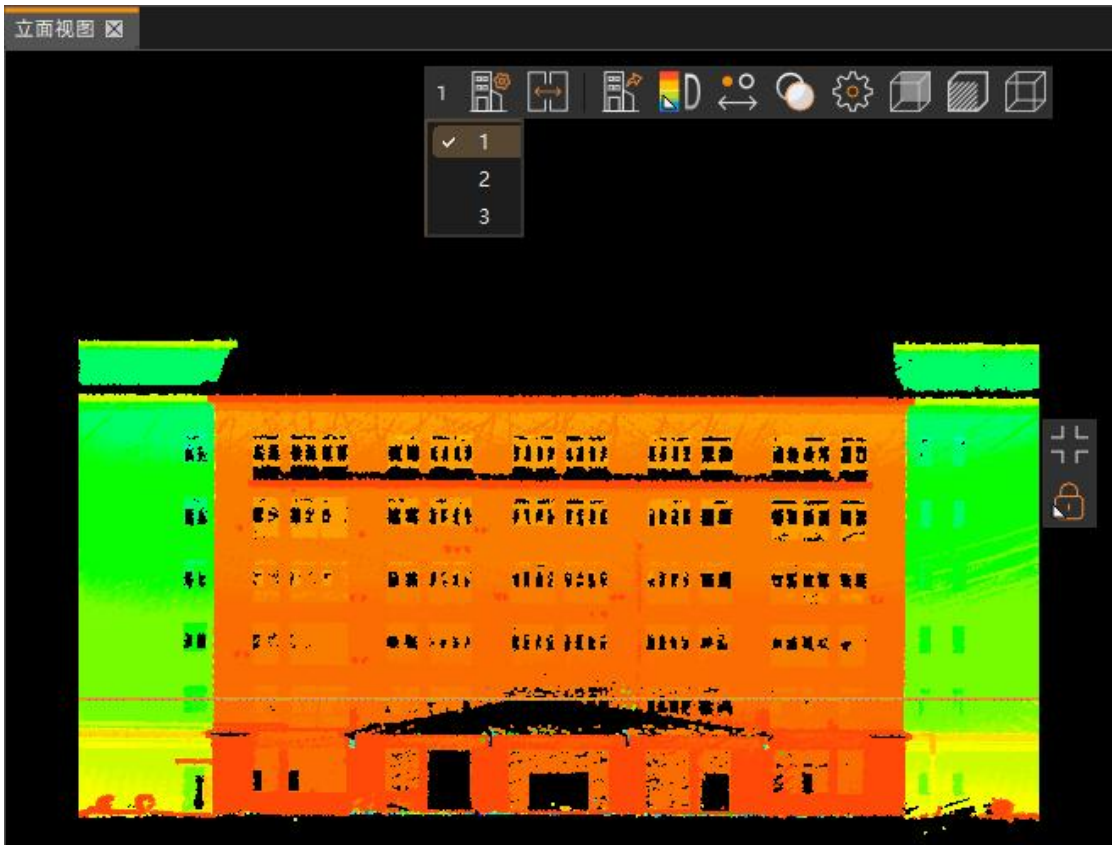


Figure: Facade View - Front View

Note:

1. The data display range of the current elevation view corresponds to the range covered by the corresponding elevation proxy line in the 3D view to p-down perspective.

2. After closing the Create Elevation dialog box, the drawn vector line is not retained.

2.4.9.3 Flatten Elevation

Function Description:

By selecting an elevation proxy line, elevation vector, or planar outline, flattens and copies all vector features from the related elevation view into the 3D view.

Operation Steps:

1. Click Vector -> Building Extraction -> Flatten Elevation.

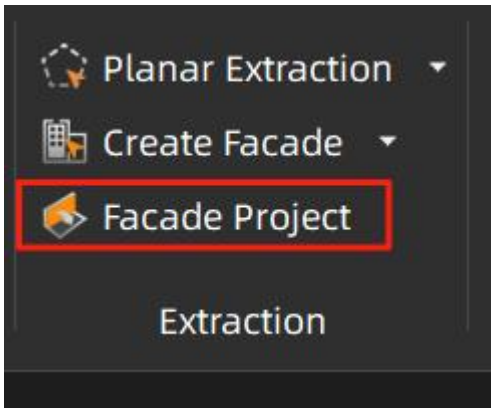


Figure: Facade Project

2. Click on the elevation proxy line, elevation vector, or planar outline in the 3D view. All vectors from the elevation view appear as a preview attached to the mouse cursor.

3. Click a point to determine the base point for the flattened elevation. The Flatten Elevation operation is completed.

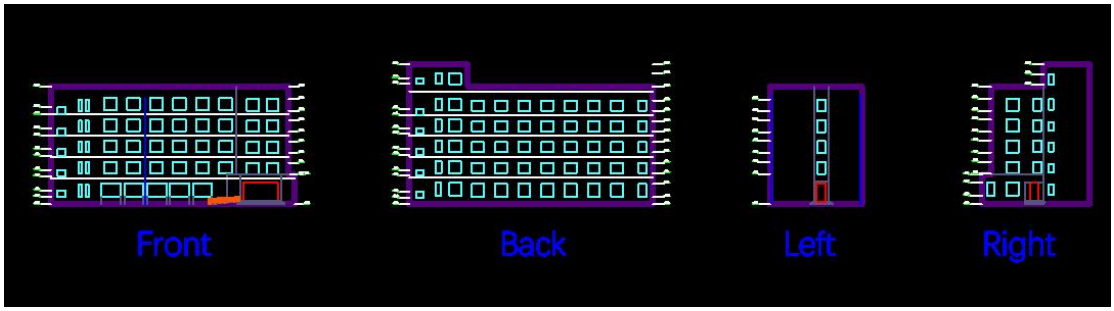


Figure: Effect of Facade Flattening

2.5 Classification Module

2.5.1 Partition

Function Description:

Splits a point cloud into multiple files based on rules.

Operation Steps:

1. Click Classification -> Partition.

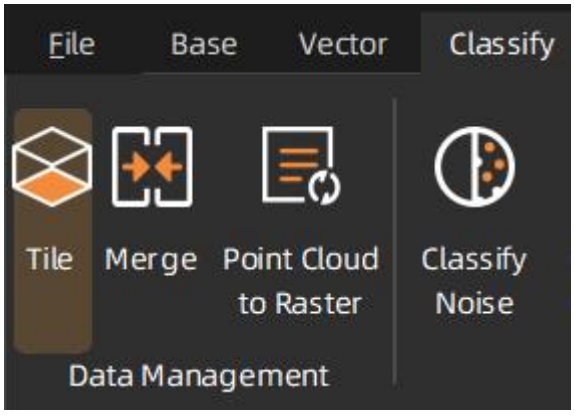


Figure: Partition

2. When the Partition interface opens, it automatically adds the currently lo aded point cloud files to the point cloud file list. You can also add other p oint cloud files to be processed via the Add button, or delete/clear unneces sary files via the Delete/Clear buttons.

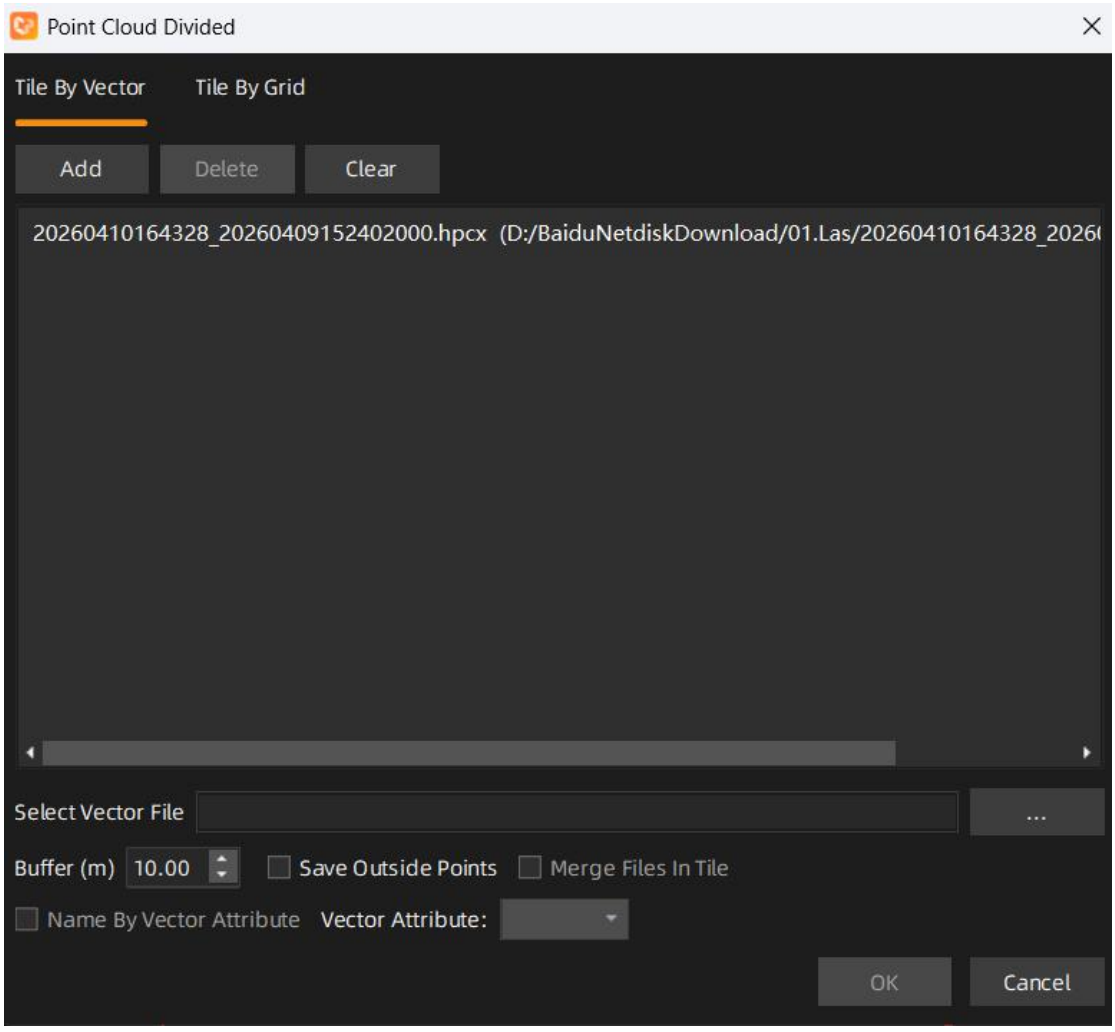


Figure: Partition Dialog Box

3. Choose to import a vector for partitioning (generates point cloud files for the area inside closed vectors from an imported vector file) or set range partitioning (partitions the point cloud based on a set range size).

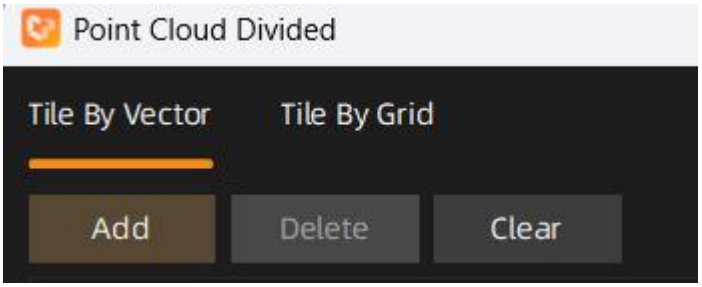


Figure: Import Vector Partition

4. Select the vector file. Supports .shp, .dxf, .dwg files.

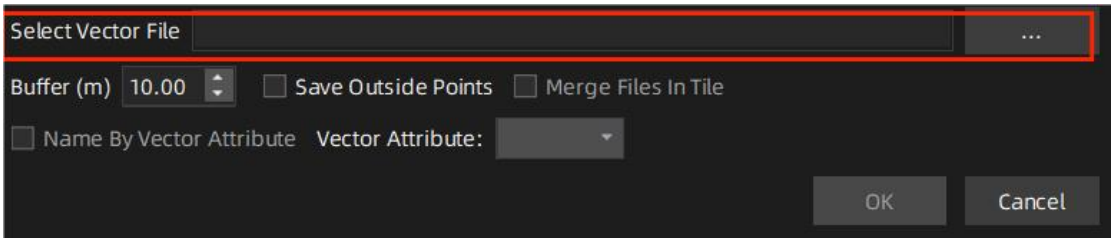


Figure: Select Vector File

5. After selecting the file, the selected boundary vector appears in the view. The red box represents the current point cloud's bounding box. The yello w vector lines are the closed vectors from the selected file. The pink numb ers indicate the current closed region index.

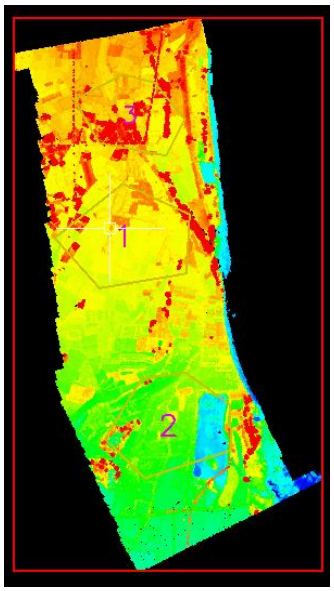


Figure: Partition Preview

6. Set the buffer (the area extending outward from the current closed regi on. Point clouds inside the buffer will be saved to the partitioned point clo ud file).

7. Choose to output the file outside the range (saves point clouds outside t he closed vectors, named outside.hpcx).

8. Merge partition results (if there are point clouds from multiple files insid e the closed region, saves all point clouds inside the closed region to a sin gle point cloud file. If unchecked, the point clouds inside the closed vector

are saved as multiple files). If merging is checked, the naming rule is: 1.hpcx, 2.hpcx...

If merging is not checked, the naming rule is: 1_1.hpcx, 1_2.hpcx, 2_1.hpcx, 2_2.hpcx...

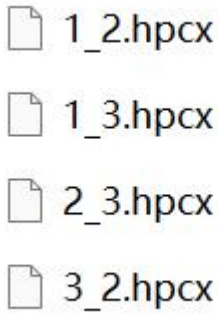


Figure: Not Merging Partition Results

9. If the range file is a shp file and has attribute fields, the "Name by Attribute" button will be enabled. Checking "Name by Attribute" will name the exported point cloud files based on the attribute value.



Figure: Name by Attribute

10. Click "Set Range Partition". The parameter setting interface changes.

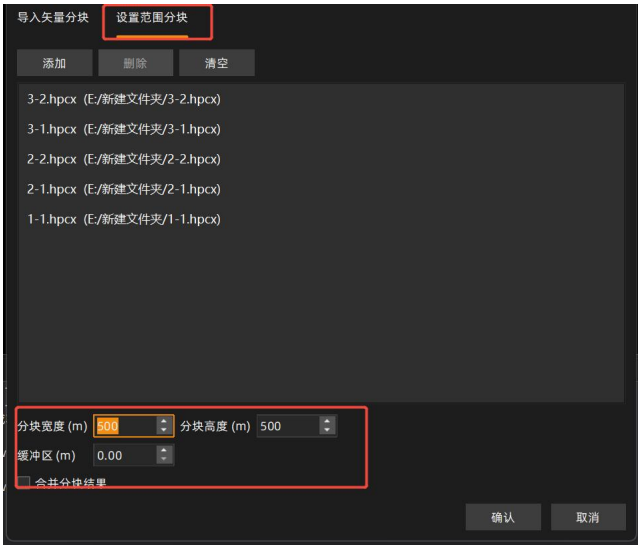


Figure: Set Range Partition

11. Set the partition width and partition height (size of the small rectangles in the view).

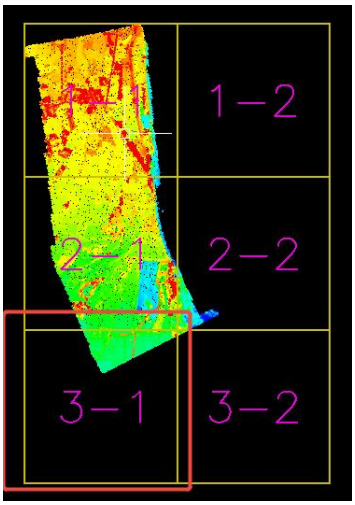


Figure: Partition Preview

12. Merge partition results is the same as in step 8.

13. Click OK, then select the export folder and click OK again to start partitioning.

14. After processing, a prompt asks if you want to load the new point cloud files. Click Yes, and the newly generated point cloud data is added to the project folder.

2.5.2 Merge

Function Description:

Exports the currently loaded point cloud(s). Can optionally merge multiple point cloud files into a single file.

Operation Steps:

1. Click Classification -> Merge.

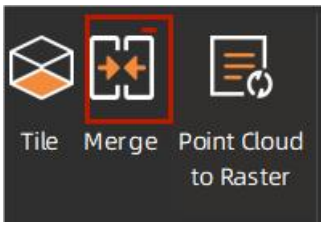


Figure: Merge Button Location

2. In the Merge function interface, you can set export parameters, including Sampling Setting, Sampling Rate, Export Format, and whether to merge into a single file (when merging is checked, you need to set the exported point cloud file name).

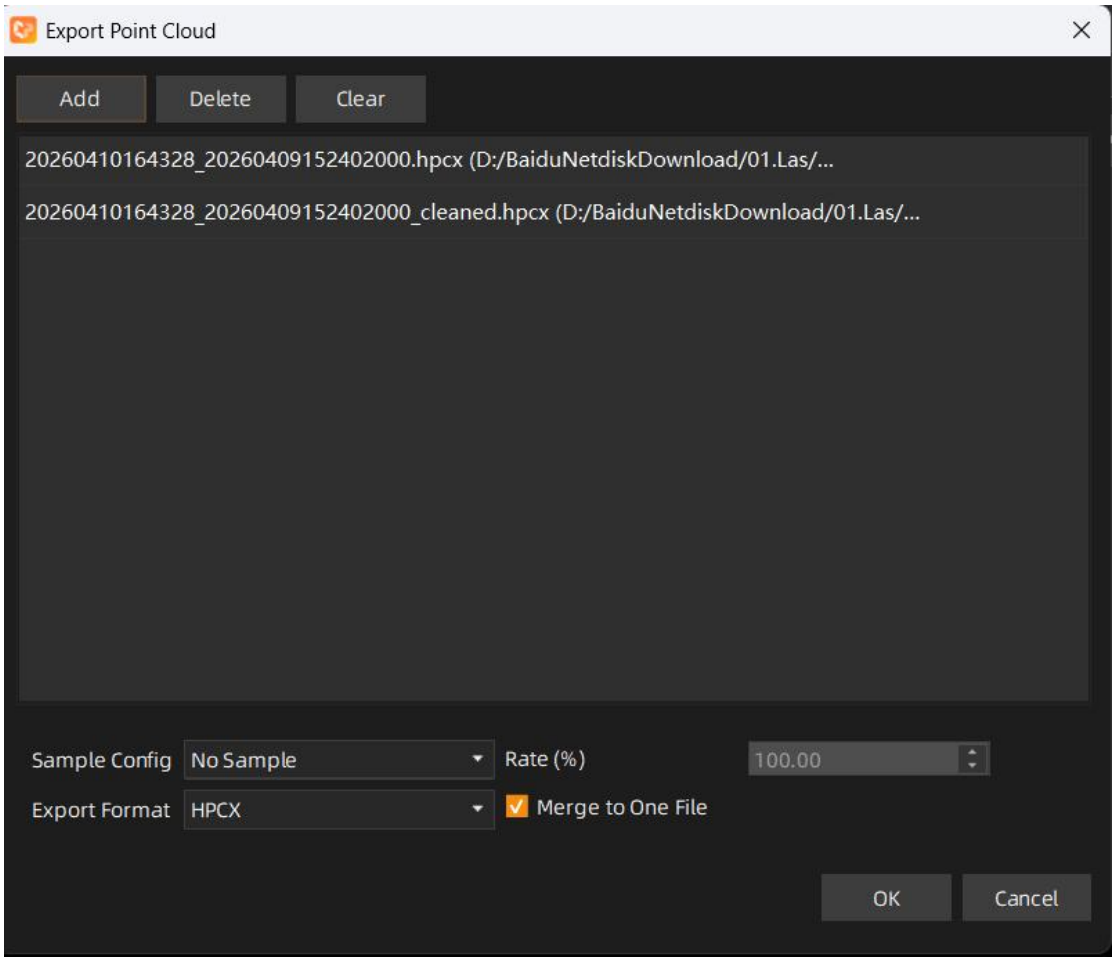


Figure: Merge Function Interface

3. Click OK and wait for the export to complete. A popup window asks if you want to load the results. Click "Yes" to load the newly exported file into the software and display it in the active view.

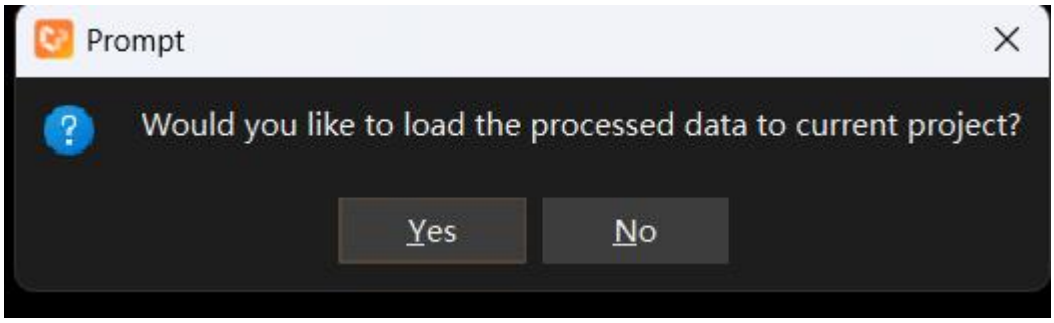


Figure: Merge Result Load Prompt

2.5.3 Point Cloud to Raster

Function Description:

Rasterizes the corresponding attributes of a point cloud, converting it to a raster file.

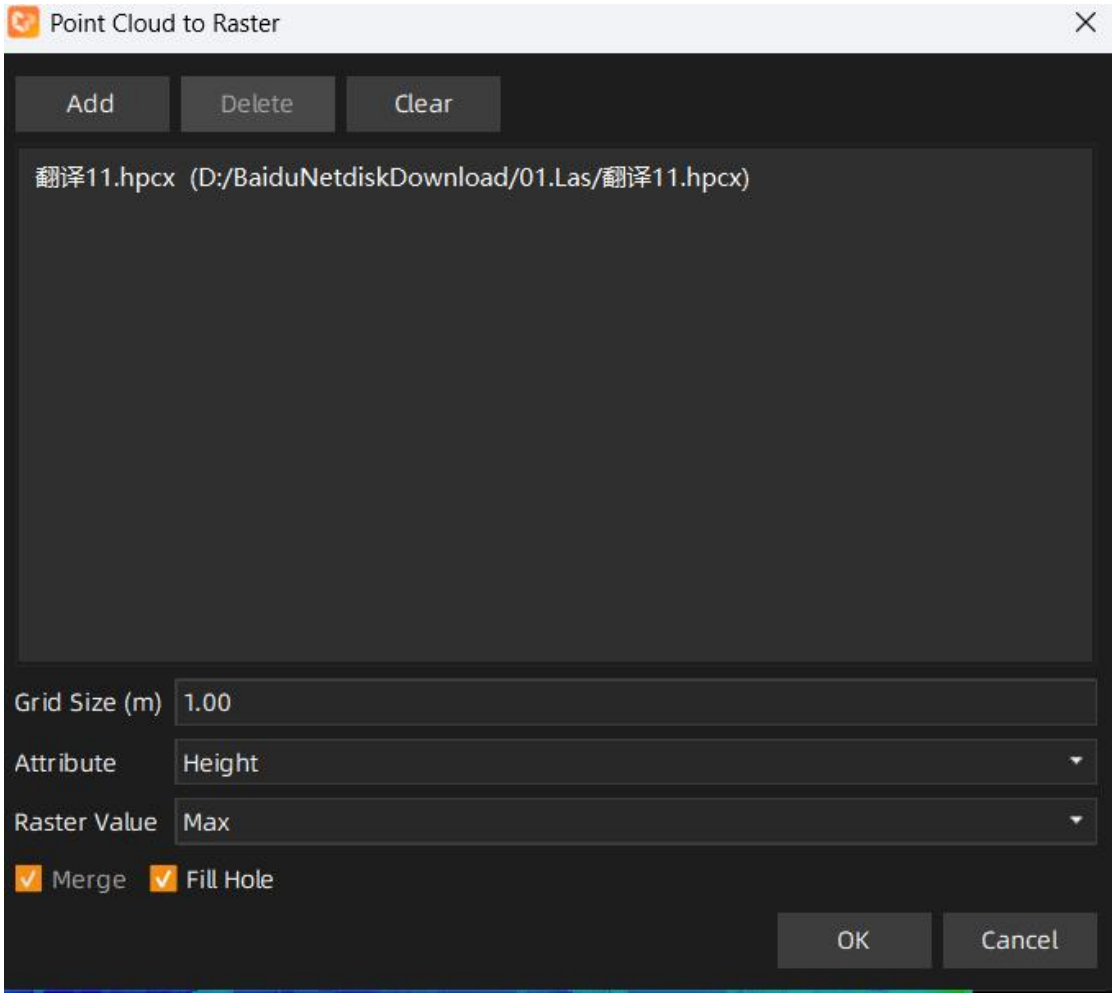


Figure: Point Cloud to Raster Dialog Box

Operation Steps:

1. Click Classification -> Data Management -> Point Cloud to Raster.

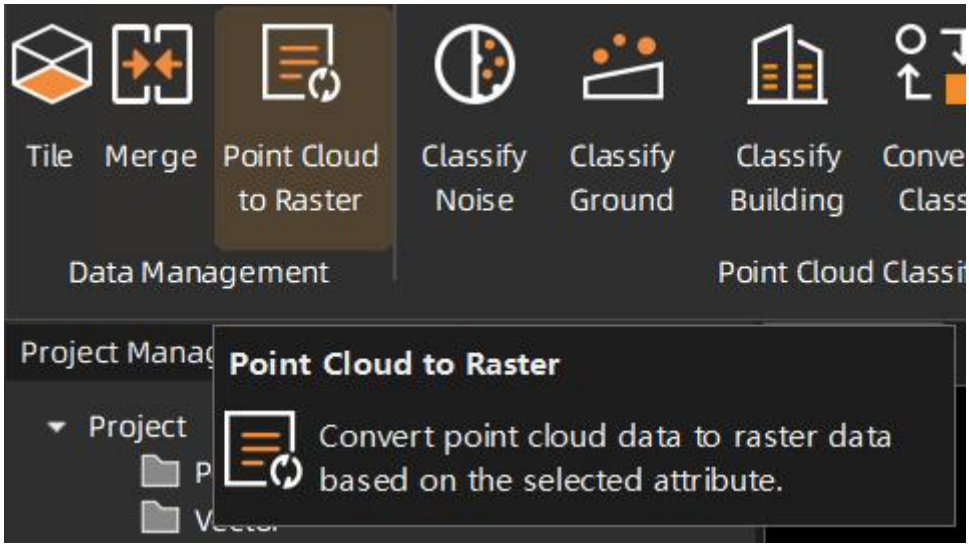


Figure: Point Cloud to Raster Button

2. Set the Grid Cell Size, Attribute, Merge, and Hole Filling options, then click OK to start execution. When the attribute is Elevation, you need to set the Raster Value parameter additionally.

3. Grid Cell Size (m): The size corresponding to each pixel of the output raster file.

4. Attribute

Elevation: Uses the elevation attribute of the point cloud as the pixel value of the raster.

RGB: Uses the RGB color values of the point cloud as the pixel value of the raster.

Class: Uses the class attribute of the point cloud as the pixel value of the raster. The color mapped to each class is the same as the class rendering color in the current window.

5. Raster Value

Maximum: Uses the point with the highest elevation within the pixel area as the pixel value.

Minimum: Uses the point with the lowest elevation within the pixel area as the pixel value.

Average: Uses the average elevation of all points within the pixel area as t he pixel value.

6. Merge: Whether to merge the input point clouds and output a single ras ter file.

7. Hole Filling: Whether to fill holes in the raster file.

2.5.4 Noise Classification

Function Description:

Removes noise points from point cloud data based on set parameters.

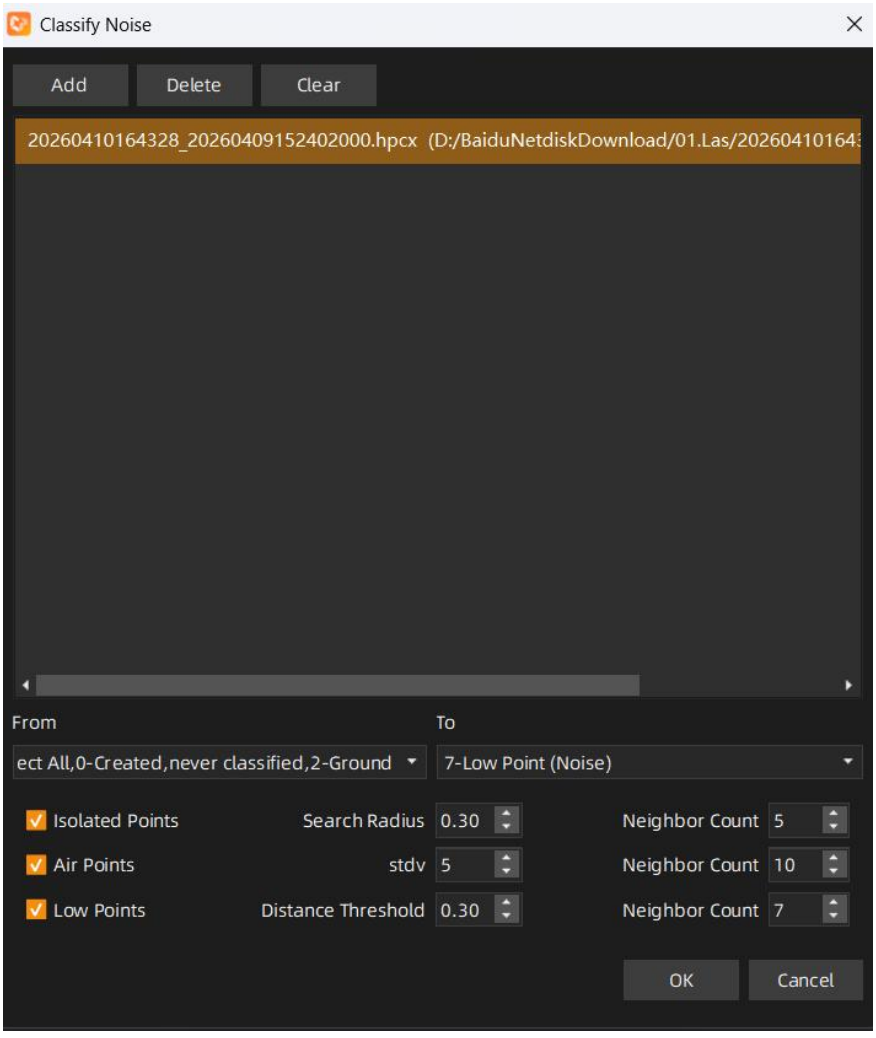


Figure: Noise Classification Dialog Box

Operation Steps:

1. Click Classification -> Point Cloud Classification -> Noise Classification.

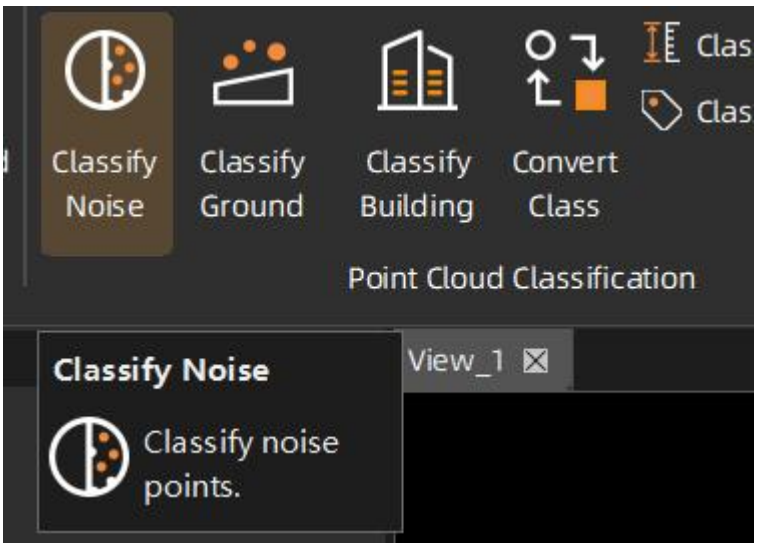


Figure: Noise Classification Button

2. Select the Source Class, Target Class, Reference Class, set the parameters, and click OK to start noise classification.

3. Isolated Points

Isolated Points: Within a certain radius (Search Radius), if the number of neighboring points around a data point is less than the specified threshold, the point is considered an isolated point.

Isolated Points - Parameter Settings: The Search Radius is recommended to be 2-3 times the average point spacing. Default is 0.3. The Number of Neighbors defaults to 5.

4. Airborne Points

Airborne Points: Calculates the average distance of a data point to its nearest k points (Number of Neighbors). Calculates the mean and standard deviation of the average distances for all points. If the distance exceeds the threshold, the point is considered an airborne point.

Airborne Points - Parameter Settings: Standard Deviation multiplier defaults to 5. Number of Neighbors defaults to 7.

5. Low Points

Low Points: For a point, search for its nearest k points (Number of Neighbors), including the query point itself. If the height difference between the point with the second largest elevation and the point with the largest elevation among these k points is greater than the Distance Threshold, the query point is considered a low point.

Low Points - Parameter Settings: Distance Threshold defaults to 0.3. Number of Neighbors defaults to 7.

2.5.5 Ground Point Classification

Function Description:

Classifies key ground points from point clouds based on set parameters for terrain production.

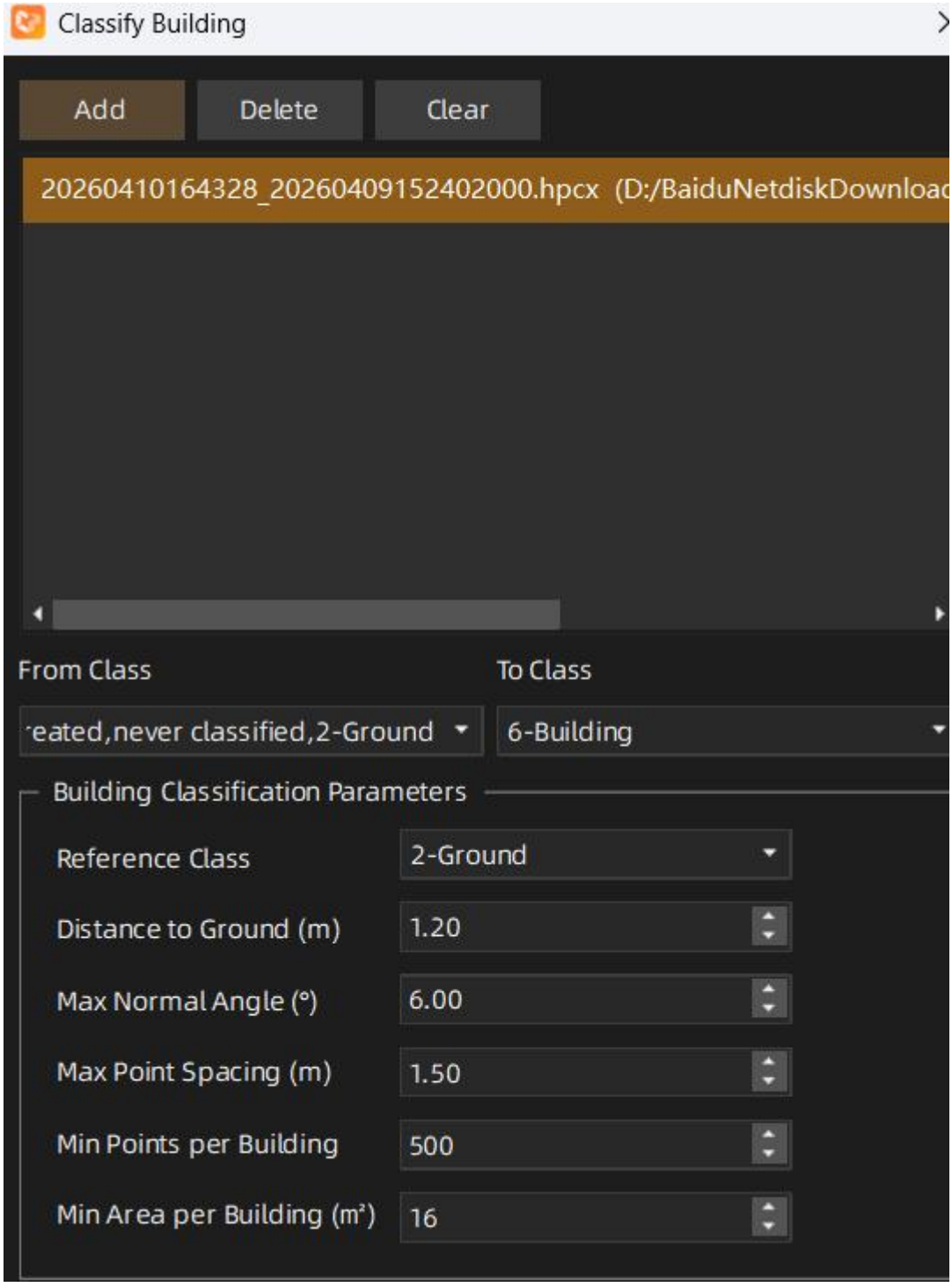


Figure: Ground Point Classification Dialog Box

Operation Steps:

1. Click Classification -> Point Cloud Classification -> Ground Point Classification.

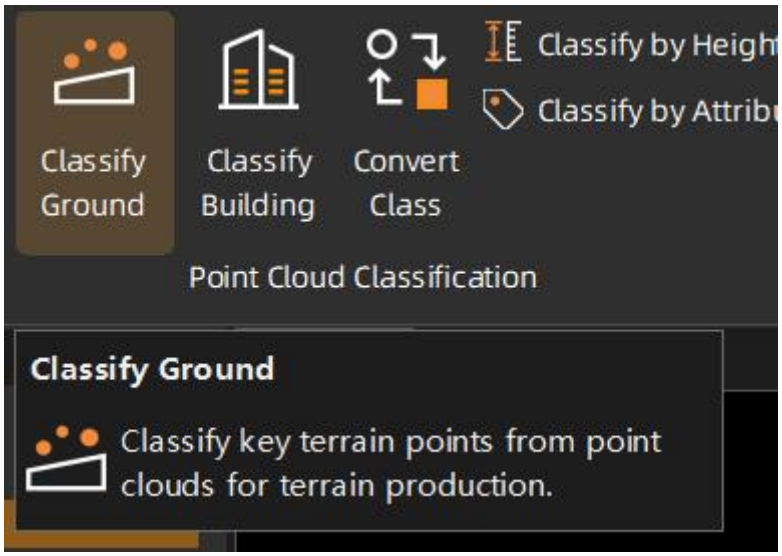


Figure: Ground Point Classification Button

2. Select the Source Class, Target Class, Reference Class, set the parameters, and click OK to start ground point classification.

3. Scenario

Scenario: Four scenario types: General, Flat, Hilly, Mountainous. For relatively flat terrain, use Flat. For undulating terrain, use Hilly. For steep terrain with distinct ridges, use Mountainous. For other environments, use General.

4. Advanced Parameters

Advanced Parameters: Under non-General scenarios, adjusting the content in Advanced Parameters can improve ground point classification results.

4.1 Maximum Building Size

This parameter controls the progressive window size and iteration count of the morphological filter algorithm. Generally, keep the default value, or adjust based on actual building dimensions (usually the diagonal length, the longest distance across the building). Default is 80.

4.2 Maximum Terrain Angle

Select the steepest slope segment and measure its angle. For Flat scenarios, default is 15. For Hilly and Mountainous scenarios, default is 88.

4.3 Iteration Angle

The maximum angle formed by a point and the three vertices of a triangle. A larger iteration angle allows points farther from the TIN to be added as ground points if they satisfy the iteration angle. For Flat scenarios, default is 12. For Hilly and Mountainous scenarios, default is 18.

4.4 Iteration Distance

The perpendicular distance from a point to the TIN plane. For Flat scenarios, default is 1.0. For Hilly scenarios, default is 1.2. For Mountainous scenarios, default is 1.5.

4.5 Ground Point Density

The thinning level of the filtering result. Generally, very dense ground points are not needed. For Flat and Hilly scenarios, default is Medium Density. For Mountainous scenarios, default is High Density.

4.6 Decrease Iteration Angle When Edge Length Is Less Than

When the edge length of the filtering TIN is less than the set value, reduce the number of iterations in that area. This can effectively reduce the roughness of ground points. Not checked by default. Threshold defaults to 2.

4.7 Stop Constructing Triangles When Edge Length Is Less Than

When this setting is enabled, ground points closer than the set threshold will not be used to generate further triangles. This prevents generating overly dense ground points. Not checked by default. Threshold defaults to 2.

2.5.6 Building Classification

Function Description:

Classifies building points from point clouds based on set parameters.

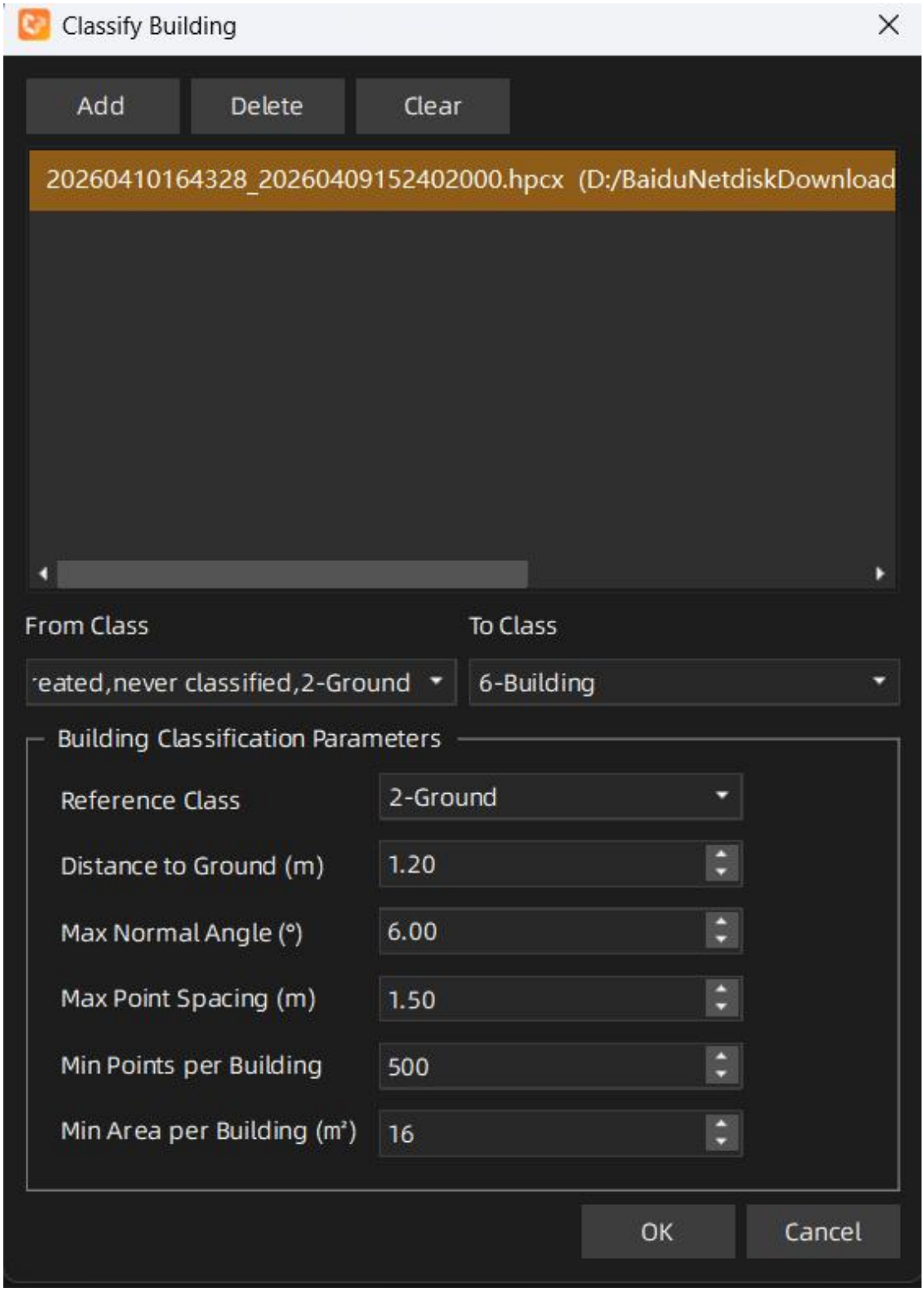


Figure: Building Classification Dialog Box

Operation Steps:

1. Click Classification -> Point Cloud Classification -> Building Classific ation.

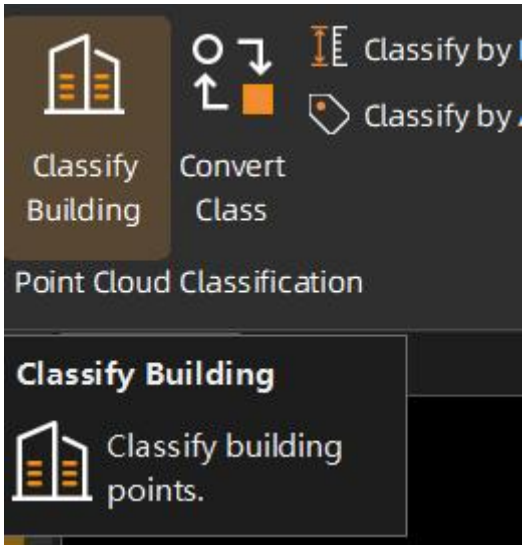


Figure: Building Classification Button

2. Select the Source Class, Target Class, Reference Class, set the para meters, and click OK to start building classification.

3. Distance from Ground

Distance from Ground: The minimum height of the lowest building point ab ove the ground. This primarily prevents points close to the ground (e.g., ca rs, low artificial platforms) from affecting subsequent building outline extrac tion.

Distance from Ground - Parameter Settings: Default is 1.2, range [0.1, 3]. R ecommended range [1, 2.5]. For low rural buildings, set to 1.2. For urban a reas where buildings are typically above 3m, set to 2.5 to ensure building outline extraction accuracy.

Note: Setting this parameter may cause some points at the very bottom of

buildings to be missed, but this has little impact on building outline extrac tion.

4. Maximum Normal Angle

Maximum Normal Angle: The maximum allowed normal angle between adja cent points on a single building. A larger value allows rougher building surf aces to be extracted. A smaller value extracts smoother surfaces. Setting it too large may misclassify points from building attachments as building poin ts. Adjust based on the specific situation.

Maximum Normal Angle - Parameter Settings: Default is 6°, range [1,30]. Re fer to the thickness of roof points for setting. Recommended values:

Rough: (Thickness approx. 4-6cm, uneven surface) set to 6. For thickness >6 cm and uneven, set >6.

General: (Thickness approx. 2-3cm) set to 3.

Smooth: (Thickness approx. <2cm, smooth surface) set to 1 or 2.

Richer data requires larger values, smoother data requires smaller values. If roof points are under-classified, increase this value slightly (e.g., by 1-2°).

5. Maximum Point Spacing

Maximum Point Spacing: The maximum allowed distance between adjacent building points. Controls the completeness of building extraction.

Maximum Point Spacing - Parameter Settings: Default is 1.5, range [0.2,6]. R ecommended range [1,1.5].

When setting, consider the spacing of sparse building points (e.g., on buildi ng facades). Too small a value may lead to incomplete building extraction. Too large a value may cause two nearby buildings to be merged into one.

6. Minimum Points per Building

Minimum Points per Building: The minimum number of points required to form a single building, based on the smallest building in the scene. Buildings with fewer points than this value will be discarded.

This parameter helps remove objects misclassified as buildings, such as small vehicles or shrubs.

Minimum Points per Building - Parameter Settings: Default is 500, range [20,2500].

When setting, estimate the number of points for a building by measuring point density and building footprint area. Set the minimum points per building as needed.

7. Minimum Building Area

Minimum Building Area: The minimum footprint area of a building in the actual scene. Buildings with a footprint smaller than this value will not have their outline extracted.

Minimum Building Area - Parameter Settings: Default is 16, range [1,40].

2.5.7 Class Conversion

Function Description:

Converts points belonging to one class in the data to another class.

Operation Steps:

1. Click Classification -> Point Cloud Classification -> Class Conversion to open the Class Conversion dialog box.

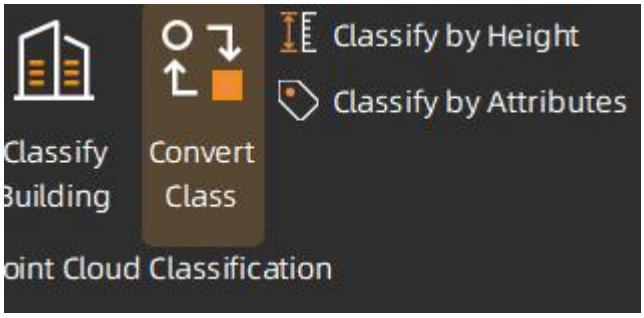


Figure: Class Conversion Button

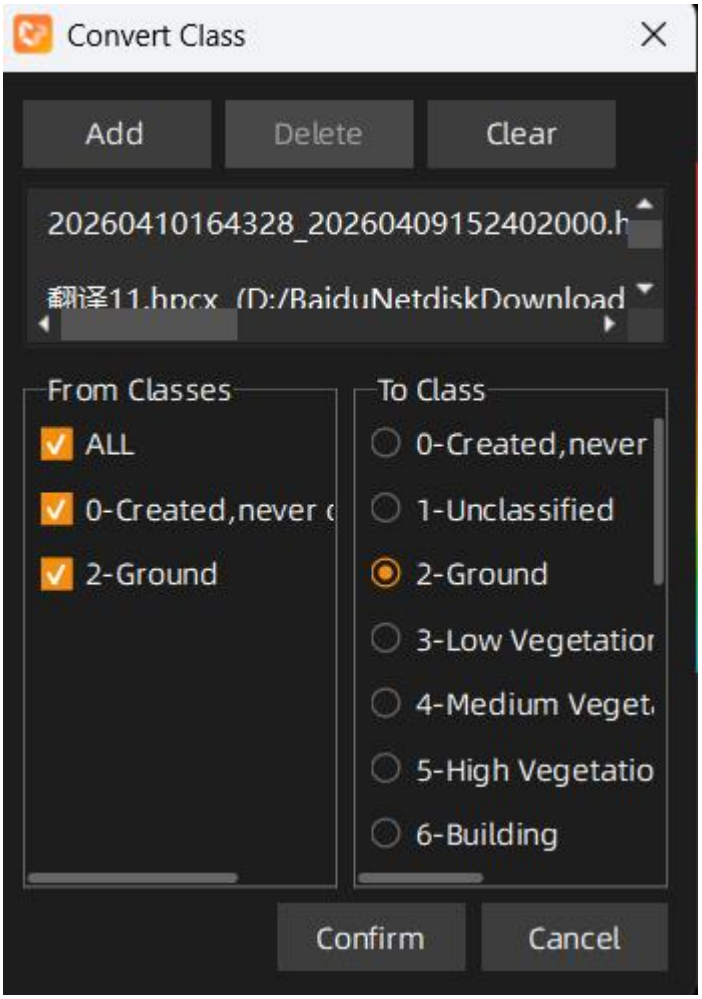


Figure: Class Conversion Dialog Box

2. Add point cloud files. The source class is automatically identified.

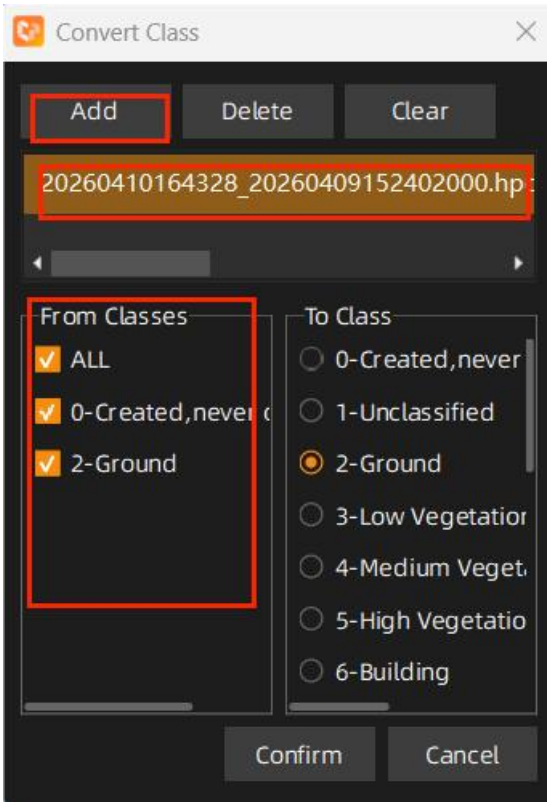


Figure: Add Point Cloud

3. Select the Source Class and Target Class. Click the Confirm button. The c lass conversion progress is shown.

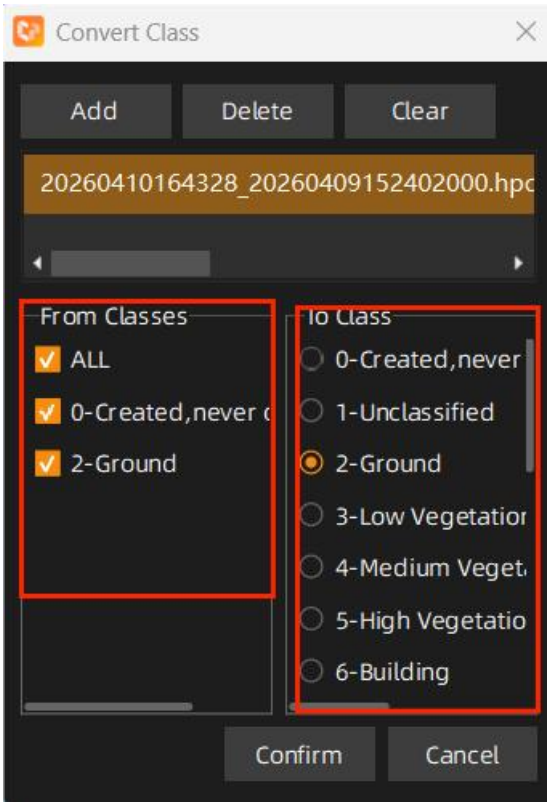


Figure: Select Classes

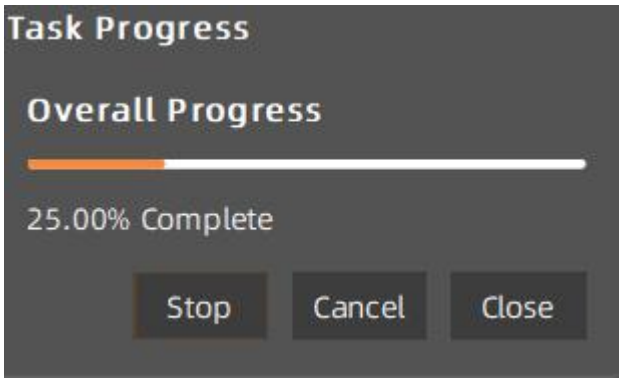


Figure: Class Conversion Progress

4. After the task is completed, the class conversion results are saved back to the original files. The console outputs processing information.



Figure: Class Conversion Result

2.5.8 Classify by Height

Function Description:

Sets a height range relative to ground points. Constructs a TIN based on ground points and classifies points within a specified height range from the TIN into a target class. In forestry scenes, this can be used for vegetation classification. Or, classification can be done by absolute elevation.

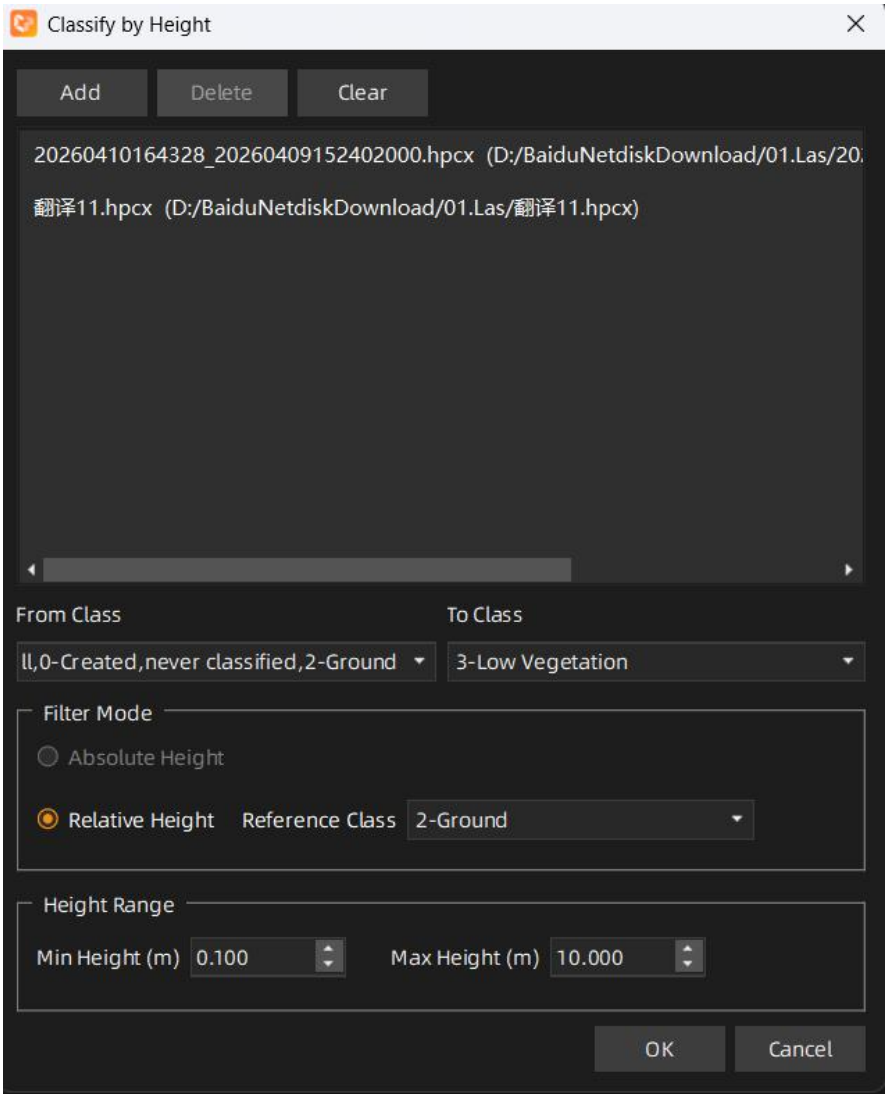


Figure: Height Classification Dialog Box

Operation Steps:

1. Click Classification -> Point Cloud Classification -> Classify by Height.

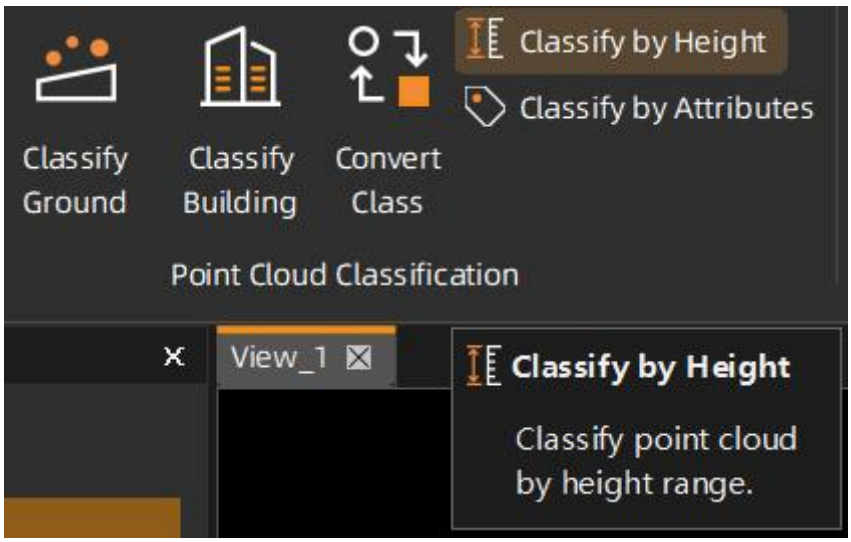


Figure: Classify by Height Button

2. Select the Source Class, Target Class, Reference Class, set the Filter Mode and Height Range, then click OK to start classification.

3. Filter Mode

Absolute Height: When selected, points with absolute elevation within the set Min/Max range are classified into the target class.

[Relative Height]: Refers to the height relative to the TIN constructed from ground points. When selected, points whose relative height to the TIN surface falls within the set Min/Max range are classified into the target class.

4. Height Range

Minimum Height: Sets the minimum value of the height range. Points with height greater than this value will be classified into the target class.

Maximum Height: Sets the maximum value of the height range. Points with height less than this value will be classified into the target class.

2.5.9 Classify by Attribute

Function Description:

Selects a point cloud attribute and classifies points based on a range of attribute values. Points whose attribute falls within the set range will be classified into the selected target class.

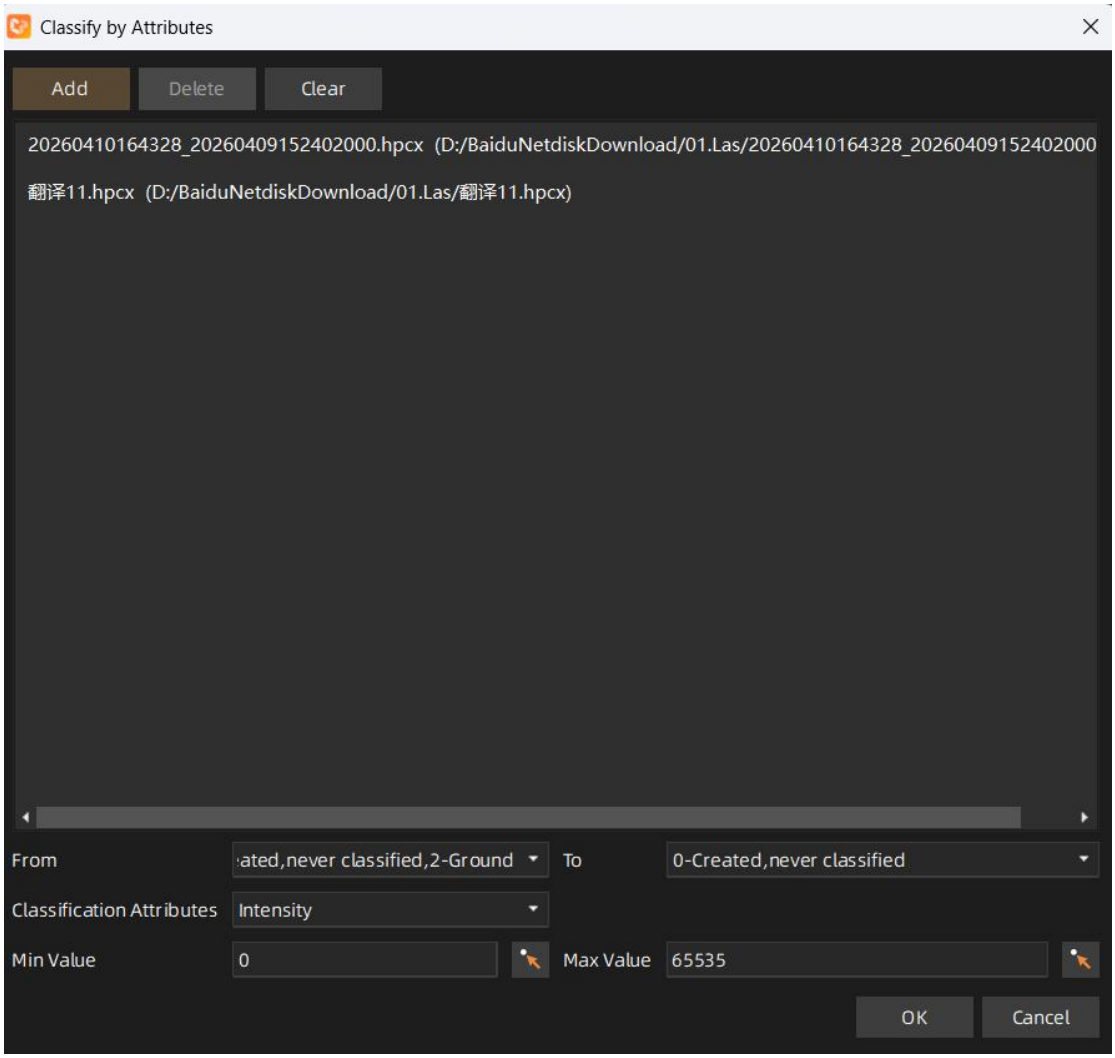


Figure: Classify by Attribute Dialog Box

Operation Steps:

1. Click Classification -> Point Cloud Classification -> Classify by Attribute.

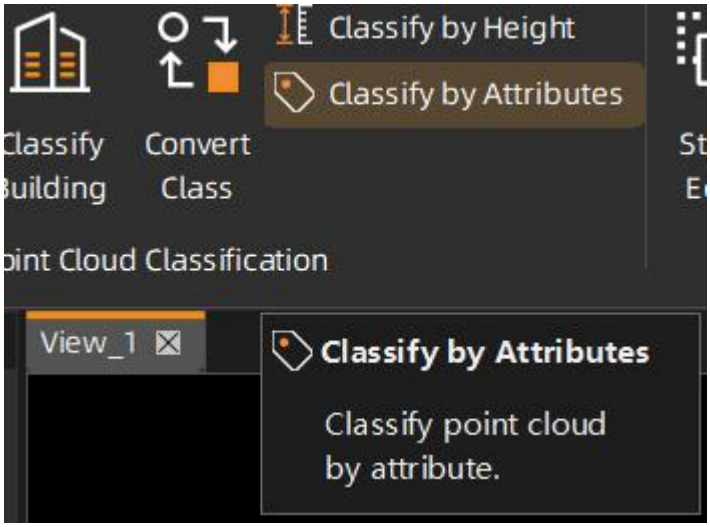


Figure: Classify by Attribute Button

2. Select the Source Class, Target Class, and the attribute to classify by. For non-RGB color attributes, set the Minimum and Maximum values. You can also use the Pick button next to the input box to pick attribute values from points in the view. For the RGB color attribute, set the target R, G, B values and Tolerance. Points whose RGB values fall within the tolerance range of the target color will be classified into the target class. You can also use the Pick button to pick RGB values from a point in the view.

3. The list of classification attributes includes Intensity, Absolute Height, Echo Count, Echo Index, RGB Color, GPS Time, Scan Angle, Scan Direction, Scan Channel, User Data, Point Source ID.

2.5.10 Classification Editing

Function Description:

Manually edits point cloud classes to optimize classification results and meet production requirements.

2.5.10.1 Start Editing

Function Description:

Starts manual classification of the point cloud.

Operation Steps:

1. Load the point cloud file.

2. Click Classification -> Start Editing to enable the classification editing func tion.

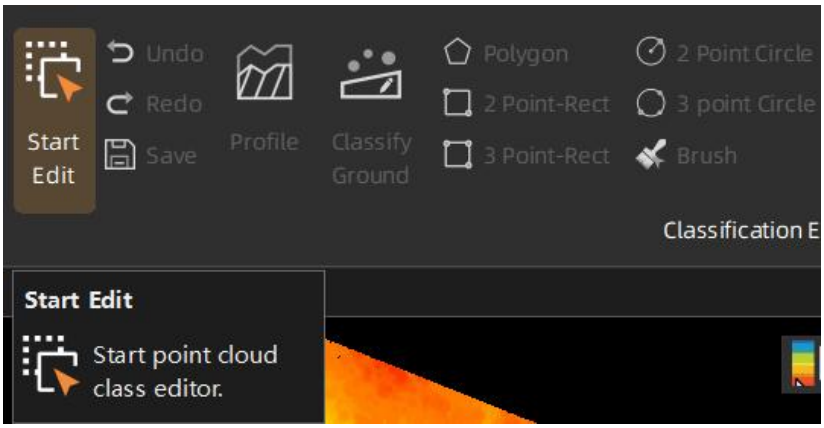


Figure: Start Editing

3. After activating Start Editing, the button remains highlighted. The currentl y active 3D view switches to 2D mode. The class settings interface appears on the left side of the software. The point cloud rendering settings switch to class rendering.

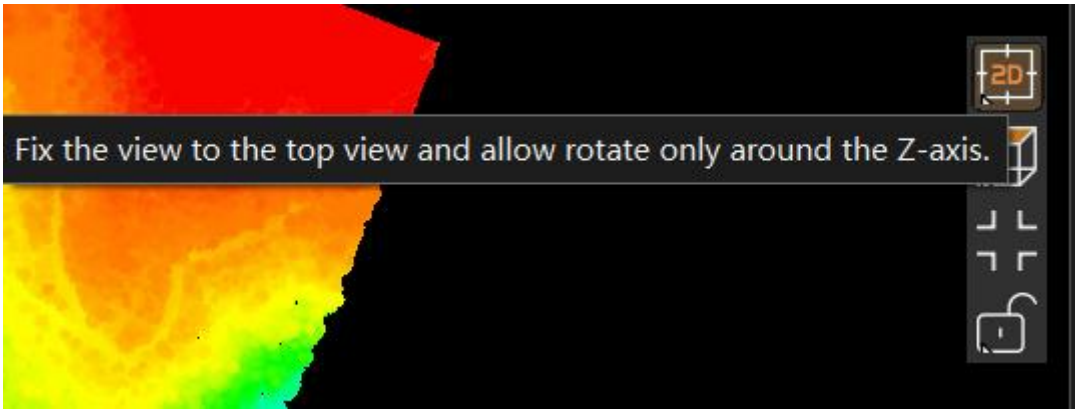


Figure: 2D Mode

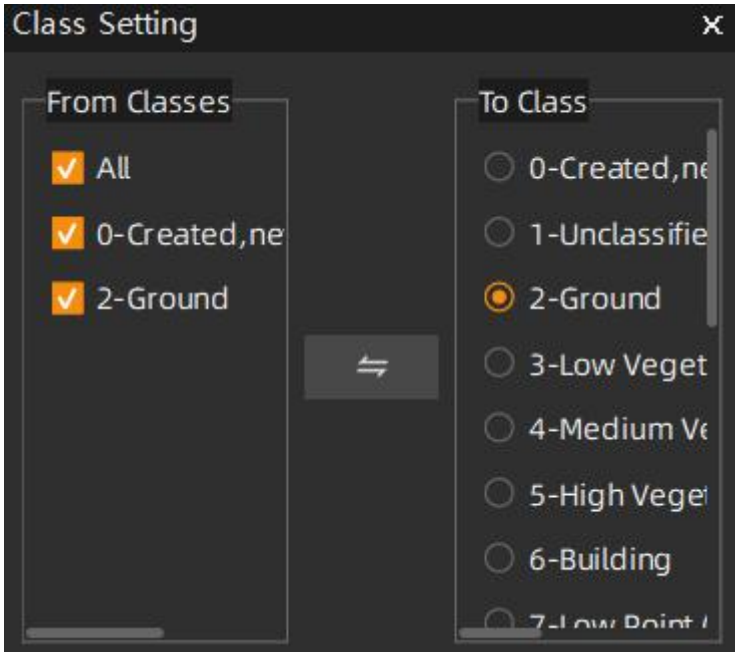


Figure: Class Settings

2.5.10.2 Profile

Function Description:

Creates a profile view.

Operation Steps:

1. Click the Profile button in Classification Editing to create a profile view.

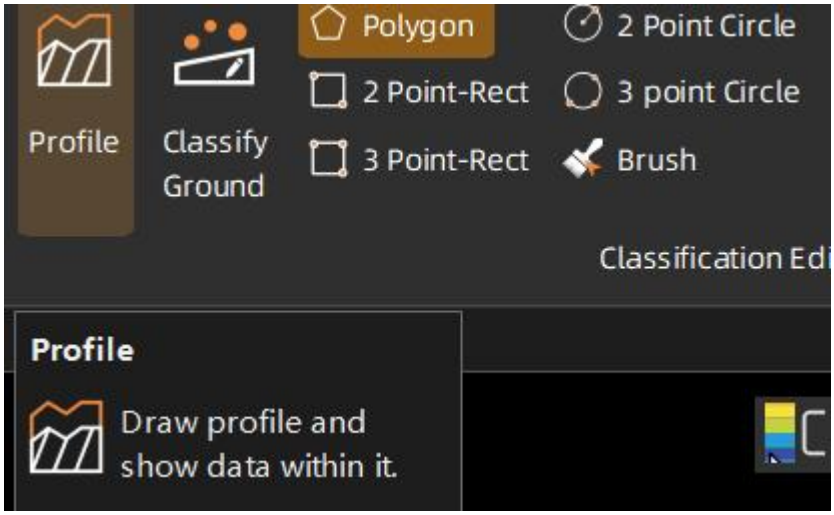


Figure: Classification Editing Profile Button

2. After creating the profile view, the Profile button remains highlighted. You can draw a rectangle in the 3D view by clicking three points. After drawing, the point cloud data within the drawn rectangle is displayed in the profile view.



Figure: Draw Profile View Range

3. After the profile range is drawn, the point cloud data within the profile appears in the profile view.

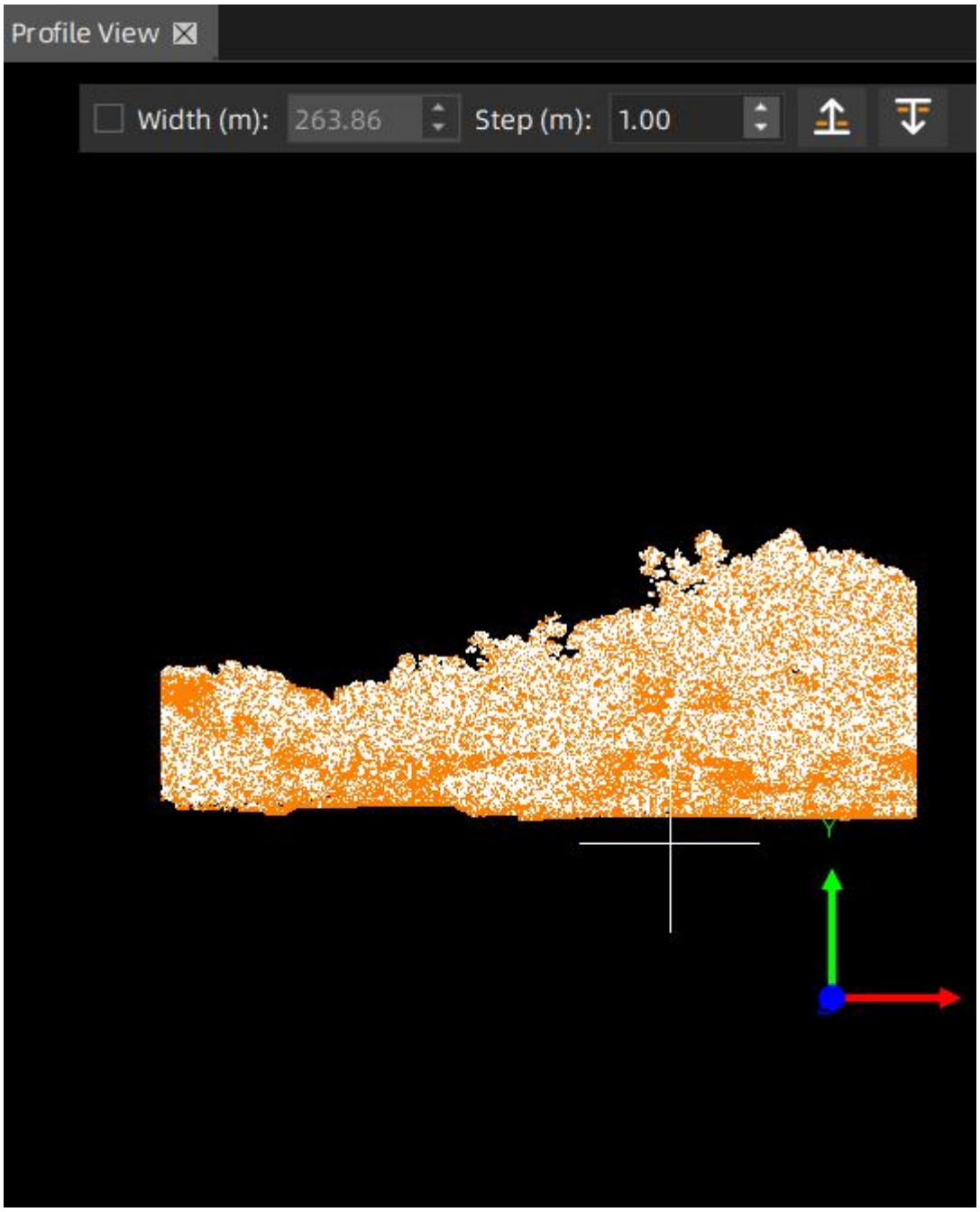


Figure: Profile View

4. In the toolbar at the top of the profile view, the first control allows checking "Width". When checked, the width of subsequently drawn vector ranges will match the set width.



Figure: Profile Width

5. The Step parameter controls the movement length for each click of the Move Up/Move Down functions.



Figure: Profile Move Step

6. The Move Up and Move Down functions shift the profile range in the sp ecified direction by the length set in the Step parameter.

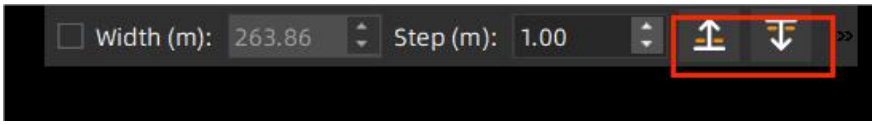


Figure: Profile Move Up, Move Down

2.5.10.3 Ground Point Classification

Function Description:

Classifies key terrain points from point clouds for terrain production.

Operation Steps:

1. Click the Ground Point Classification button in Classification Editing. Belo w the class settings on the left, the parameter panel for the Ground Point Classification function appears. You can set the required ground point classi fication parameters in this panel.

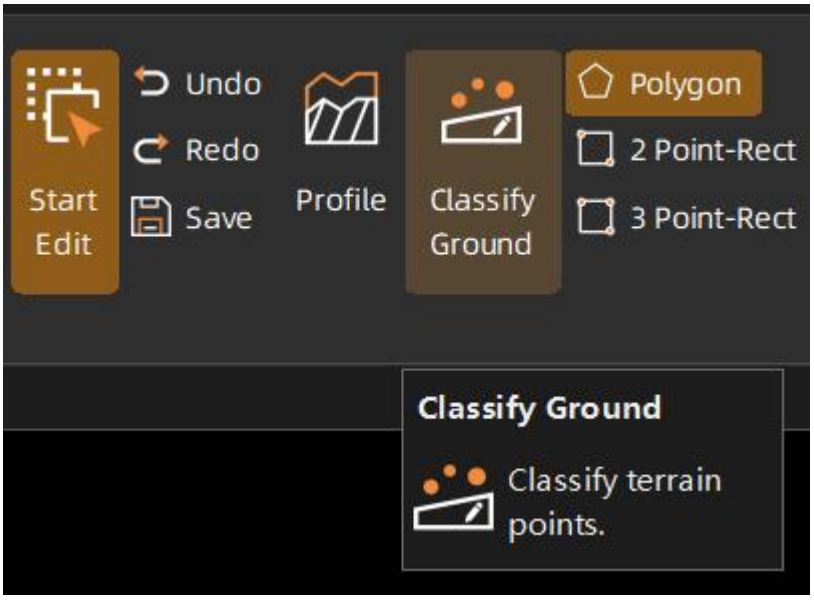


Figure: Classification Editing Ground Point Classification Button

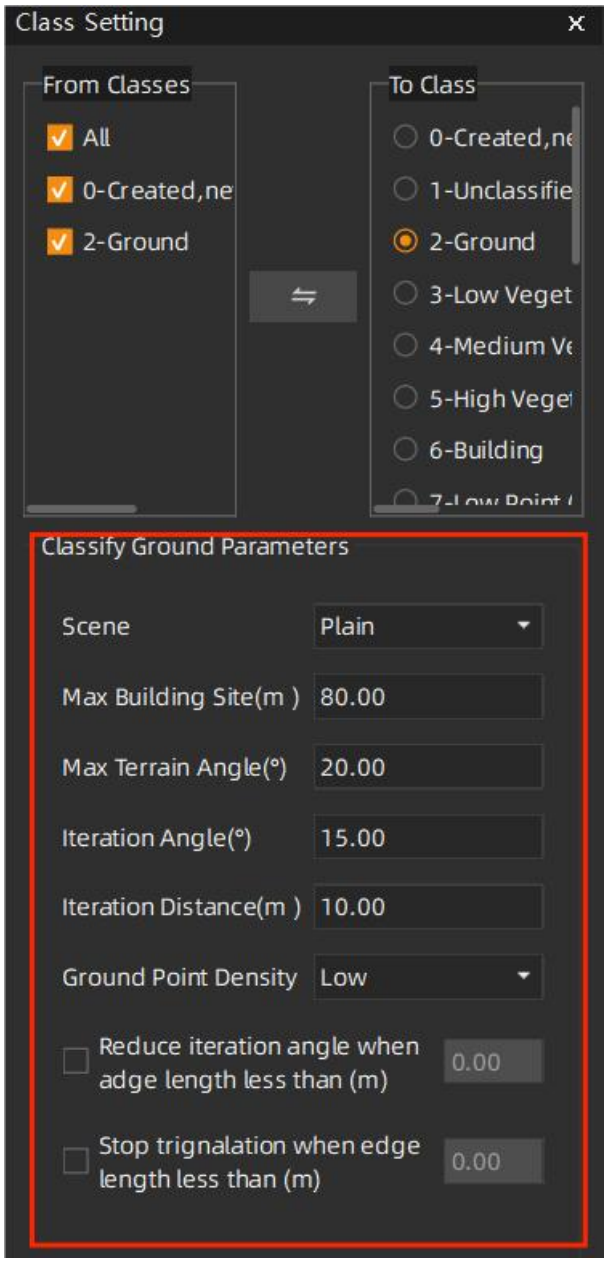


Figure: Ground Point Classification

2. After activating Ground Point Classification in Classification Editing, you can use the range selection tools in Classification Editing to select any range. Within the selected range, ground point classification will be performed according to the set parameters.

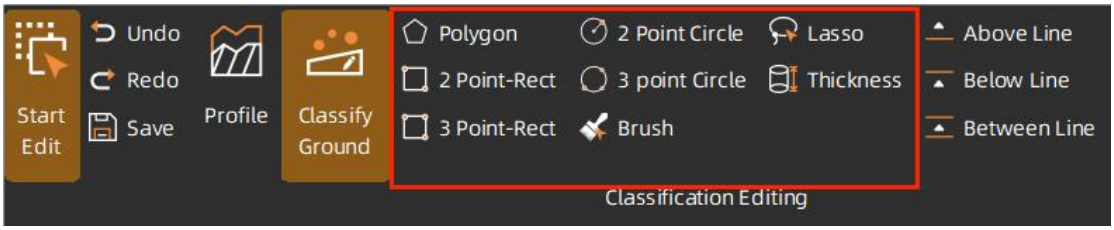


Figure: Range Selection Tools

2.5.10.4 Polygon

Function Description:

Range selection tool. Draws a polygon range.

Operation Steps:

1. Click the Polygon button in Classification Editing. The Polygon button bec omes highlighted.

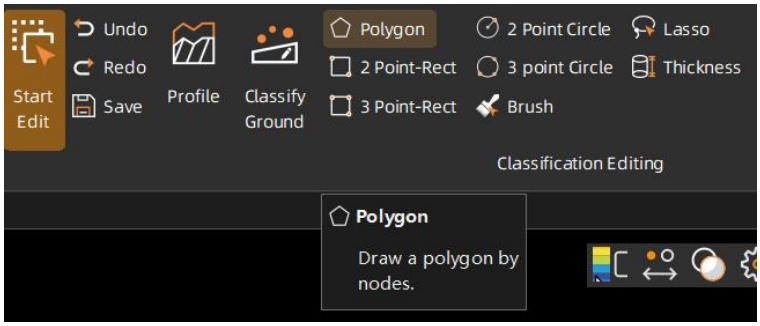


Figure: Polygon Button

2. After activating the Polygon range drawing tool, you can draw a polygon range in the view. Right-click to confirm or double-click to end drawing an d finalize the classification editing range. Once the range is determined, poi nt clouds within the range that have the checked source class(es) will be c onverted to the target class.

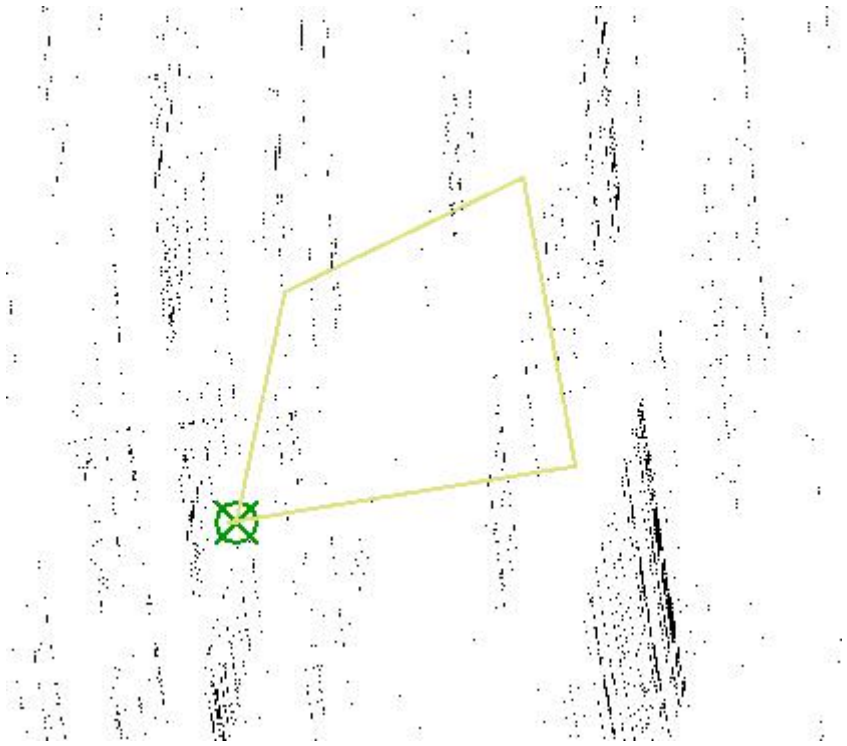


Figure: Draw Polygon

2.5.10.5 Two-Point Rectangle

Function Description:

Range selection tool. Draws a rectangle using two points.

Operation Steps:

1. Click the Two-Point Rectangle button in Classification Editing. The Two-Point Rectangle button becomes highlighted.

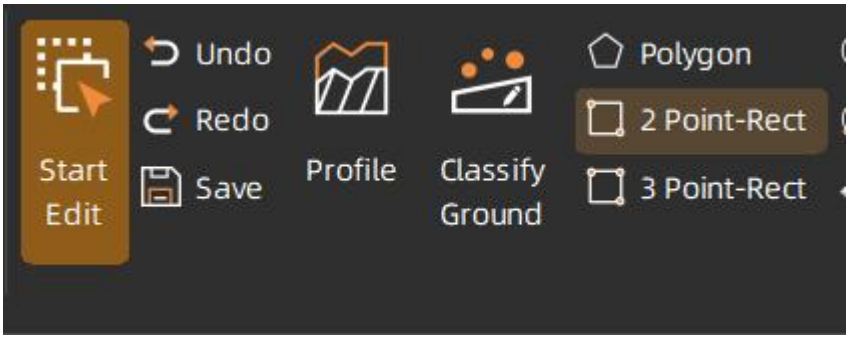


Figure: Two-Point Rectangle Button

2. After activating the Two-Point Rectangle range drawing tool, you can dra w a range in the view. After drawing the two-point rectangle, the classificati on editing range is determined. Point clouds within the range that have the checked source class(es) will be converted to the target class.

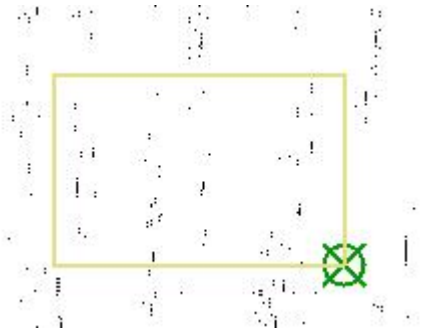


Figure: Draw Two-Point Rectangle

2.5.10.6 Three-Point Rectangle

Function Description:

Range selection tool. Draws a rectangle using three points.

Operation Steps:

1. Click the Three-Point Rectangle button in Classification Editing. The Three -Point Rectangle button becomes highlighted.



Figure: Three-Point Rectangle Button

2. After activating the Three-Point Rectangle range drawing tool, you can dr aw a range in the view. After drawing the three-point rectangle, the classifi

cation editing range is determined. Point clouds within the range that have the checked source class(es) will be converted to the target class.

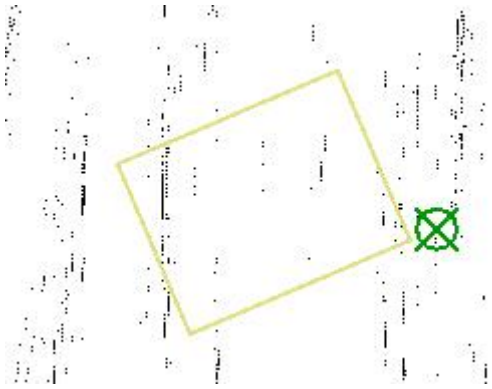


Figure: Draw Three-Point Rectangle

2.5.10.7 Radius Circle

Function Description:

Range selection tool. Draws a circle using its center and radius.

Operation Steps:

1. Click the Radius Circle button in Classification Editing. The Radius Circle button becomes highlighted.

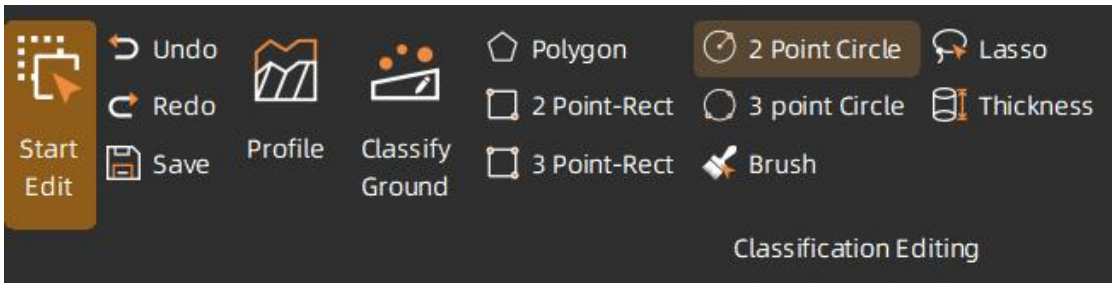


Figure: Radius Circle Button

2. After activating the Radius Circle range drawing tool, you can draw a ran ge in the view. After drawing the radius circle, the classification editing ran

ge is determined. Point clouds within the range that have the checked sour ce class(es) will be converted to the target class.

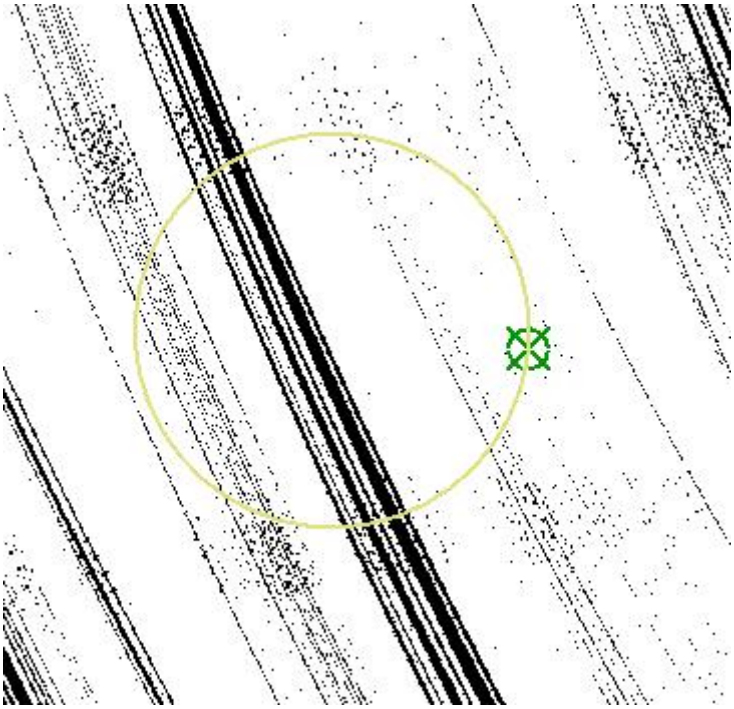


Figure: Draw Radius Circle

2.5.10.8 Three-Point Circle

Function Description:

Range selection tool. Draws a circle using three points on its circumference.

Operation Steps:

1. Click the Three-Point Circle button in Classification Editing. The Three-Poi nt Circle button becomes highlighted.

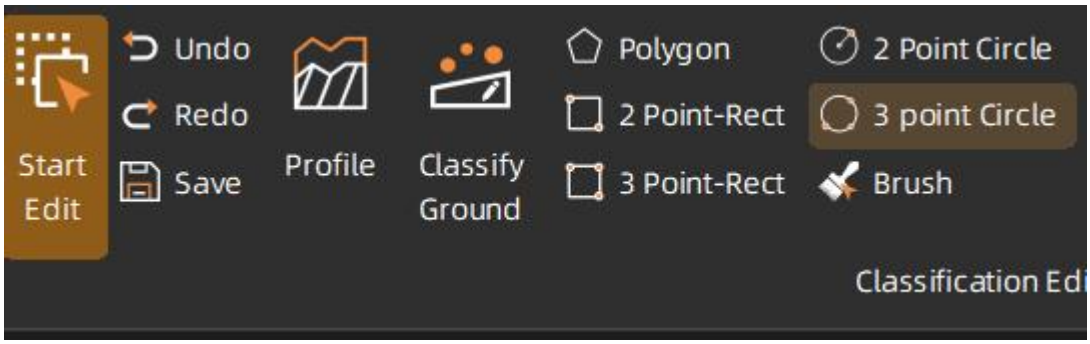


Figure: Three-Point Circle Button

2. After activating the Three-Point Circle range drawing tool, you can draw a range in the view. After drawing the three-point circle, the classification e diting range is determined. Point clouds within the range that have the che cked source class(es) will be converted to the target class.

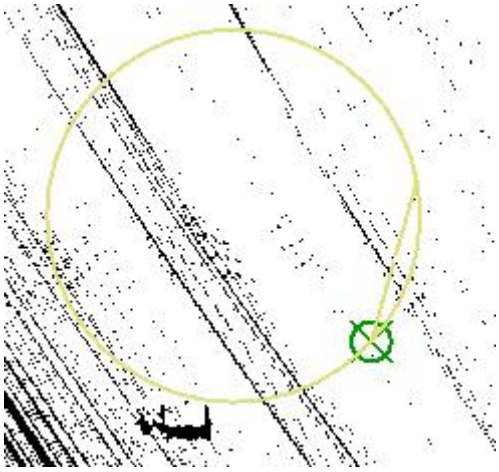


Figure: Draw Three-Point Circle

2.5.10.9 Brush

Function Description:

Range selection tool. Uses a brush to draw a range.

Operation Steps:

1. Click the Brush button in Classification Editing. The Brush button become s highlighted.

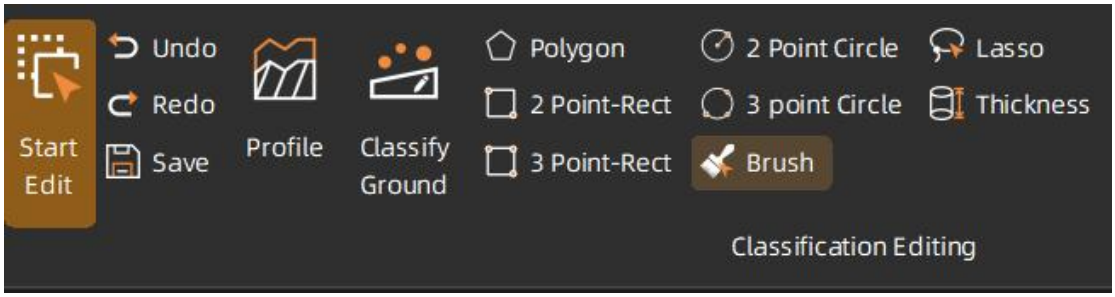


Figure: Brush Button

2. After activating the Brush range drawing tool, you can hold the left mou se button and drag to draw a range in the view. After releasing the mouse button, the classification editing range is determined. Point clouds within t he range that have the checked source class(es) will be converted to the ta rget class.

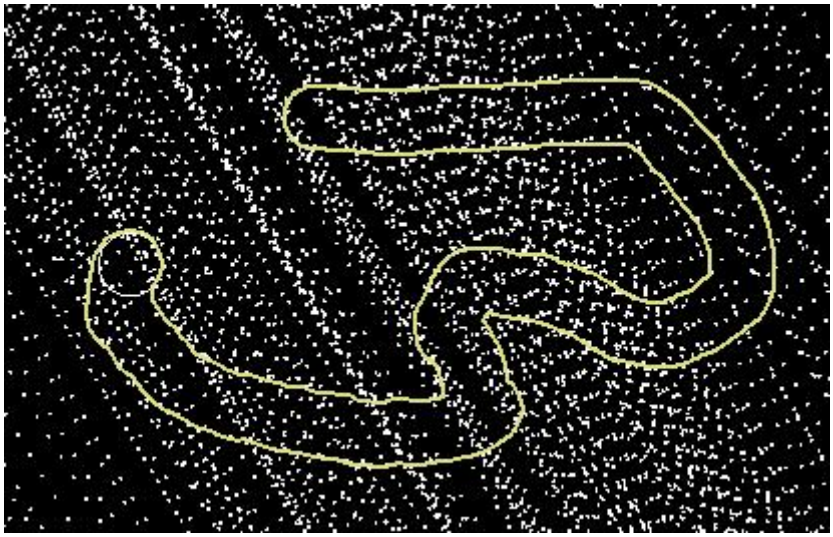


Figure: Brush Drawing Range

2.5.10.10 Lasso

Function Description:

Range selection tool. Uses a lasso tool to draw a range.

Operation Steps:

1. Click the Lasso button in Classification Editing. The Lasso button become s highlighted.

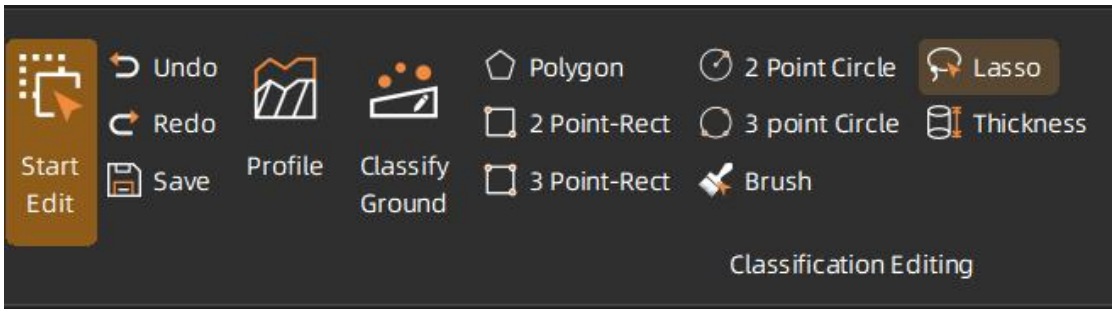


Figure: Lasso Button

2. After activating the Lasso range drawing tool, click the left mouse button in the view, move the mouse to start drawing the range. Click the left mo use button again to end drawing. The classification editing range is determi ned. Point clouds within the range that have the checked source class(es) will be converted to the target class.

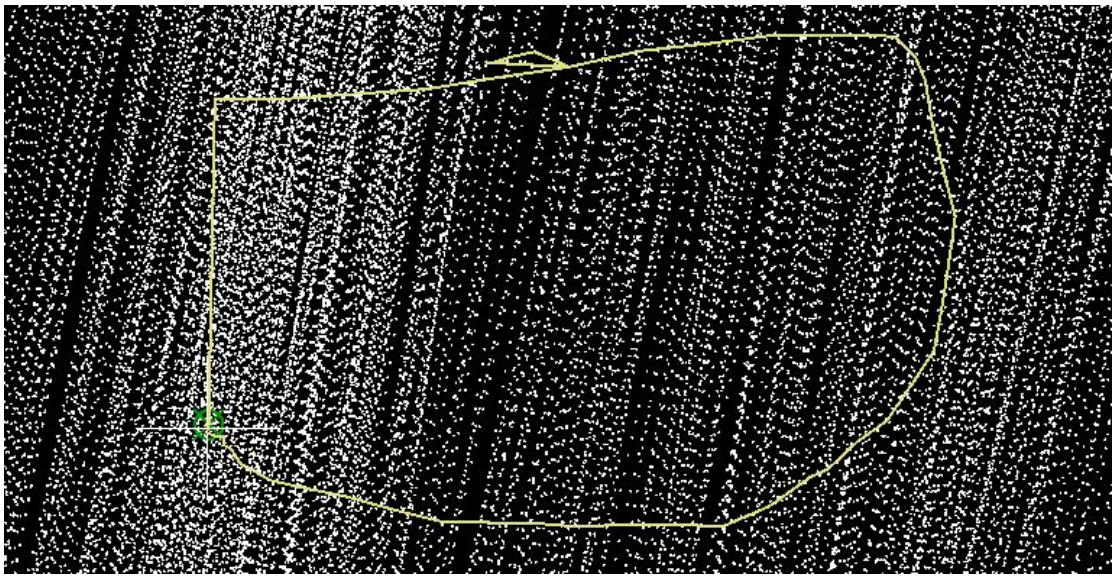


Figure: Lasso Drawing Range

2.5.10.11 Thickness

Function Description:

Range selection tool. Uses the thickness tool to draw a range.

Operation Steps:

1. Click the Thickness button in Classification Editing. The Thickness button becomes highlighted.

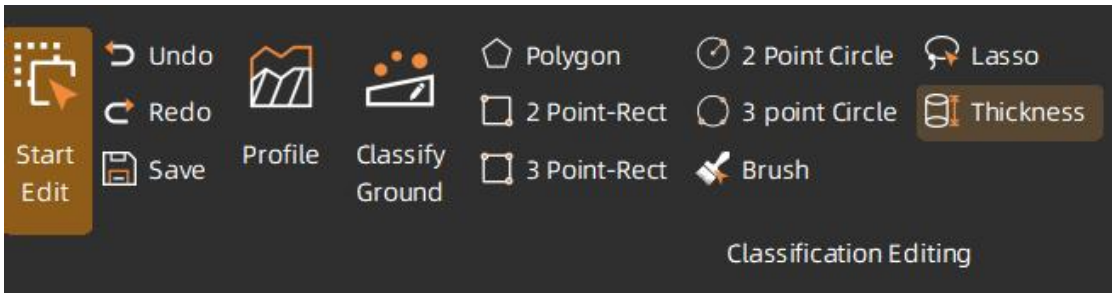


Figure: Thickness Button

2. After activating the Thickness range drawing tool, the thickness parameter setting interface appears. You can adjust the radius and thickness of the thickness tool.

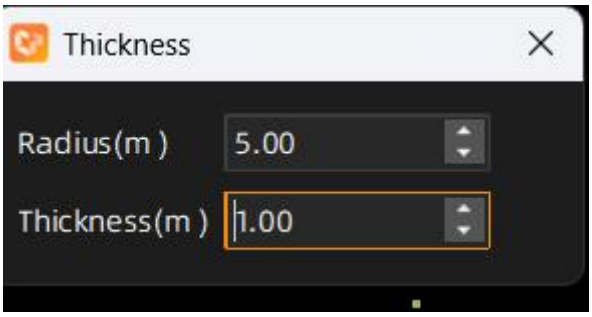


Figure: Thickness Settings

3. Use the thickness tool in the view. Click the left mouse button to select a point cloud area. Point clouds within the thickness tool range that have the checked source class(es) will be converted to the target class.

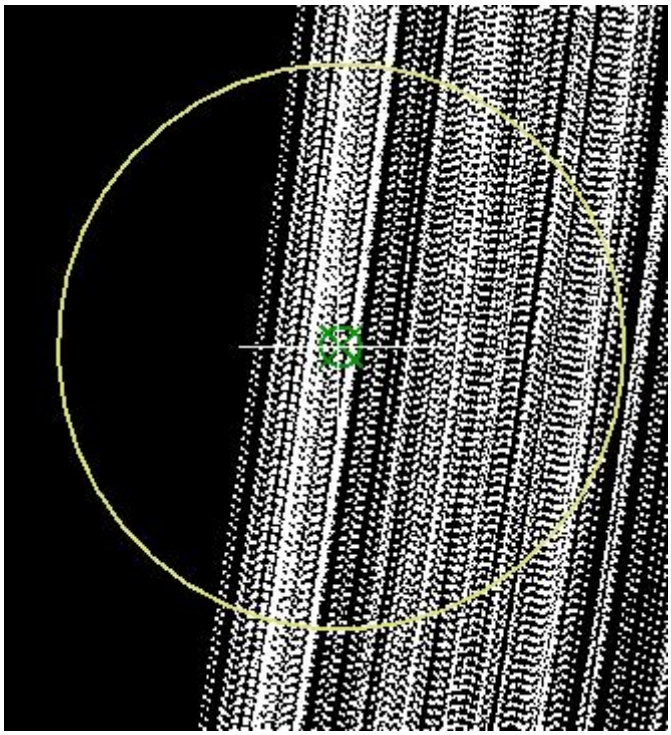


Figure: Using Thickness Tool

2.5.10.12 Above Line

Function Description:

Range selection tool. Uses the above-line tool to draw a range.

Operation Steps:

1. Click the Above Line button in Classification Editing. The Above Line butt on becomes highlighted.

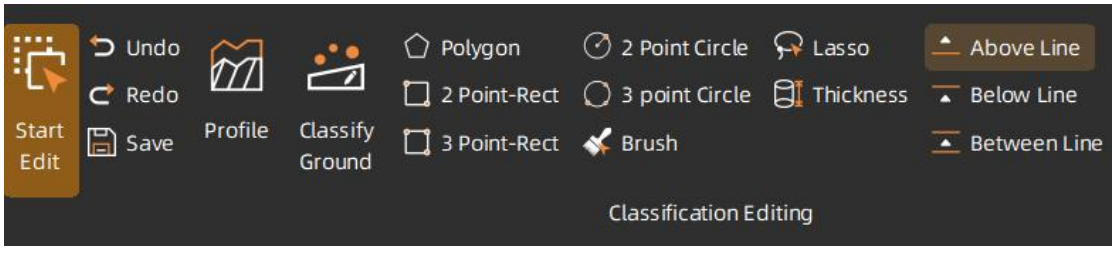


Figure: Above Line Button

2. Use the above-line tool in the view. Draw a polyline in the view. Point clouds within the range above the drawn polyline that have the checked source class(es) will be converted to the target class.

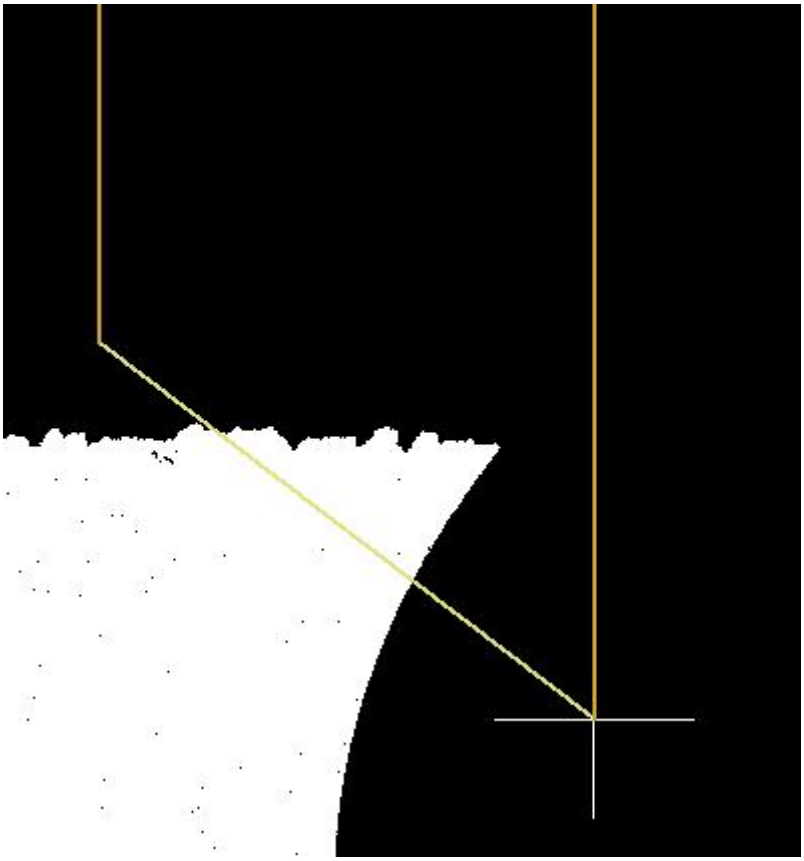


Figure: Using Above Line Tool

2.5.10.13 Below Line

Function Description:

Range selection tool. Uses the below-line tool to draw a range.

Operation Steps:

1. Click the Below Line button in Classification Editing. The Below Line butt

on becomes highlighted.

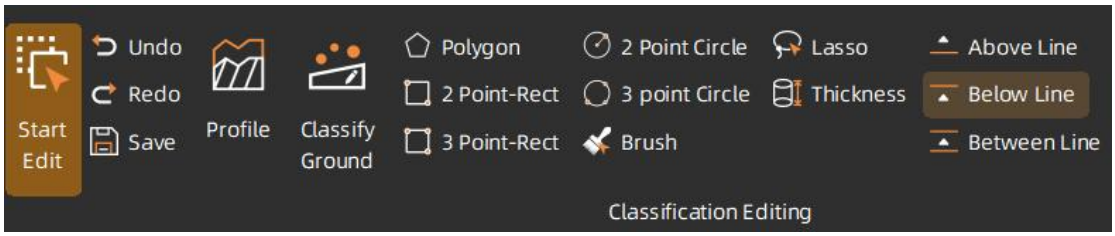


Figure: Below Line Button

2. Use the below-line tool in the view. Draw a polyline in the view. Point clouds within the range below the drawn polyline that have the checked source class(es) will be converted to the target class.

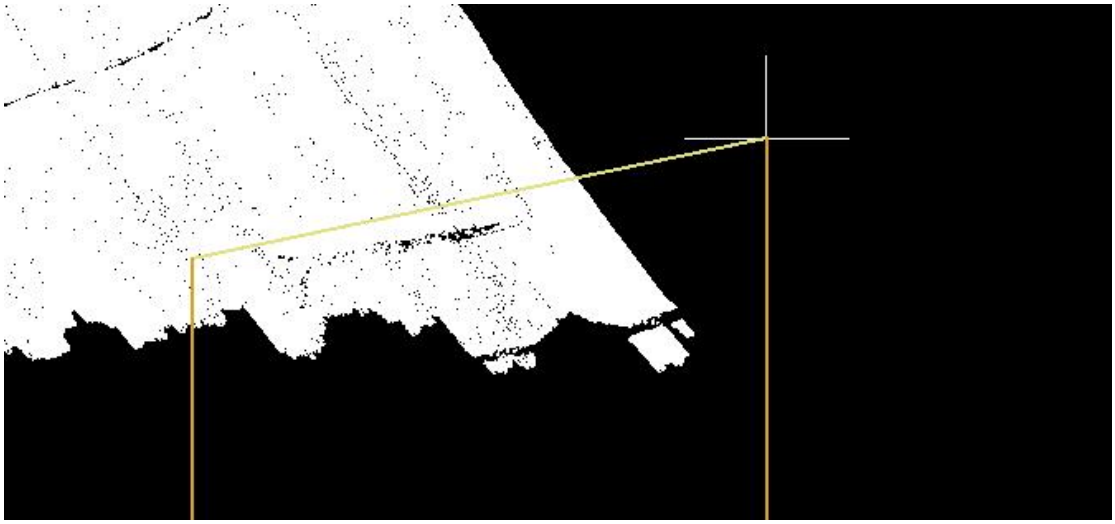


Figure: Using Below Line Tool

2.5.10.14 Between Lines

Function Description:

Range selection tool. Uses the between-lines tool to draw a range.

Operation Steps:

1. Click the Between Lines button in Classification Editing. The Between Lines button becomes highlighted.

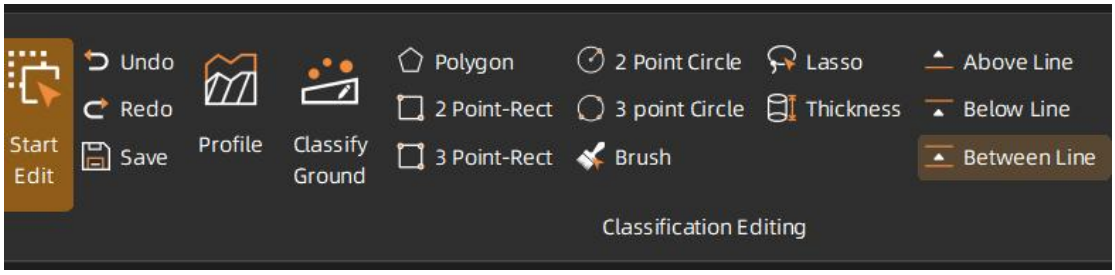


Figure: Between Lines Button

2. Use the between-lines tool in the view. Draw a line segment in the view. Then move the mouse to either side of the drawn segment and click again to determine the current selection range. Point clouds within the selected range that have the checked source class(es) will be converted to the target class.

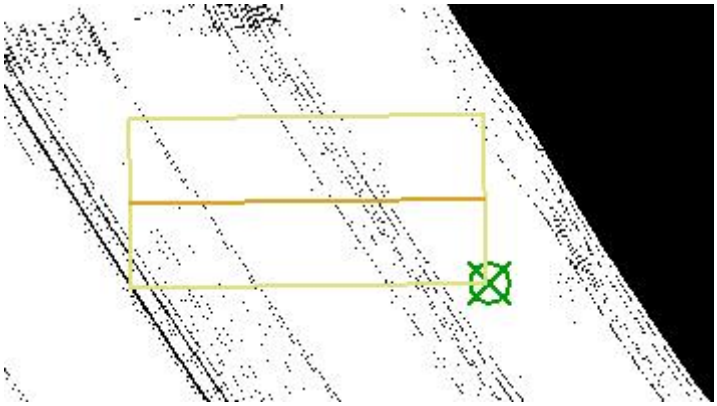


Figure: Using Between Lines Tool

2.5.11 Define Classes

Function Description:

Customizes point cloud class names.

Operation Steps:

1. Click Classification -> Classification Settings -> Define Classes to open the Define Classes dialog box.



Figure: Classify by Attribute Button

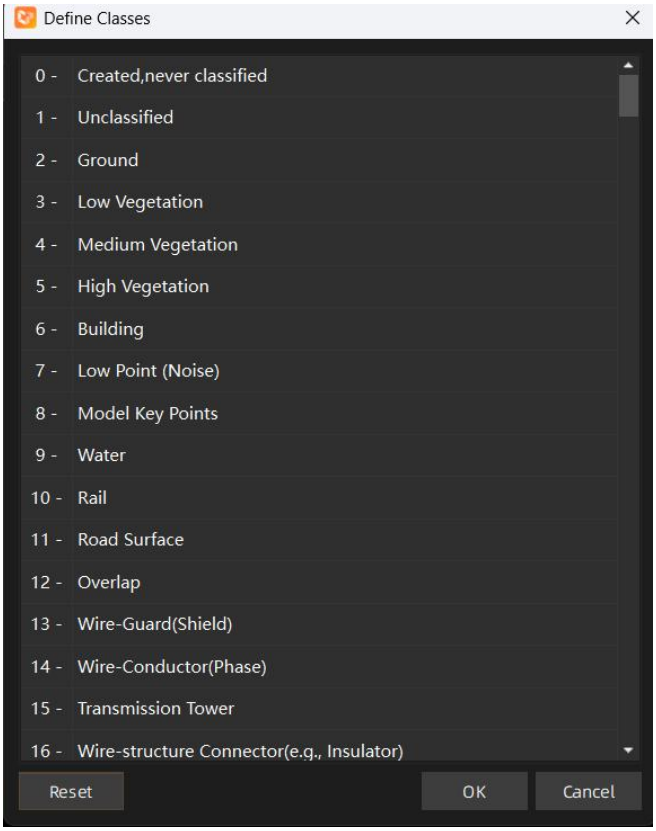


Figure: Define Classes Dialog Box

2. In the Define Classes dialog box, select a class, modify its name, and click the Confirm button to save.

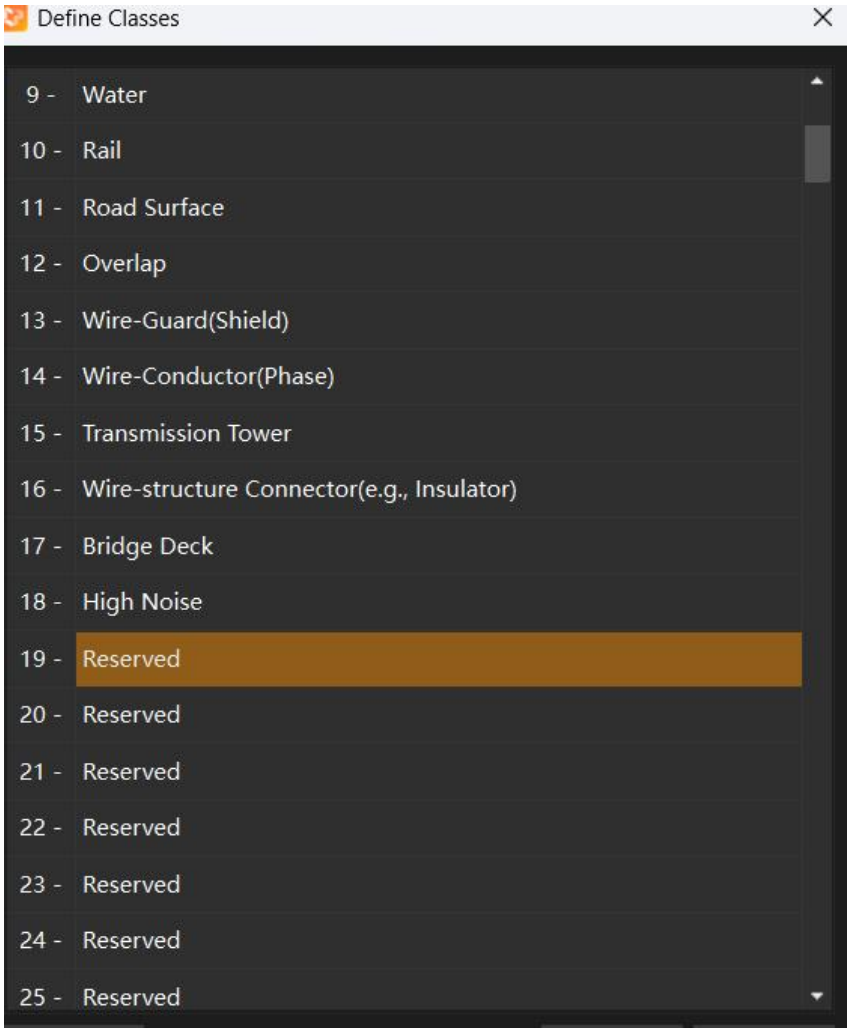


Figure: User Defined Classes

3. Click the Reset button to restore the system default classes.

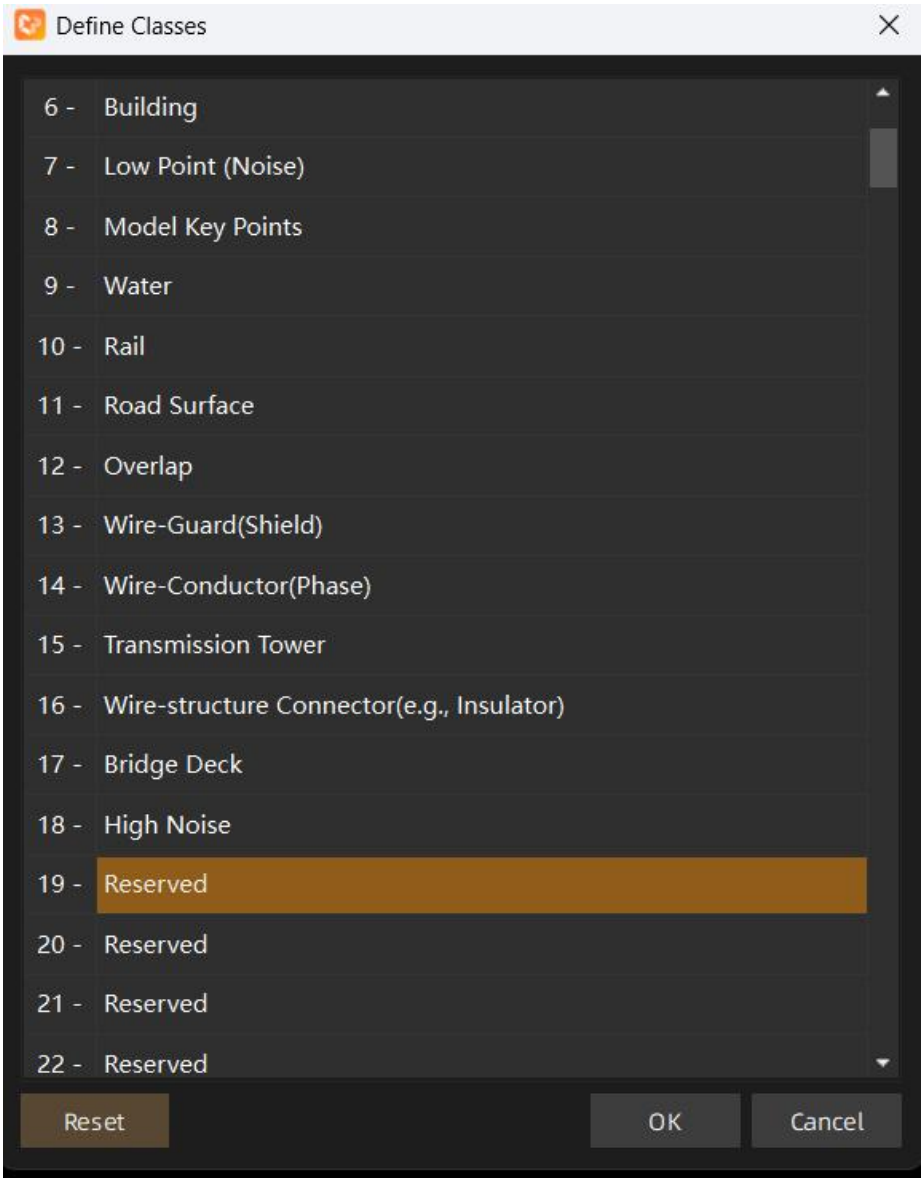


Figure: User Reset Classes

2.6 Terrain Module

2.6.1Quick Generate

Function Description:

One-click completion of preprocessing and generation of various terrain pro ducts.

Operation Steps:

1. Click Terrain -> Quick Generate.

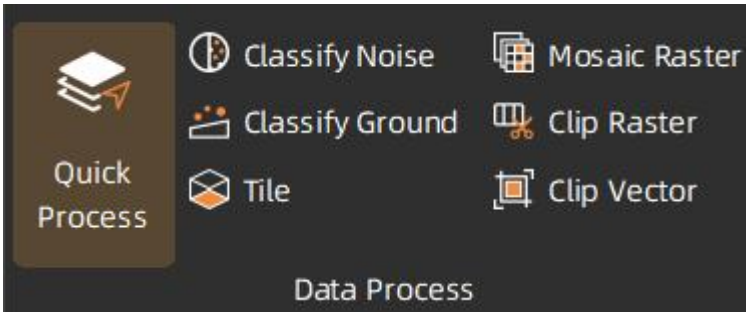


Figure: Quick Generate Button Location

2. In the Quick Generate interface, the software automatically adds the currently loaded point cloud files to the point cloud list in the function interface. You can also add other point clouds to be processed via the Add button, or delete unnecessary ones via the Delete button.

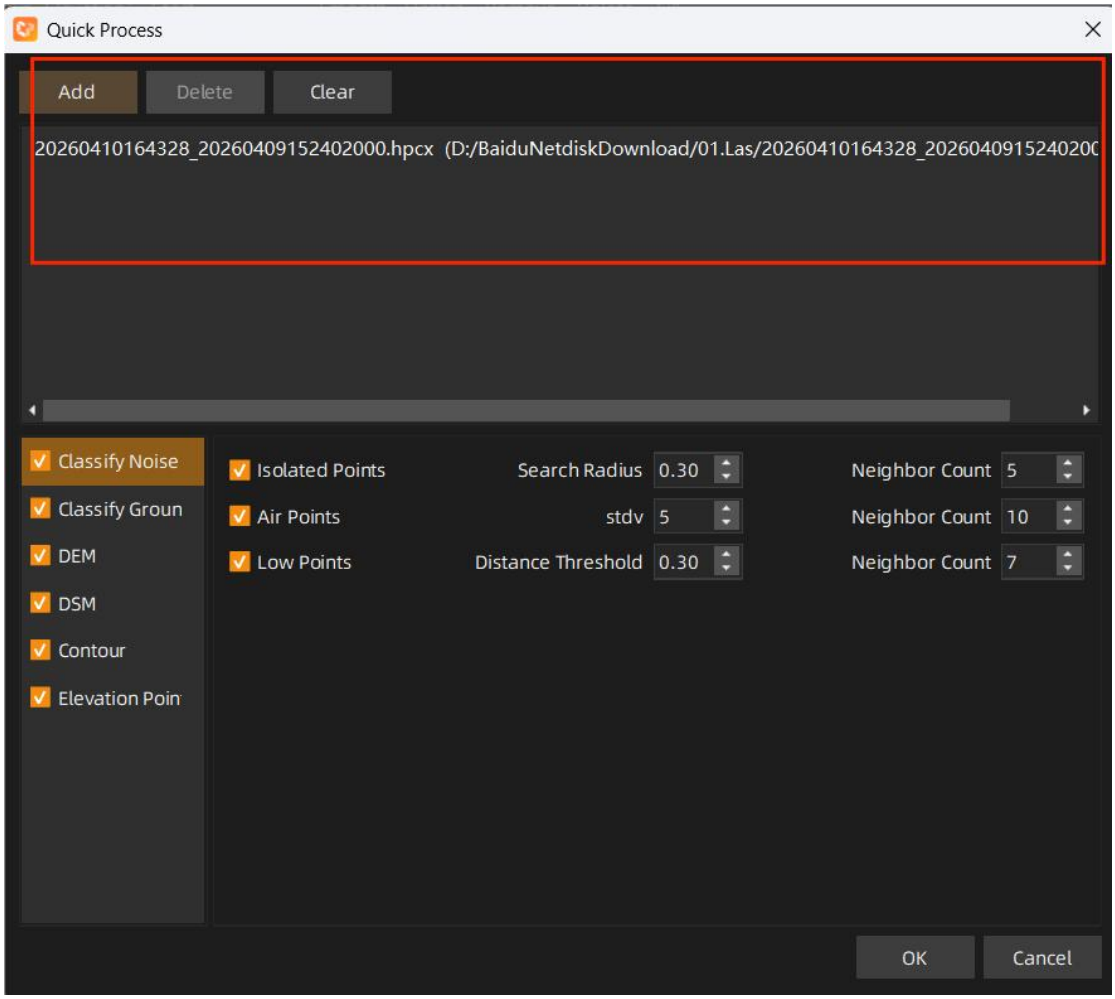


Figure: Quick Process Point Cloud List

3. In the function list on the left side of the Quick Generate interface, chec k the required functions to process (the order of functions cannot be chan ged).

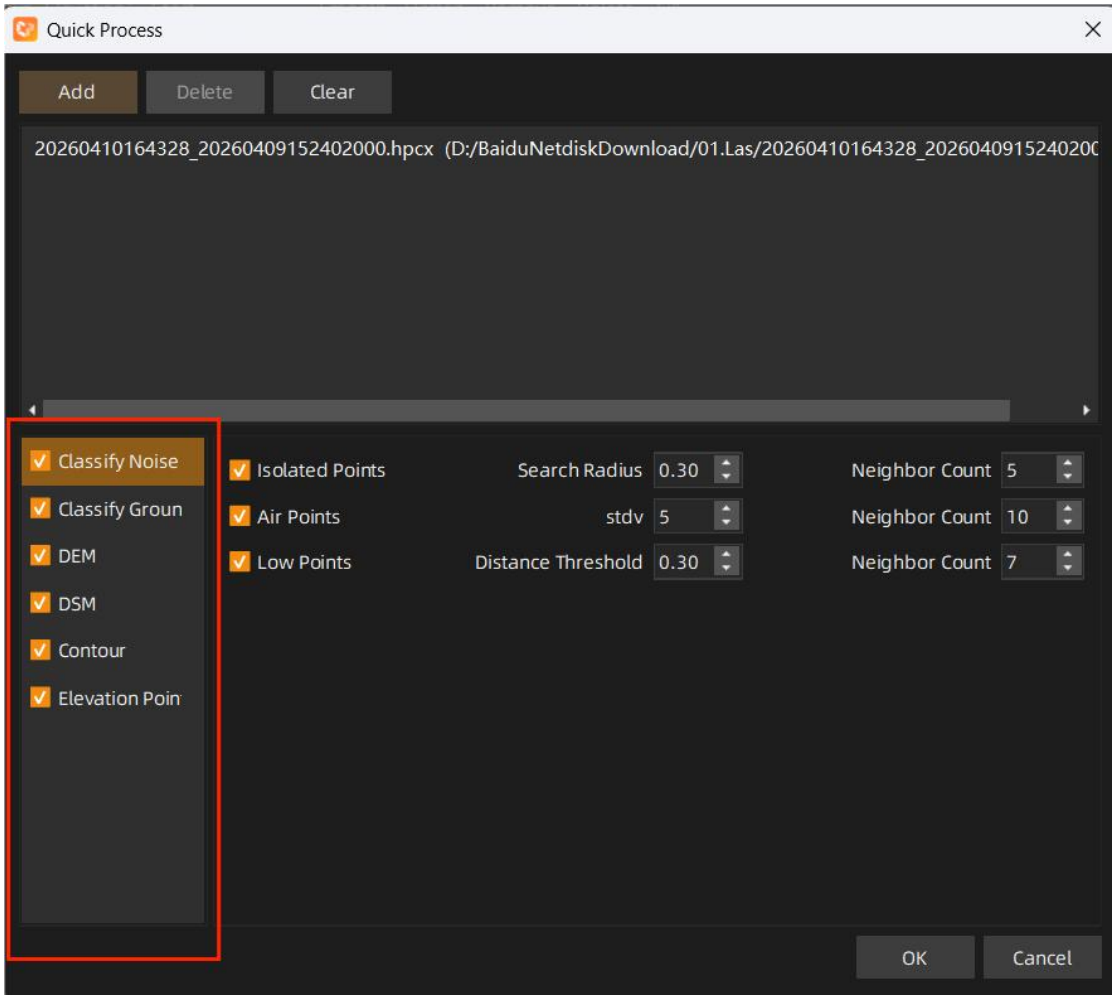


Figure: Quick Generate Checkboxes

4. In the Quick Generate interface, select the function whose parameters yo u need to modify from the function list. The corresponding parameters can be modified in the interface.

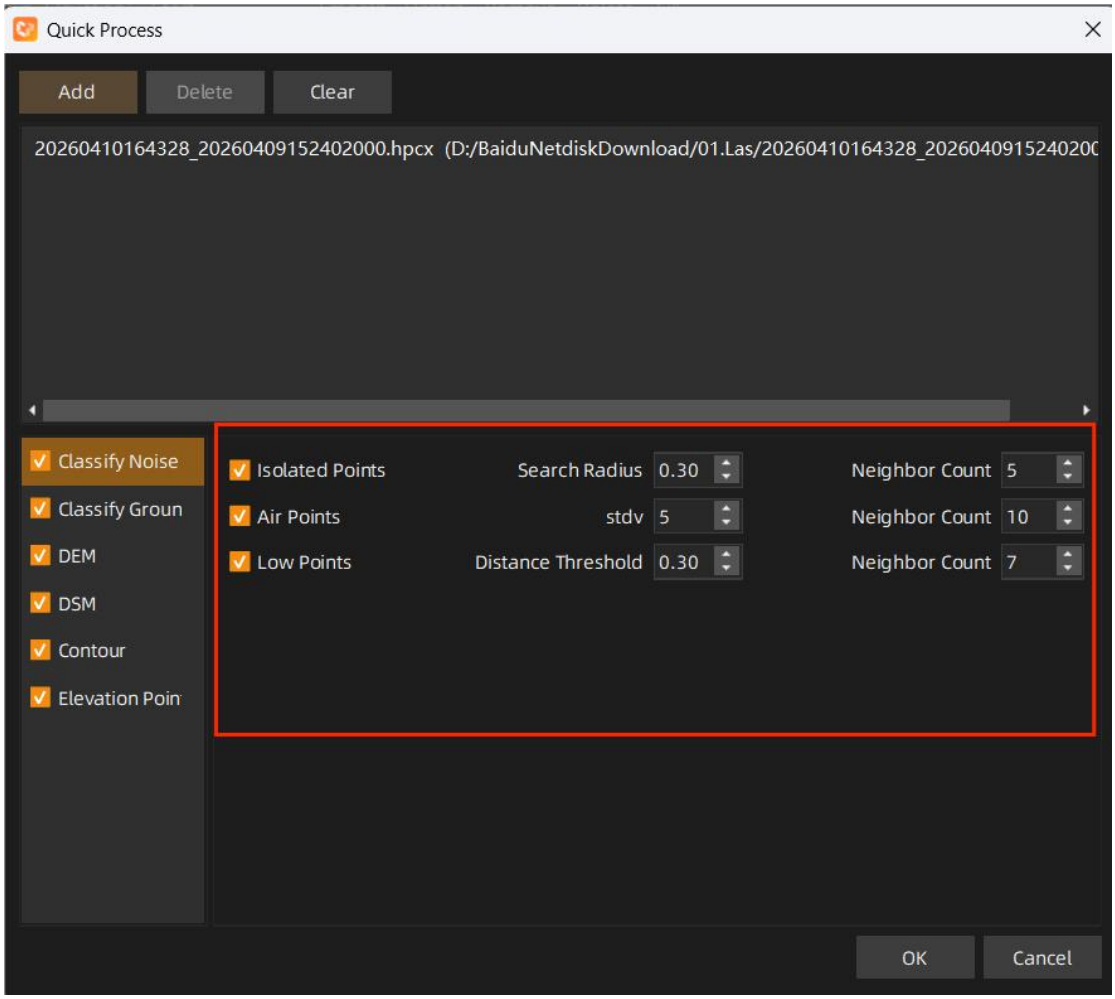


Figure: Quick Generate Parameters

5. After selecting the functions and setting the parameters, click OK to start the quick processing (if DEM or DSM functions are checked, you need to select the output location for DEM/DSM when clicking OK; if Contour or Elevation Point functions are checked, an active drawing must exist).

6. If DEM/DSM functions were checked, after quick processing is completed, the resulting products are automatically loaded into the software and displayed in the currently active view.

2.6.2Partition

Function Description:

Splits a point cloud into multiple files based on rules.

Operation Steps:

1. Click Terrain -> Partition.

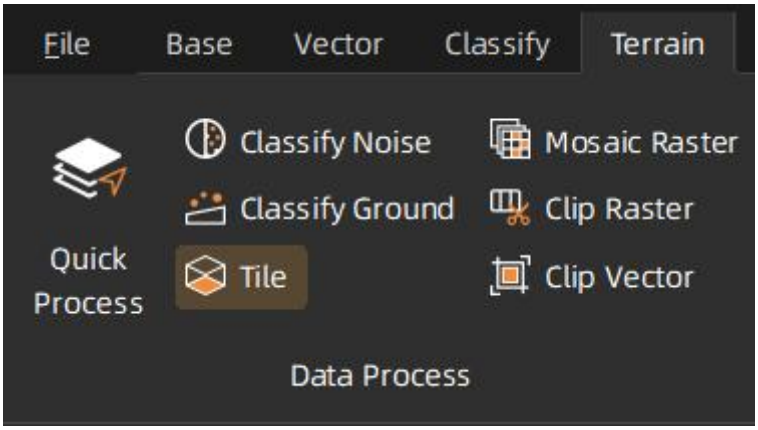


Figure: Partition

2. When the Partition interface opens, it automatically adds the currently loaded point cloud files to the point cloud file list. You can also add other point cloud files to be processed via the Add button, or delete/clear unnecessary files via the Delete/Clear buttons.

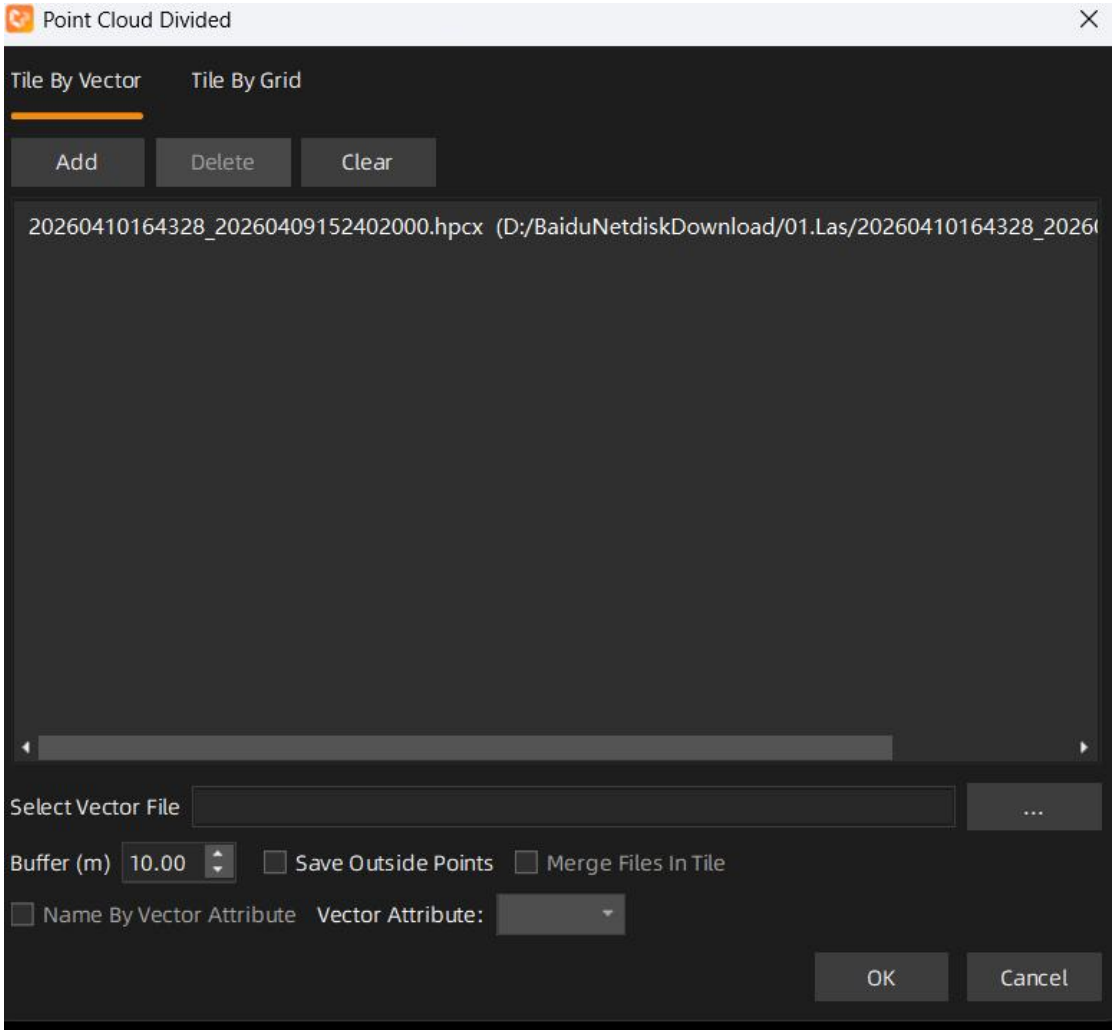


Figure: Partition Dialog Box

3. Choose to import a vector for partitioning (generates point cloud files for the area inside closed vectors from an imported vector file) or set range partitioning (partitions the point cloud based on a set range size).

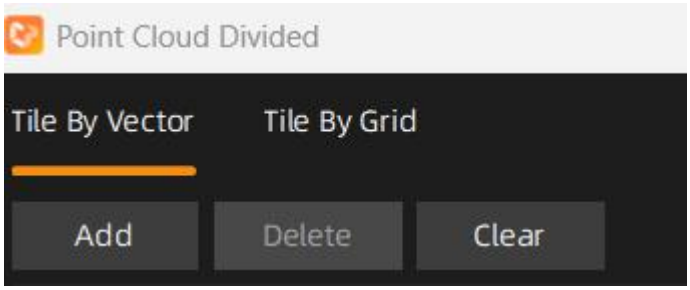


Figure: Import Vector Partition

4. Select the vector file. Supports .shp, .dxf, .dwg files.

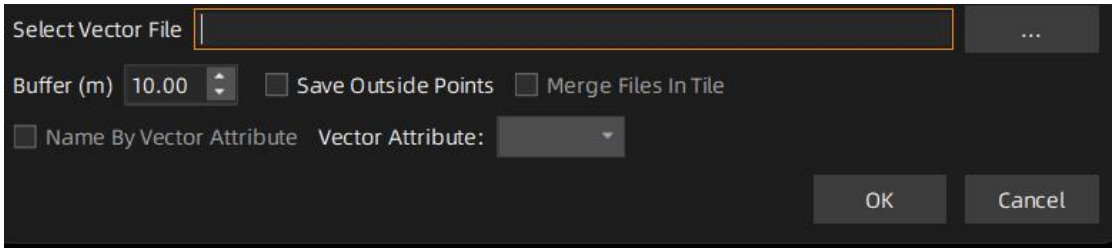


Figure: Select Vector File

5. After selecting the file, the selected boundary vector appears in the view. The red box represents the current point cloud's bounding box. The yello w vector lines are the closed vectors from the selected file. The pink numb ers indicate the current closed region index.

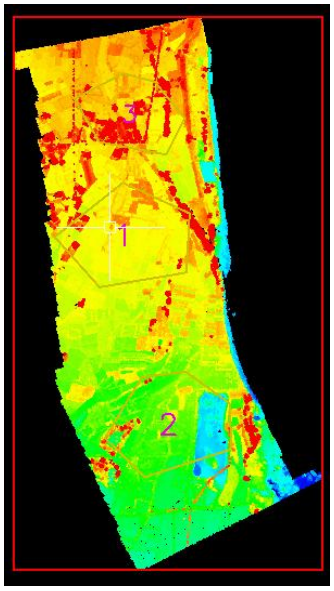


Figure: Partition Preview

6. Set the buffer (the area extending outward from the current closed regi on. Point clouds inside the buffer will be saved to the partitioned point clo ud file).

7. Choose to output the file outside the range (saves point clouds outside t he closed vectors, named outside.hpcx).

8. Merge partition results (if there are point clouds from multiple files insid

e the closed region, saves all point clouds inside the closed region to a sin gle point cloud file. If unchecked, the point clouds inside the closed vector are saved as multiple files). If merging is checked, the naming rule is: 1.hpc x, 2.hpcx...

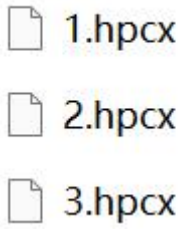


Figure: Merge Partition Results

If merging is not checked, the naming rule is: 1_1.hpcx, 1_2.hpcx, 2_1.hpcx, 2_2.hpcx...

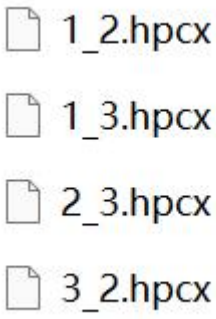


Figure: Not Merging Partition Results

9. If the range file is a shp file and has attribute fields, the "Name by Attri bute" button will be enabled. Checking "Name by Attribute" will name the exported point cloud files based on the attribute value.

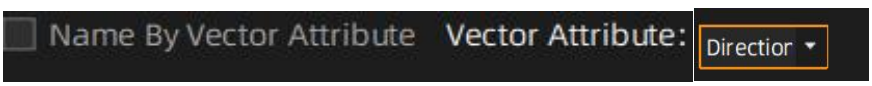


Figure: Name by Attribute

10. Click "Set Range Partition". The parameter setting interface changes.

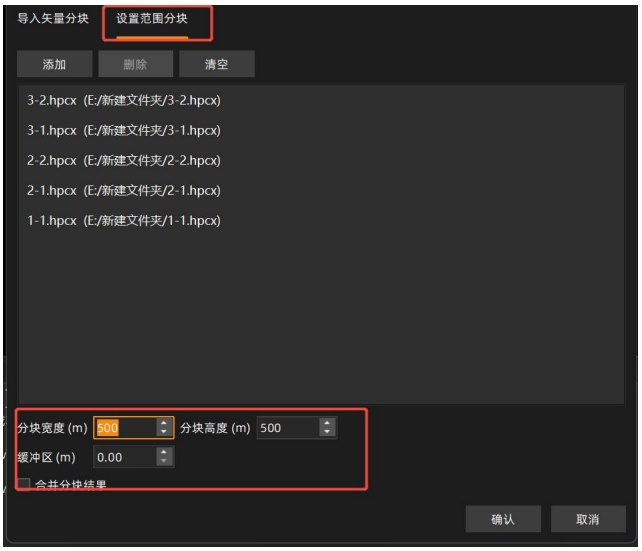


Figure: Set Range Partition

11. Set the partition width and partition height (size of the small rectangles in the view).

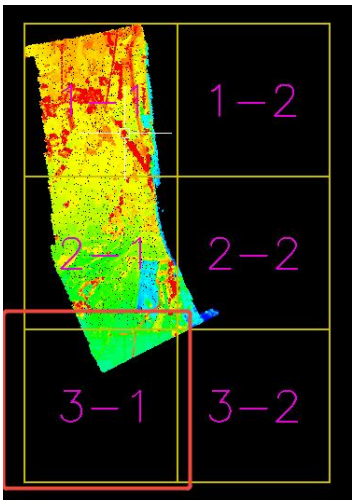


Figure: Partition Preview

12. Merge partition results is the same as in step 8.

13. Click OK, then select the export folder and click OK again to start partit ioning.

14. After processing, a prompt asks if you want to load the new point clou d files. Click Yes, and the newly generated point cloud data is added to th e project folder.

2.6.3Raster Mosaic

Function Description:

Merges multiple raster files into a single raster file.

Operation Steps:

1. Click Terrain -> Raster Mosaic.

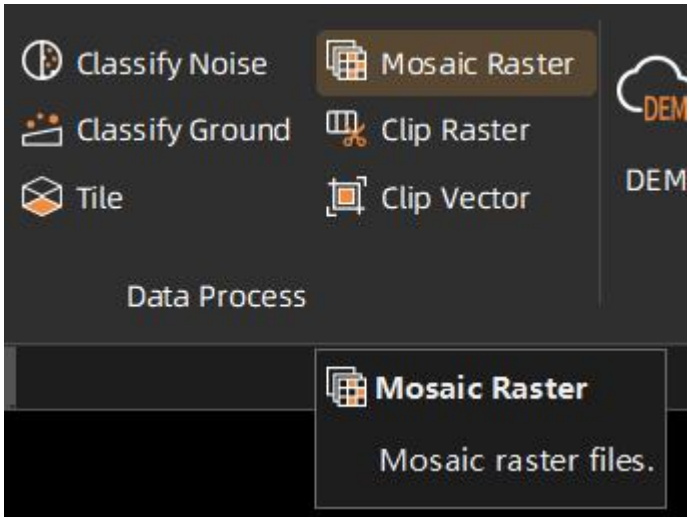


Figure: Raster Mosaic Button

2. In the Raster Mosaic function interface, the software automatically adds t he currently loaded raster files to the raster file list. You can also add othe r raster files to be processed via the Add button, or delete unnecessary on es via the Delete button.

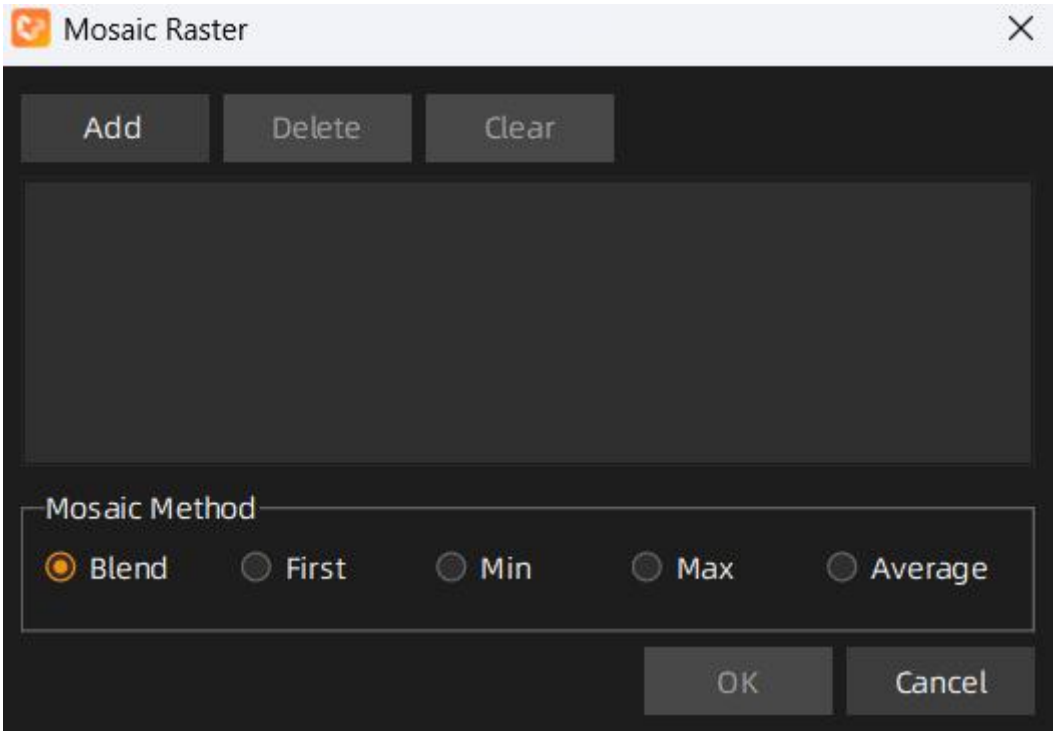


Figure: Raster Mosaic Dialog Box

3. The default mosaic method is Blend mode. To change the mosaic method, click Advanced Settings to select.

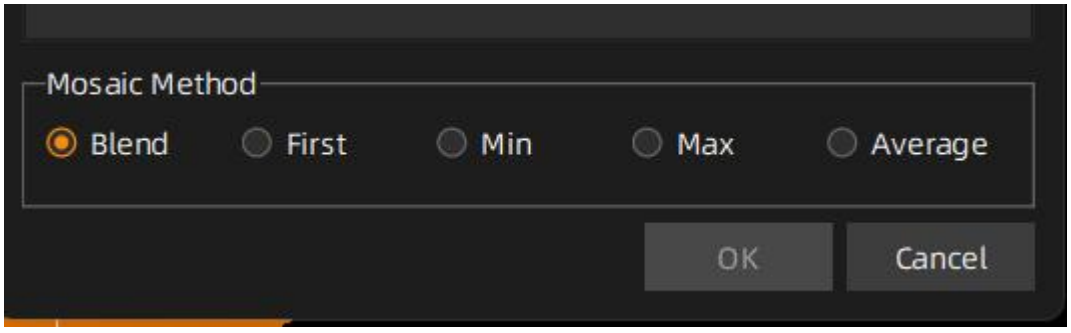


Figure: Mosaic Methods

4. Click OK, then select the output path to start the raster mosaic. After processing, a popup window asks if you want to load the result file. Click "Yes" to load the clipped result file into the software and display it in the currently active view.

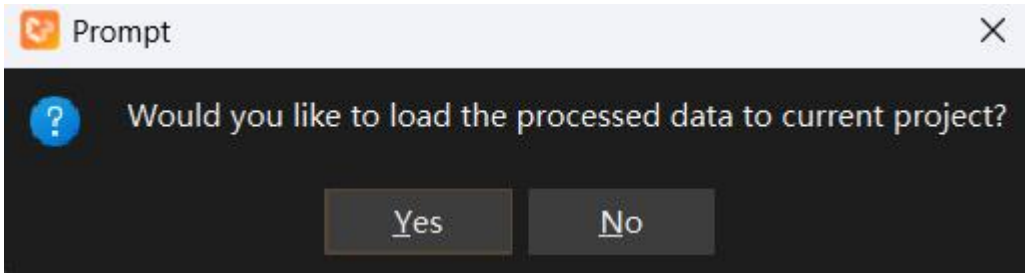


Figure: Processing Success Prompt Dialog Box

2.6.4Raster Clip

Function Description:

Clips a raster based on a vector file boundary.

Operation Steps:

1. Click Terrain -> Raster Clip.



Figure: Quick Generate Button Location

2. In the Raster Clip function interface, the software automatically adds the currently loaded raster files to the raster file list. You can also add other raster files to be processed via the Add button, or delete unnecessary ones via the Delete button.

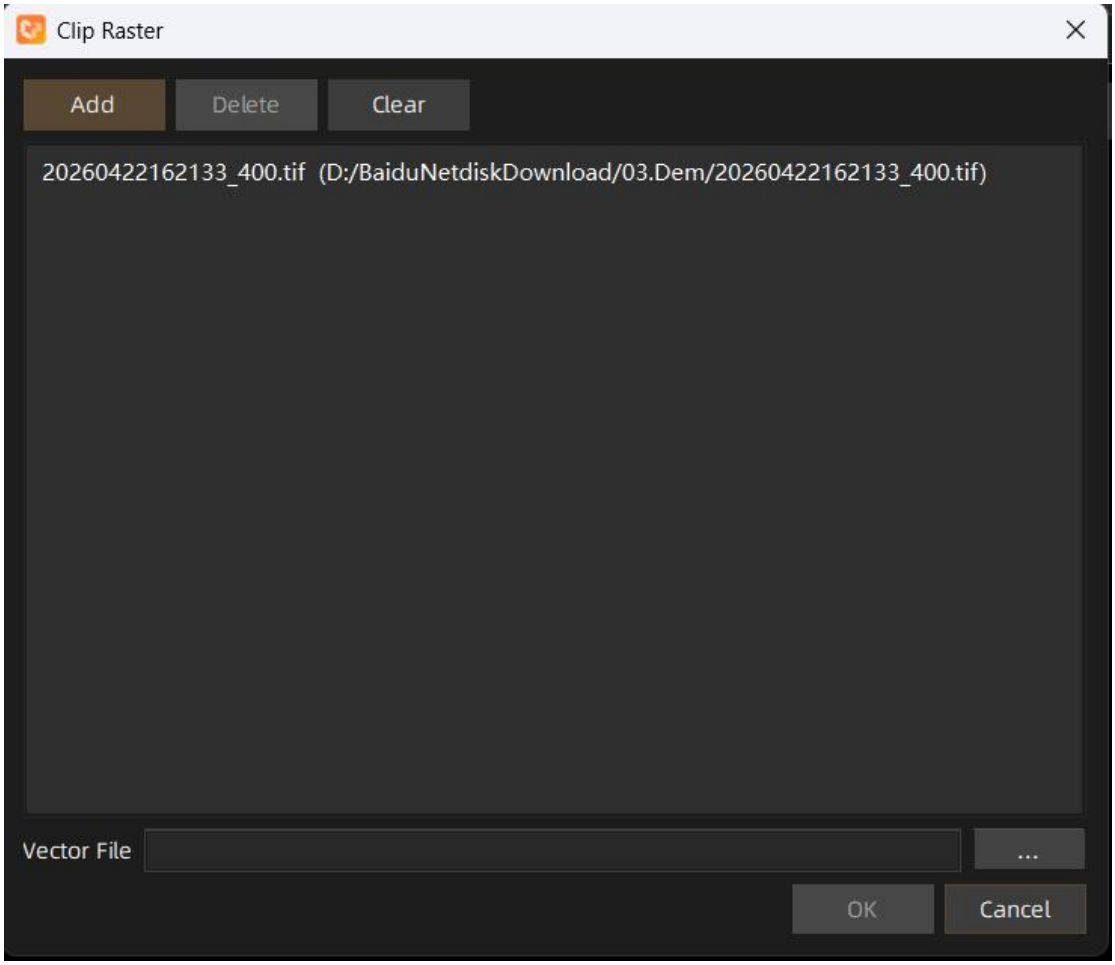


Figure: Raster Clip Raster List

3. In the Raster Clip function, enter the path of the vector boundary file in the "Select Vector File" input box (you can type, paste, or browse using the button to the right). The boundary file must be a closed vector. After selecting the boundary file, click OK to start the raster clip operation.

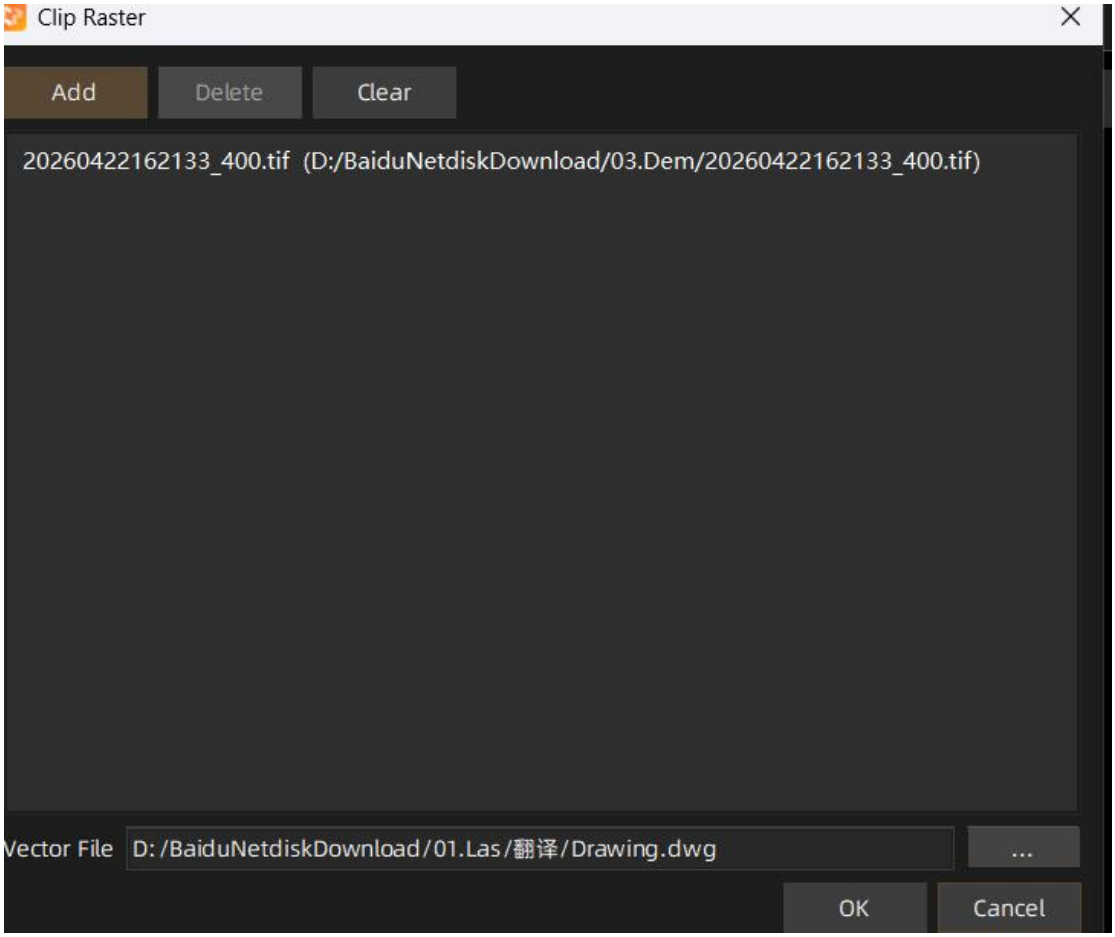


Figure: Raster Clip Confirm

4. After raster clipping is complete, a prompt box appears asking if you want to load the result. Click "Yes" to load the clipped result file into the software and display it in the currently active view.

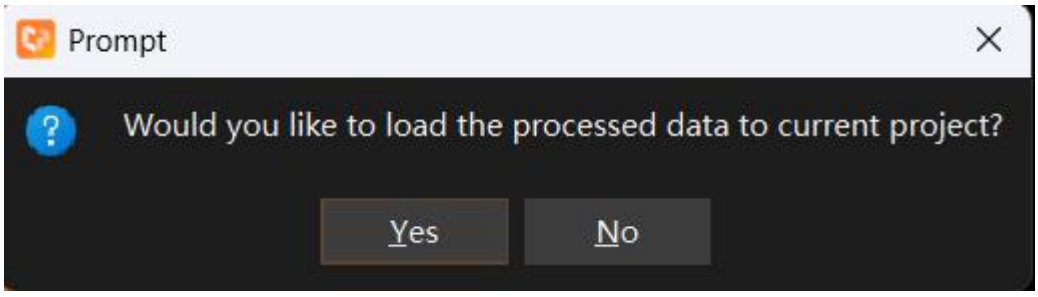


Figure: Processing Success Prompt Dialog Box

2.6.5Clip Vector

Function Description:

Clips a vector based on a vector file boundary.

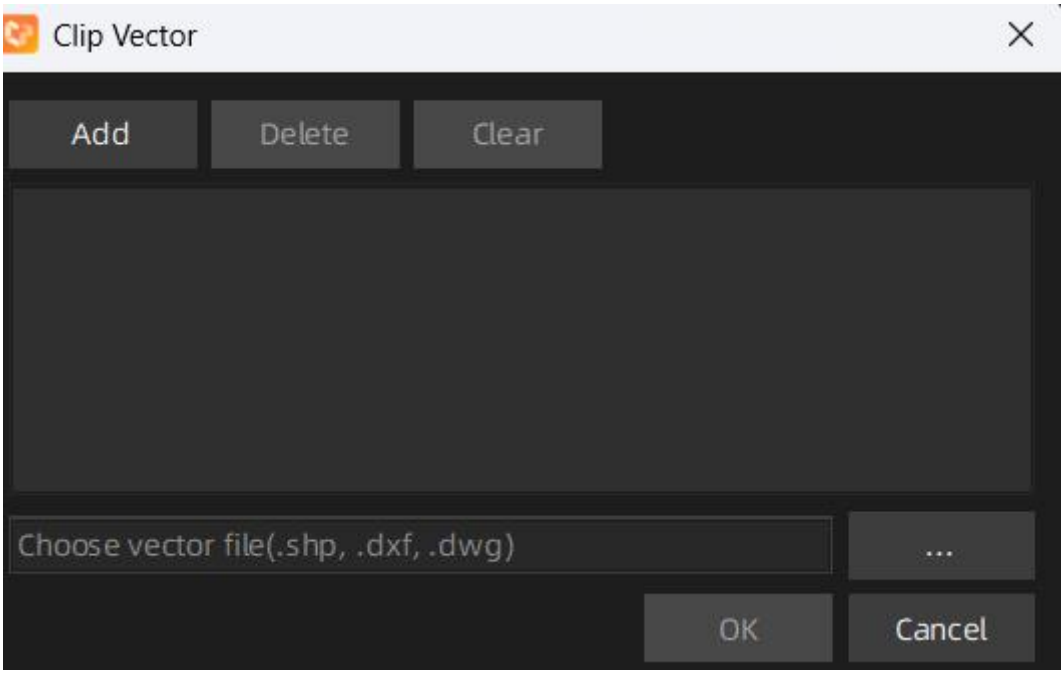


Figure: Clip Vector Interface

Operation Steps:

1. Click Terrain -> Data Processing -> Clip Vector.

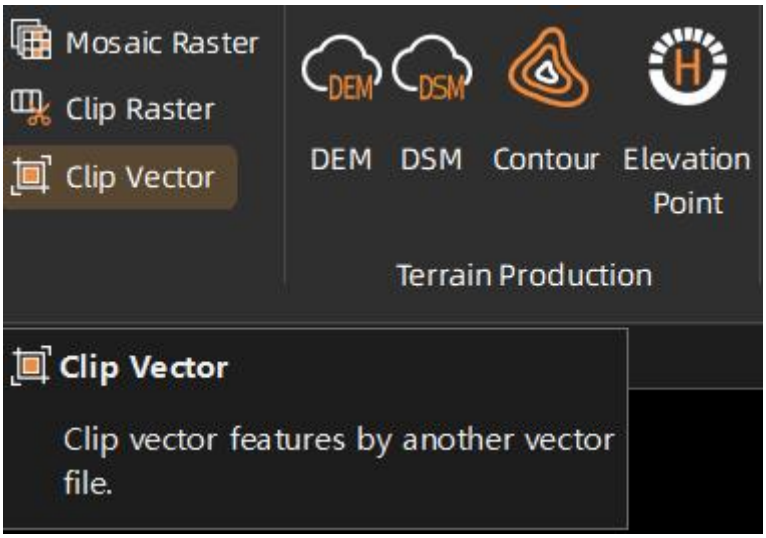


Figure: Clip Vector Button

2. In the Clip Vector interface, add the vector file to be clipped and the cli

pping boundary (the clipping boundary must be a closed vector).

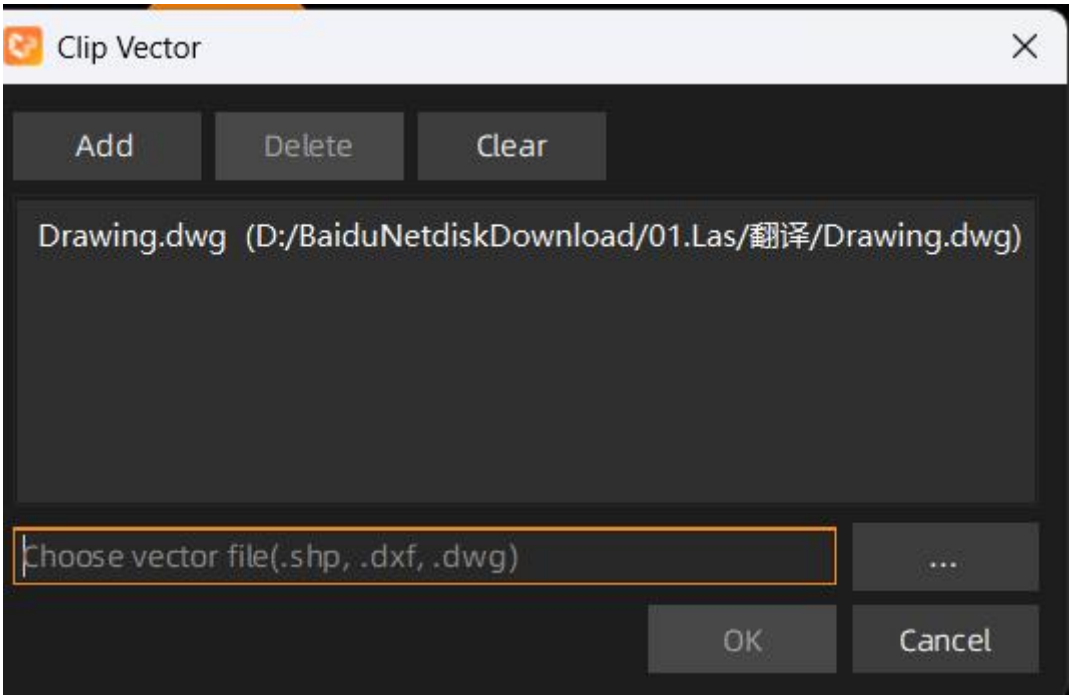


Figure: Add Vector and Boundary

3. Click OK, then select the output path for the clipped file. After selection, the data clipping process begins.

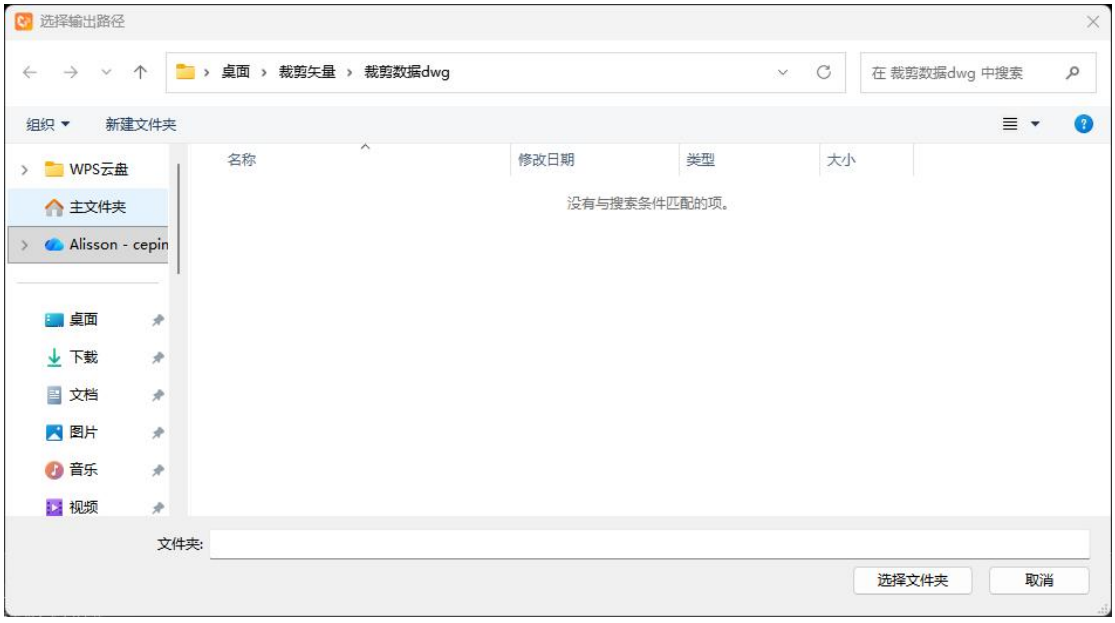


Figure: Select Output Path

4. After processing, a popup window asks if you want to load the clipping result. Click "Yes". The clipped result data is loaded into the Vector node of the software's Project Management panel (if the Vector node doesn't exist, it is created automatically), but it is not displayed in the view window by default.

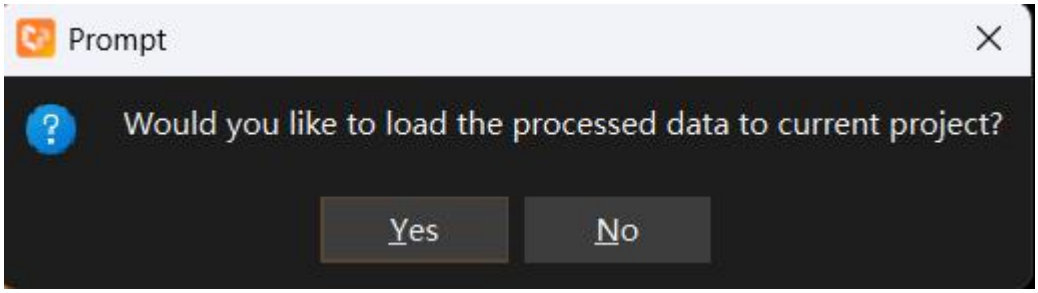


Figure: Clip Vector Result Load

2.6.6DEM

Function Description:

Generates a DEM (Digital Elevation Model) based on ground points.

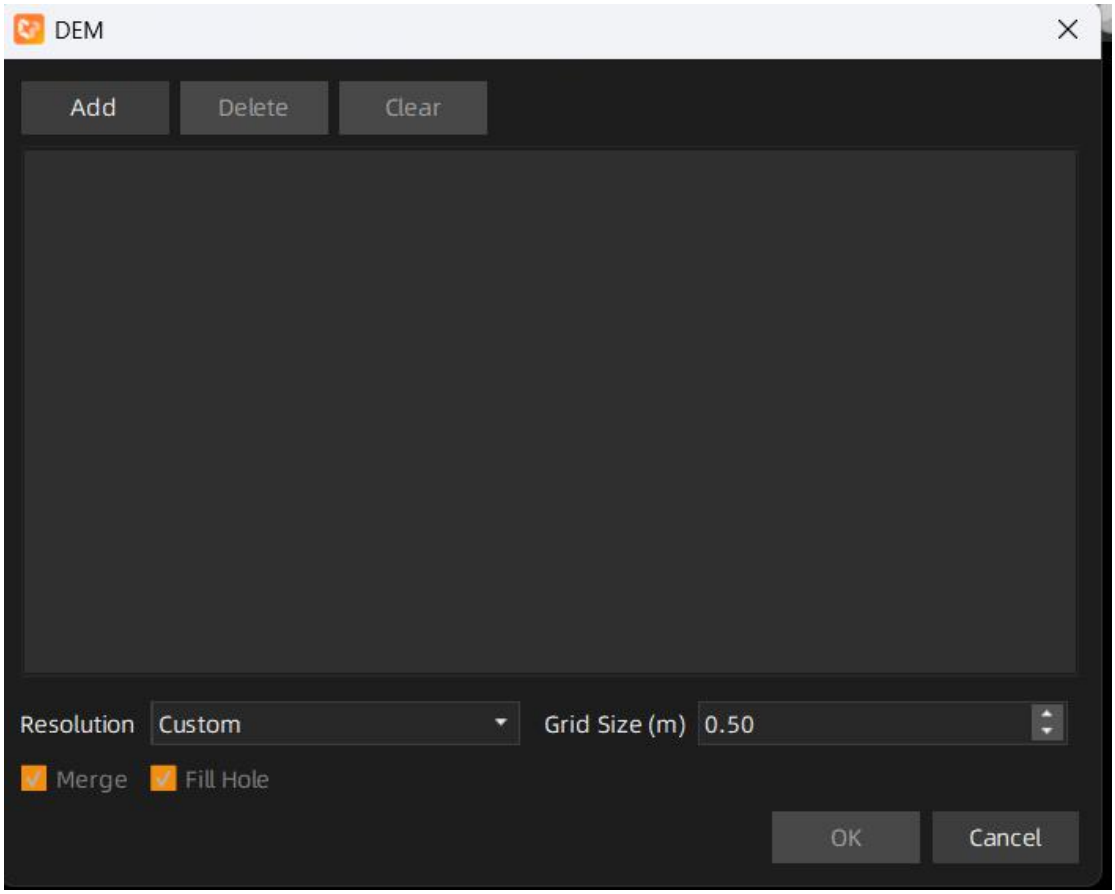


Figure: DEM Dialog Box

Operation Steps:

1. Click Terrain -> Terrain Product Generation -> DEM.

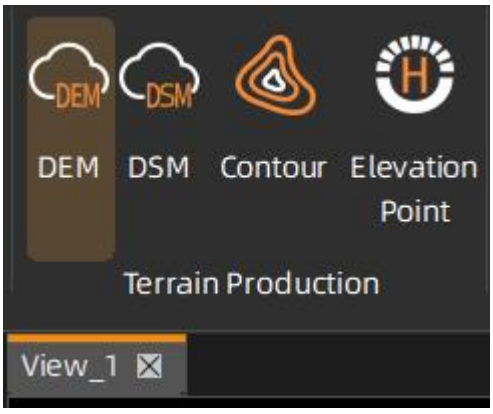


Figure: DEM Button

2. Set the parameters, then click OK to start DEM generation.

[Resolution] Select the appropriate scale (e.g., 1:500, 1:1000, 1:2000, 1:5000,

1:10000) based on project requirements. The "Grid Cell Size (m)" parameter updates automatically.

Or select "Custom" and manually enter the "Grid Cell Size (m)" parameter.

[Grid Cell Size] The resolution of the generated DEM (i.e., the actual size represented by one pixel).

[Merge] When adding 2 or more point cloud files, if this option is checked, a single merged DEM product is output. Otherwise, one DEM product is output per point cloud file.

[Hole Filling] Supports hole filling for the DEM product. If checked, holes in the raw algorithm result are filled. Otherwise, only the raw result is retained. Recommended to check this if the point cloud scan has significant voids or missing data areas.

2.6.7DSM

Function Description:

Generates a DSM (Digital Surface Model) based on selected point cloud classes.

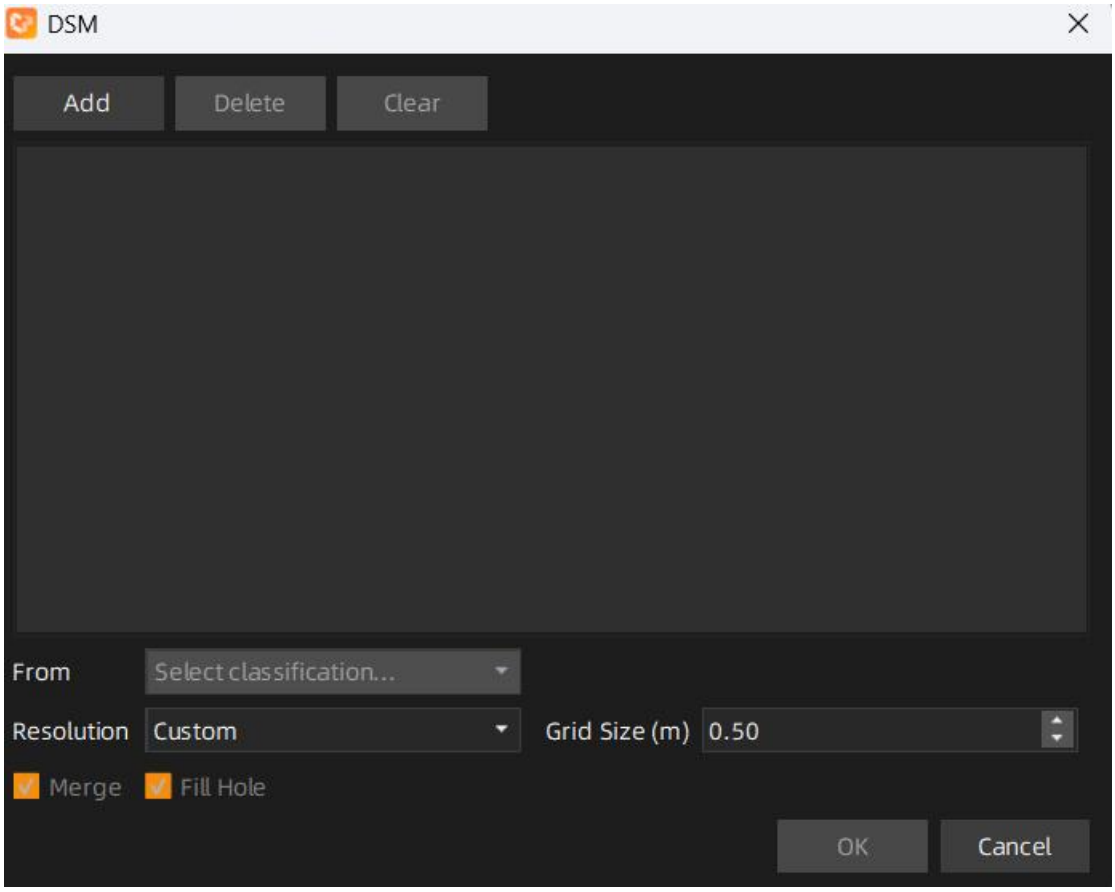


Figure: DSM Dialog Box

Operation Steps:

1. Click Terrain -> Terrain Product Generation -> DSM.



Figure: DSM Button

2. Set the parameters, then click OK to start DSM generation.

[Source Class] From the selected point cloud classes, choose the classes to

include in the DSM generation.

[Resolution] Select the appropriate scale (e.g., 1:500, 1:1000, 1:2000, 1:5000, 1:10000) based on project requirements. The "Grid Cell Size (m)" parameter updates automatically.
Or select "Custom" and manually enter the "Grid Cell Size (m)" parameter.

[Grid Cell Size] The resolution of the generated DSM (i.e., the actual size represented by one pixel).

[Merge] When adding 2 or more point cloud files, if this option is checked, a single merged DSM product is output. Otherwise, one DSM product is output per point cloud file.

[Hole Filling] Supports hole filling for the DSM product. If checked, holes in the raw algorithm result are filled. Otherwise, only the raw result is retained. Recommended to check this if the point cloud scan has significant voids or missing data areas.

2.6.8Contour

Function Description:

Generates contours based on point clouds.

Operation Steps:

1. Click Terrain -> Contour.



Figure: Contour Button Location

2. In the Contour interface, select the source class of the point cloud to ge nerate contours from (if a ground point class exists, it is selected by defaul t). Also, set parameters such as Contour Interval, Minimum Elevation, Maxi mum Elevation, Curve Type, Area Filter, and Length Filter.

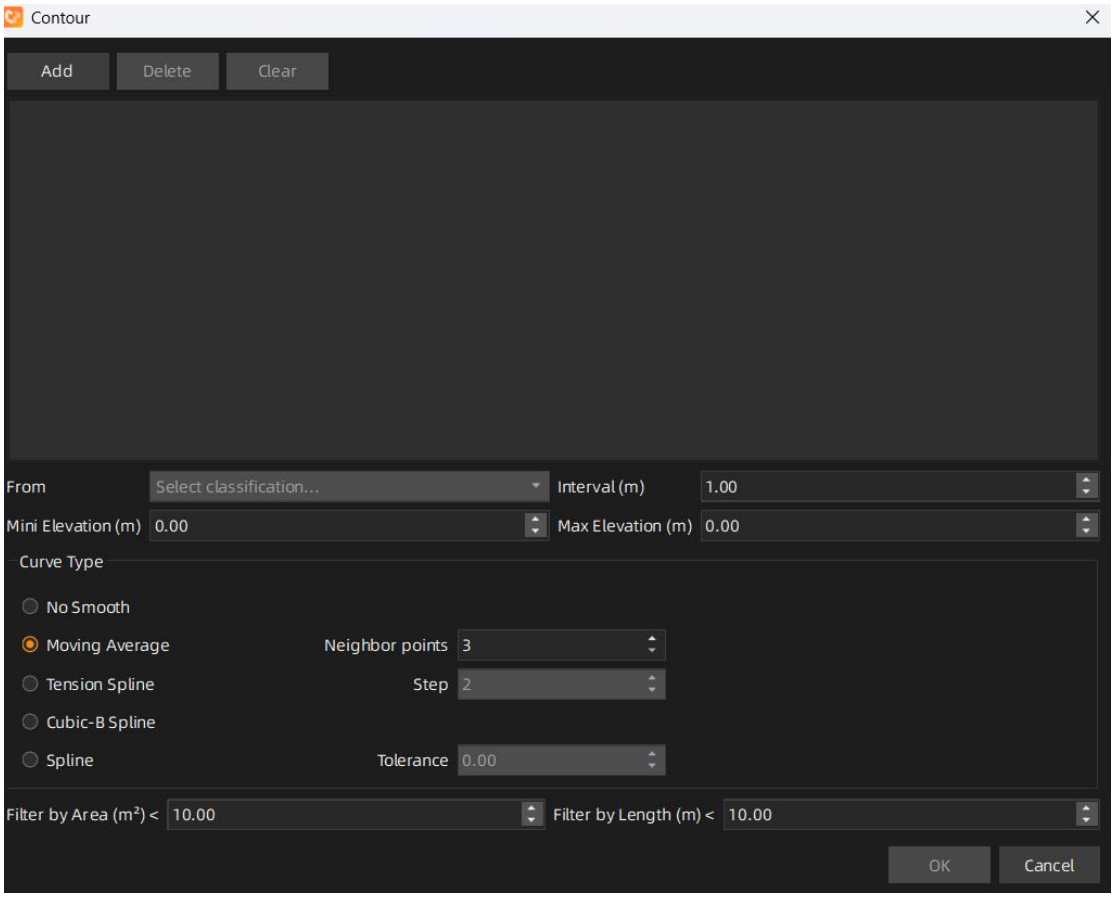


Figure: Contour Interface

3. After setting the parameters, click OK to start contour generation. Once completed, the generated contours are output to the Contour layer of the currently active drawing (if the Contour layer does not exist, it is created,

with a default color yellow).

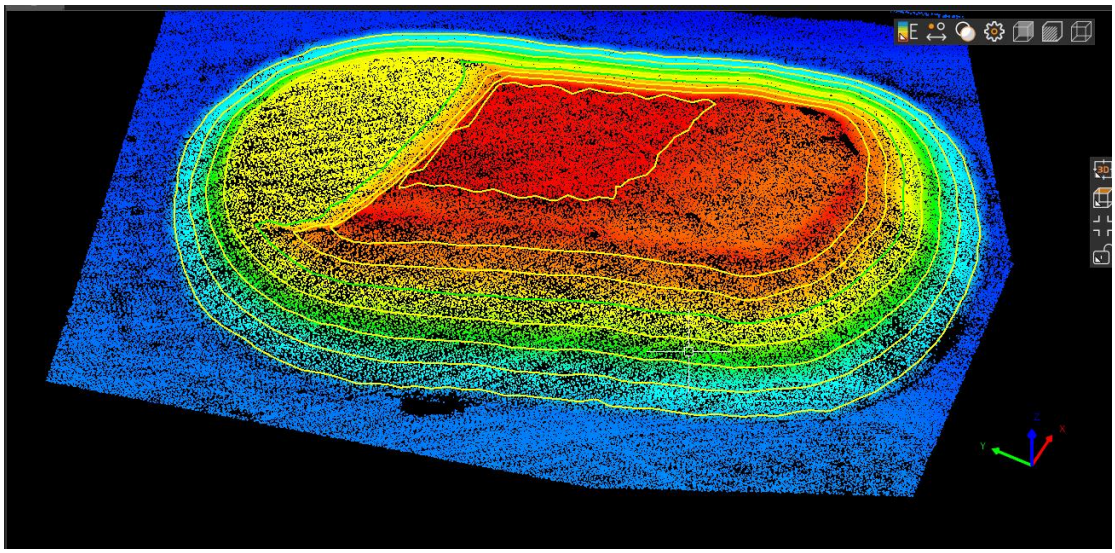


Figure: Contour

2.6.9Elevation Point

Function Description:

Generates elevation annotation points for contour plotting based on point c louds.

Operation Steps:

1. Click the Elevation Point button in Terrain Module -> Terrain Product Ge neration. The Elevation Point Generation dialog box opens.



Figure: Elevation Point Button

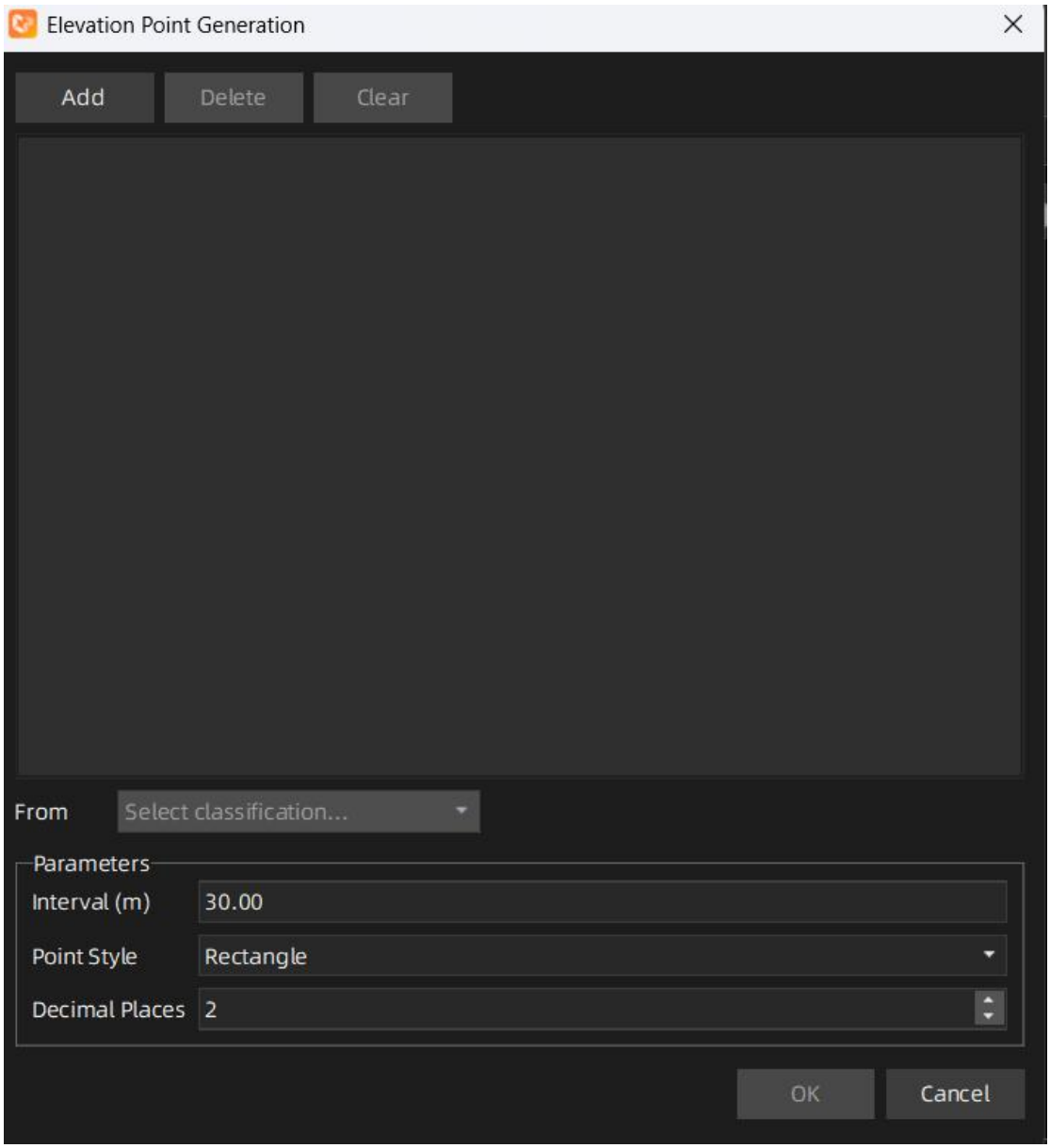


Figure: Elevation Point Generation Dialog Box

2. Click the Add button to add point cloud data.

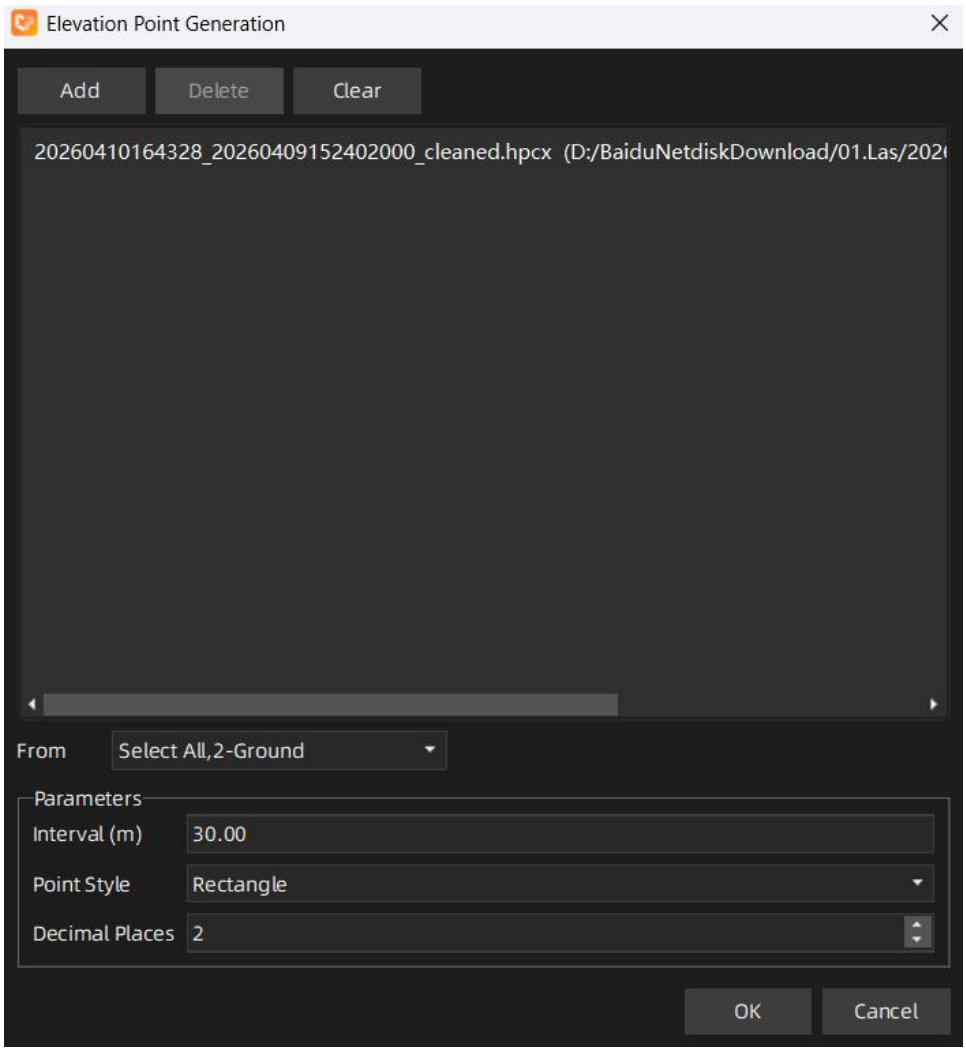


Figure: Add Point Cloud Data

3. Source Class Setting: The dropdown shows all classes present in the current point cloud. An "All" option is provided at the top. Each class has a checkbox for selection. Multiple classes can be selected.

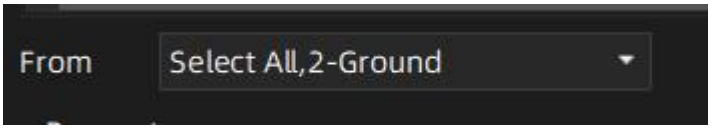


Figure: Source Class Setting

4. Parameter Settings: Point Spacing defaults to 30m, can be a float >0. Point Style defaults to Rectangle, options include Rectangle and Diamond. Decimal Places defaults to 2, can be an integer 0-5.



Figure: Parameter Settings

5. After adding data and completing settings, click the Confirm button to e xecute the elevation point generation operation. A progress bar is shown. A fter completion, the elevation points are displayed directly in the view.

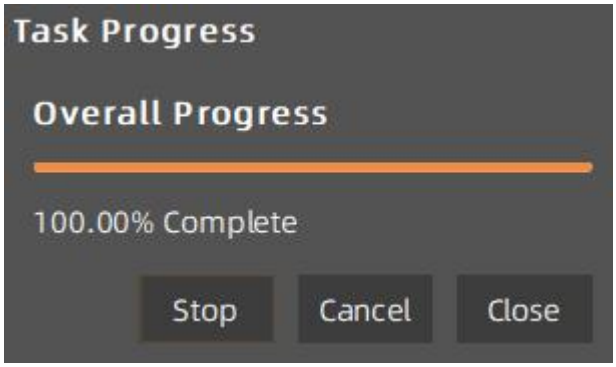


Figure: Task Progress

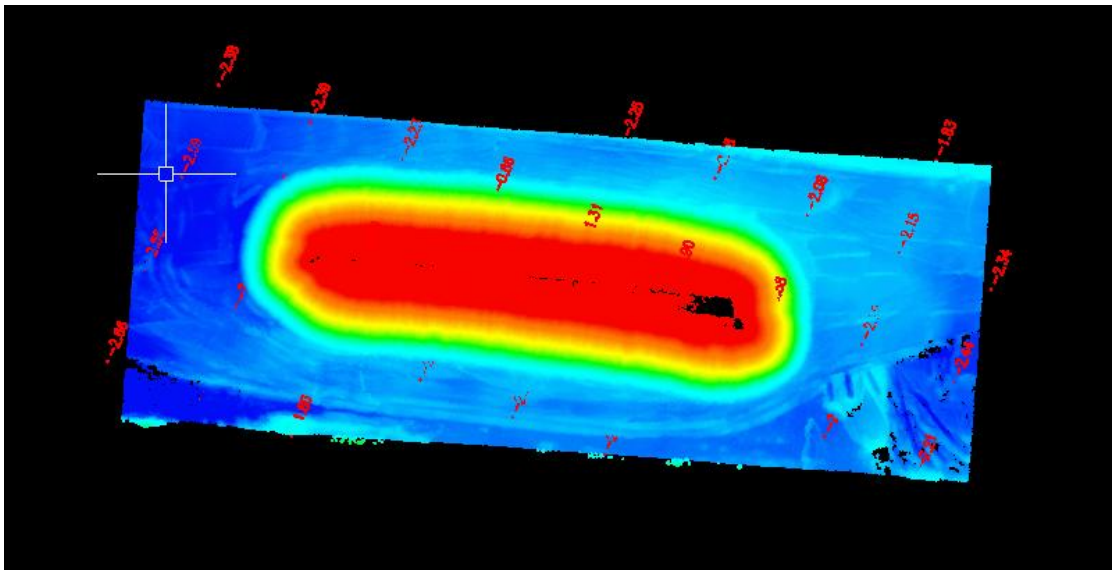


Figure: Generated Elevation Points

2.6.10Raster Editing

2.6.10.1 Start Editing

Function Description:

Enables the raster editing function, allowing editing of DEM/DSM features u sing tools.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button. The button highligh ts, enabling the raster editing function.

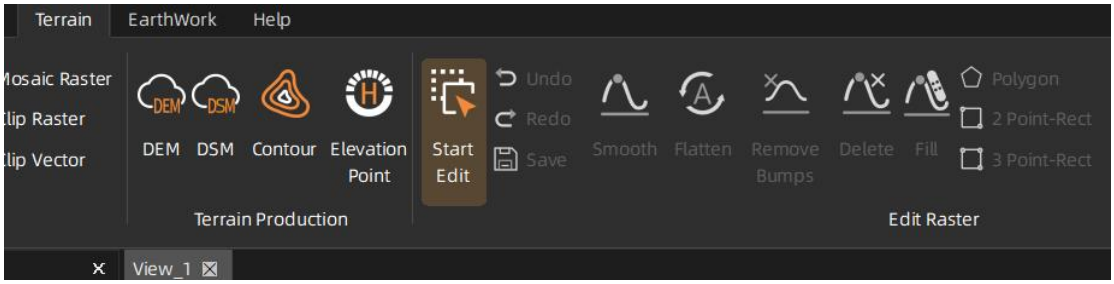


Figure: Start Editing Button

2. After activating Start Editing, the button remains highlighted. The currentl y active 3D view automatically switches to 2D mode, allowing rotation only around the Z-axis. It can be manually switched back to 3D mode.

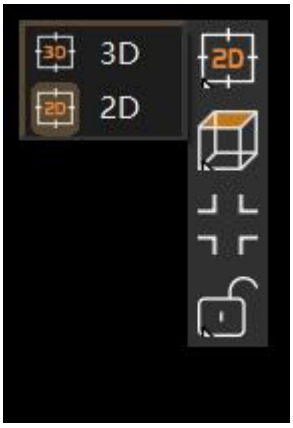


Figure: 2D Mode

2.6.10.2 Undo

Function Description:

Undoes the previous raster editing result.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Perform raster editing, then click the Undo button to undo the previous editing result.

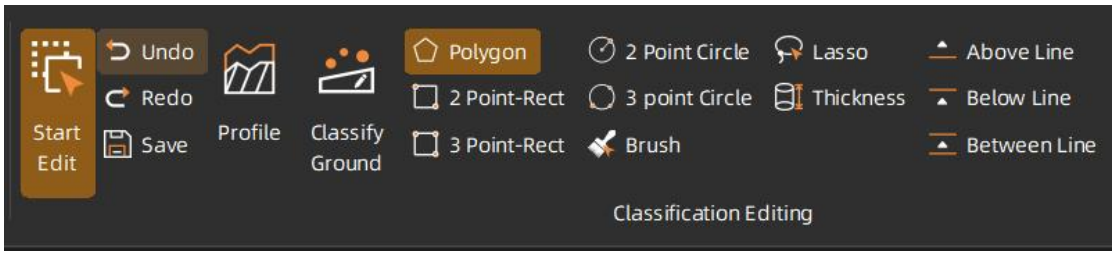


Figure: Undo Button

2.6.10.3 Redo

Function Description:

Redoes the previously undone raster editing result.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Perform raster editing, then click the Undo button to undo the previous editing result.

3. Click the Redo button to restore the last undone editing result.

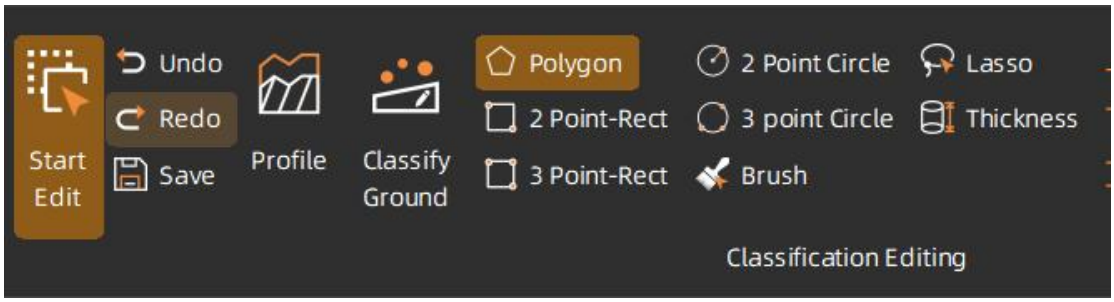


Figure: Redo Button

2.6.10.4 Smooth Elevation

Function Description:

Smooths the elevation within a selected range.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Click the Smooth Elevation button. The Polygon tool is activated by defa ult. You can select different drawing tools as needed.



Figure: Smooth Elevation Button

3. Draw a polygon area. The elevation within the range is smoothed.

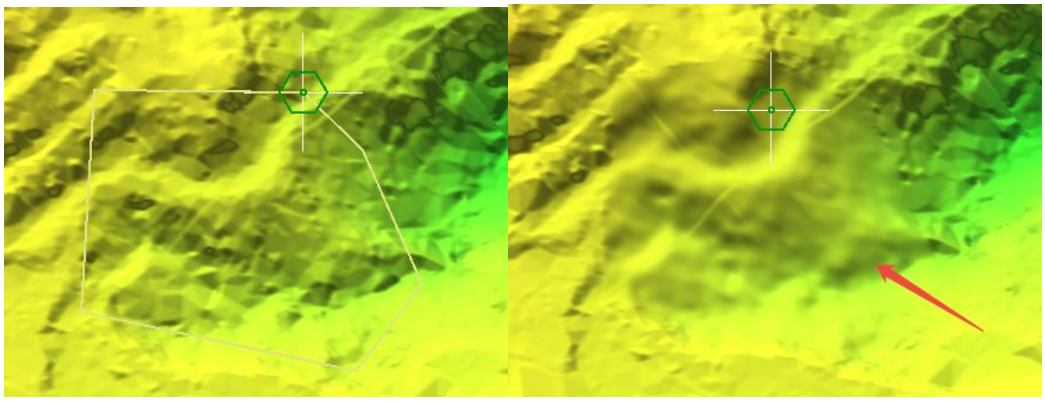


Figure: Smooth Elevation Result

2.6.10.5 Set Elevation Constant

Function Description:

Changes the elevation within a selected range to a fixed value.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Click the Set Elevation Constant button. The parameter dialog box appea

rs.



Figure: Set Elevation Constant Button



Figure: Set Elevation Constant Dialog Box

3. Set the elevation value in the dialog box. You can manually enter a specific elevation or click the "Pick Elevation" button to select a point in the view; its elevation will automatically fill the input box.

4. The Polygon tool is activated by default. You can select different drawing tools as needed. Draw the range area. The elevation within the range is modified to the set value.

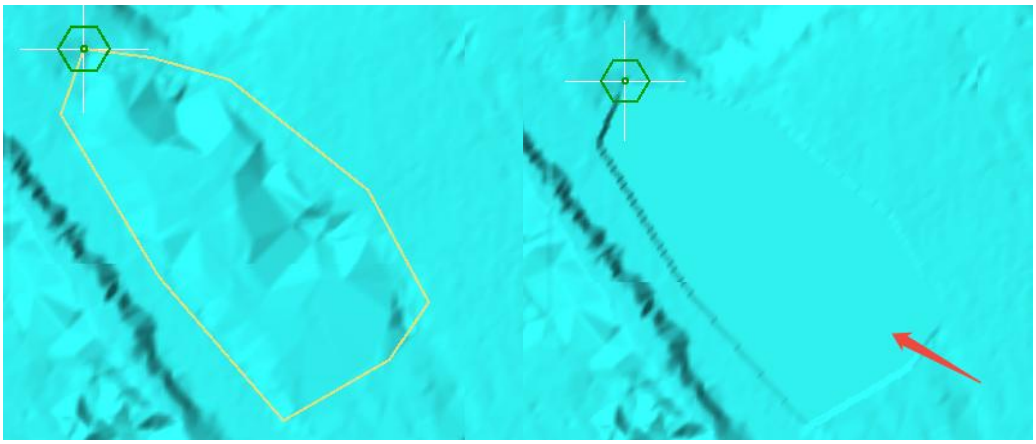


Figure: Set Elevation Constant Result

2.6.10.6 Remove Bumps

Function Description:

Eliminates raised elevations (bumps) within a selected range.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Click the Remove Bumps button. The parameter dialog box appears.

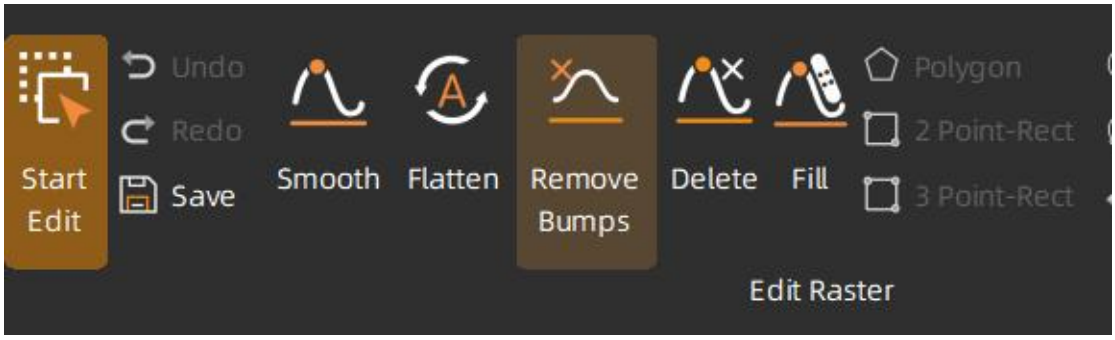


Figure: Remove Bumps Button



Figure: Remove Bumps Dialog Box

3. Set the Elevation Standard Deviation in the dialog box. Default is 0.1. Smaller values result in a flatter surface.

4. The Polygon tool is activated by default. You can select different drawing tools as needed. Draw the range area. Convex features within the range are smoothed out.

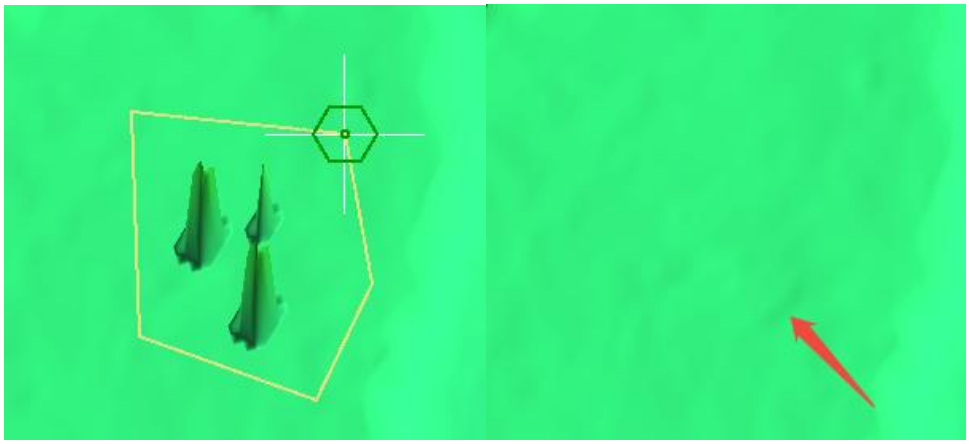


Figure: Remove Bumps Result

2.6.10.7 Delete Elevation

Function Description:

Deletes elevation data within a selected range.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Click the Delete Elevation button. The Polygon tool is activated by defaul t. You can select different drawing tools as needed.



Figure: Delete Elevation Button

3. Draw the range area. The elevation data within the range is deleted (bec

omes NoData).

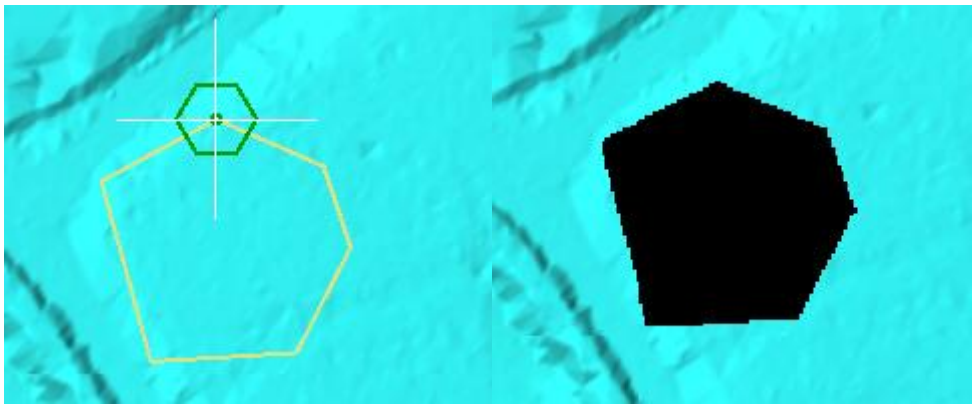


Figure: Delete Elevation Result

2.6.10.8 Fill Elevation

Function Description:

Fills areas with no elevation data (holes) within a selected range.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Click the Fill Elevation button. The Polygon tool is activated by default. You can select different drawing tools as needed.

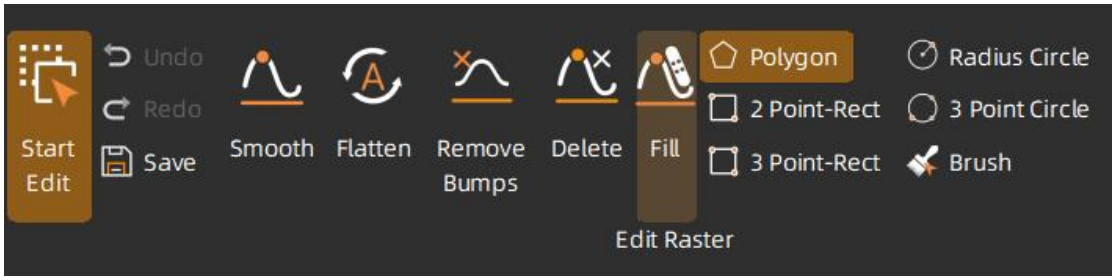


Figure: Fill Elevation Button

3. Draw the range area. The holes within the range are filled.

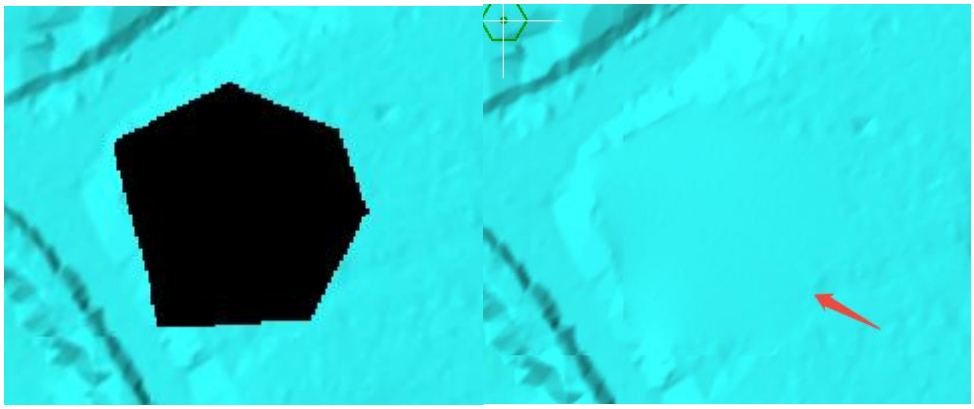


Figure: Fill Elevation Result

2.6.10.9 Polygon

Function Description:

Range selection tool. Draws a polygon range by clicking multiple points.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.
2. Select a raster editing mode: "Smooth Elevation / Set Elevation Constant / Remove Bumps / Delete Elevation / Fill Elevation". The Polygon tool is activated by default.

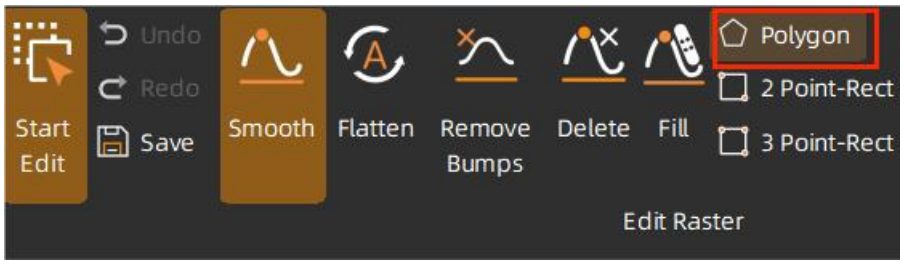


Figure: Polygon Button

3. Left-click in the view to select points. Right-click "Undo Point" or use shortcut key U to undo the last point. Double-click to end drawing and comple

te the raster editing.

2.6.10.10Two-Point Rectangle

Function Description:

Range selection tool. Draws a rectangle by clicking two diagonal points.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Select a raster editing mode: "Smooth Elevation / Set Elevation Constant / Remove Bumps / Delete Elevation / Fill Elevation". The Polygon tool is activated by default.

3. Click the Two-Point Rectangle button. The button highlights.

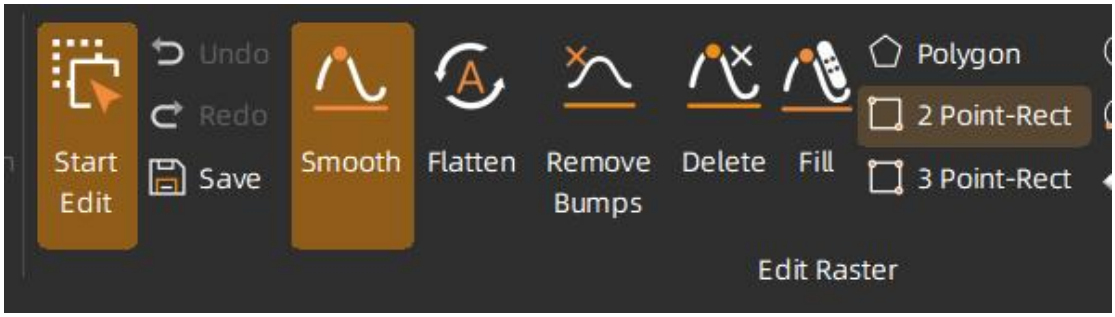


Figure: Two-Point Rectangle Button

4. Left-click two points in the view to define the rectangle. The drawing ends, and the raster editing is applied.

2.6.10.11Three-Point Rectangle

Function Description:

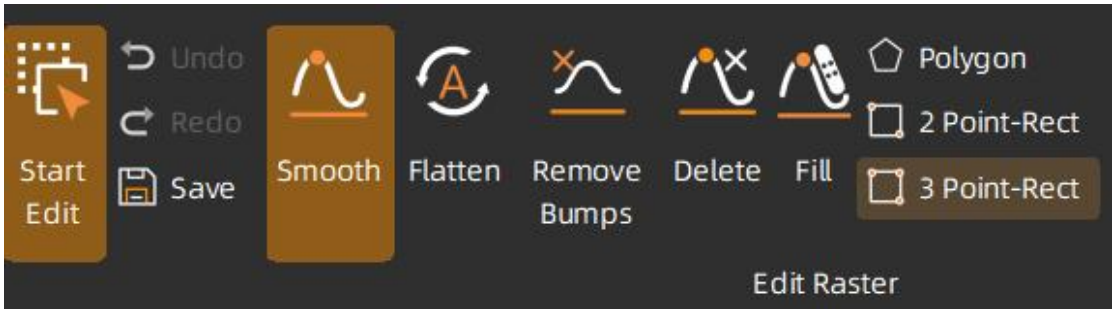
Range selection tool. Draws a rectangle by clicking three points.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Select a raster editing mode: "Smooth Elevation / Set Elevation Constant / Remove Bumps / Delete Elevation / Fill Elevation". The Polygon tool is activated by default.

3. Click the Three-Point Rectangle button. The button highlights.



Three-Point Rectangle Button

4. Left-click three points in the view to define the rectangle. The drawing ends, and the raster editing is applied.

2.6.10.12Radius Circle

Function Description:

Range selection tool. Draws a circle by clicking its center and a point on its circumference (center and radius).

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster

editing function.

2. Select a raster editing mode: "Smooth Elevation / Set Elevation Constant / Remove Bumps / Delete Elevation / Fill Elevation". The Polygon tool is act ivated by default.

3. Click the Radius Circle button. The button highlights.

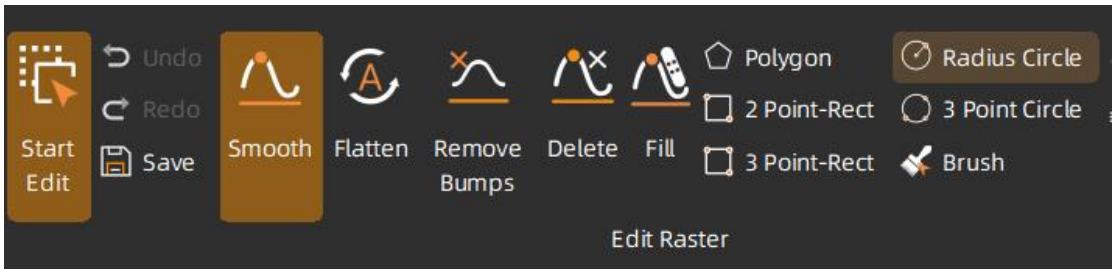


Figure: Radius Circle Button

4. Left-click two points in the view (center, then radius point). The drawing ends, and the raster editing is applied.

2.6.10.13Three-Point Circle

Function Description:

Range selection tool. Draws a circle by clicking three points on its circumfer ence.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Select a raster editing mode: "Smooth Elevation / Set Elevation Constant / Remove Bumps / Delete Elevation / Fill Elevation". The Polygon tool is act

ivated by default.

3. Click the Three-Point Circle button. The button highlights.

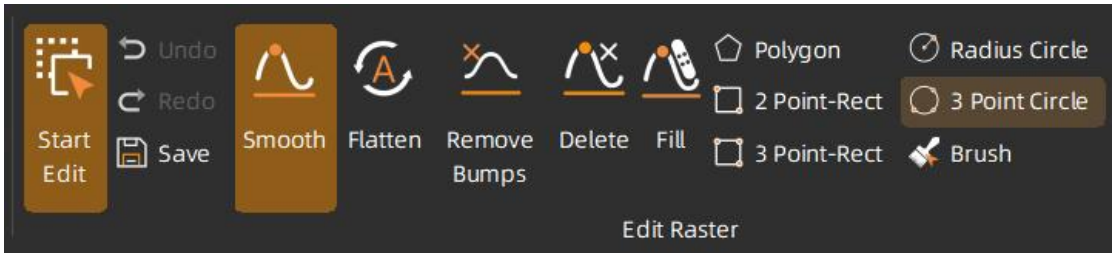


Figure: Three-Point Circle Button

4. Left-click three points in the view. The drawing ends, and the raster editi ng is applied.

2.6.10.14 Brush

Function Description:

Range selection tool. Draws a range by holding the left mouse button and dragging.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Select a raster editing mode: "Smooth Elevation / Set Elevation Constant / Remove Bumps / Delete Elevation / Fill Elevation". The Polygon tool is act ivated by default.

3. Click the Brush button. The button highlights.

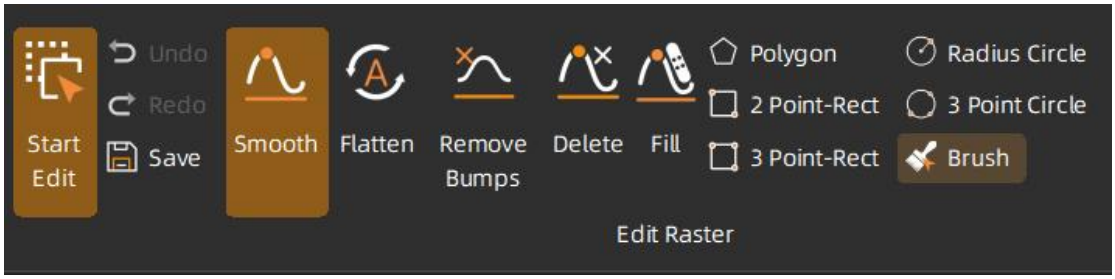


Figure: Brush Button

4. Hold the left mouse button and drag in the view. Release the mouse button. The drawing ends, and the raster editing is applied.

2.6.10.15 Breakline

Function Description:

Adjusts the elevation along a line to a uniform gradient based on set start and end elevations.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Click the Breakline button. The parameter dialog box appears.

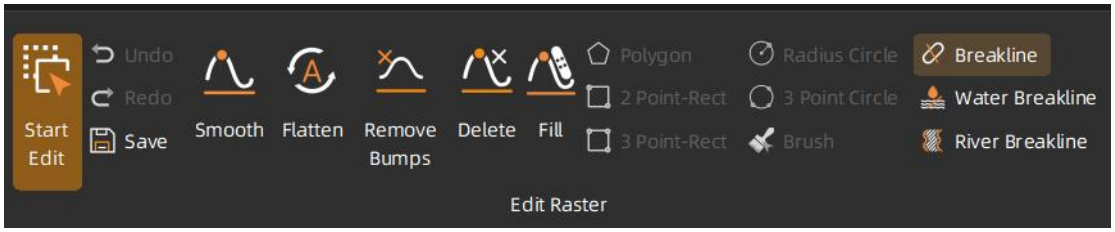


Figure: Breakline Button

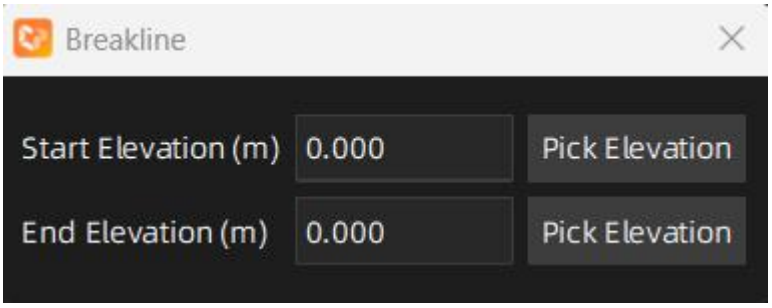


Figure: Breakline Dialog Box

3. Set the Start Elevation and End Elevation in the dialog box. You can manually enter specific elevations or click the "Pick Elevation" button to select points in the view; their elevations will automatically fill the corresponding input boxes.

4. Draw a polyline by clicking multiple points in the view. Double-click to end drawing. The elevation along the line is automatically adjusted to a uniform gradient based on the set start and end elevations.

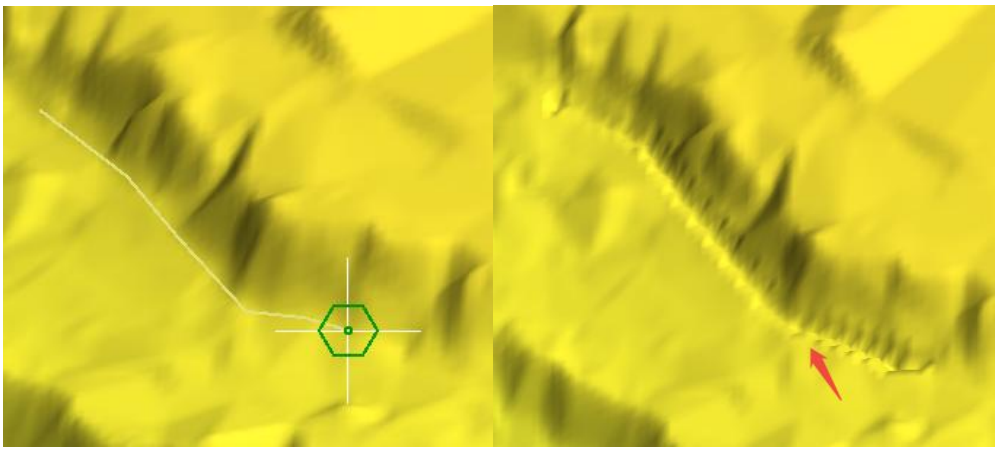


Figure: Breakline Result

2.6.10.16Water Body Breakline

Function Description:

Changes the elevation within a selected range to a fixed value.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Click the Water Body Breakline button. The parameter dialog box appears.

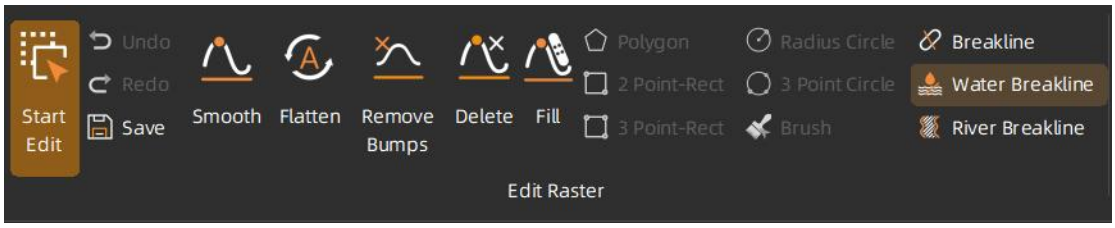


Figure: Water Body Breakline Button

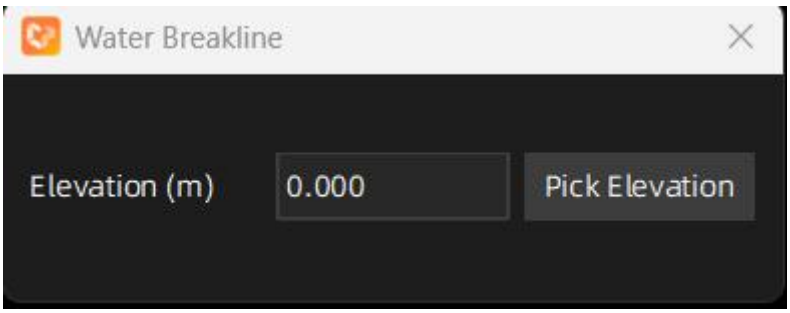


Figure: Water Body Breakline Dialog Box

3. Set the elevation in the dialog box. You can manually enter a specific elevation or click the "Pick Elevation" button to select a point in the view; its elevation will automatically fill the input box.

4. Draw a polygon by clicking multiple points in the view. Double-click to end drawing. The elevation within the polygon is modified to the set value.

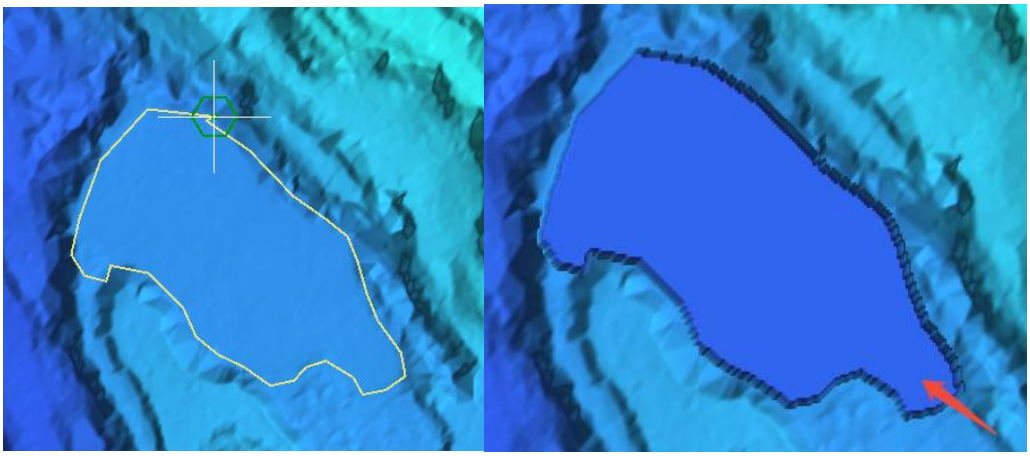


Figure: Water Body Breakline Result

2.6.10.17River Breakline

Function Description:

Draws two lines. Adjusts the elevation of the area between them to a unif orm gradient based on set start and end elevations.

Operation Steps:

1. Click Terrain -> Raster Editing -> Start Editing button to enable the raster editing function.

2. Click the River Breakline button. The parameter dialog box appears.

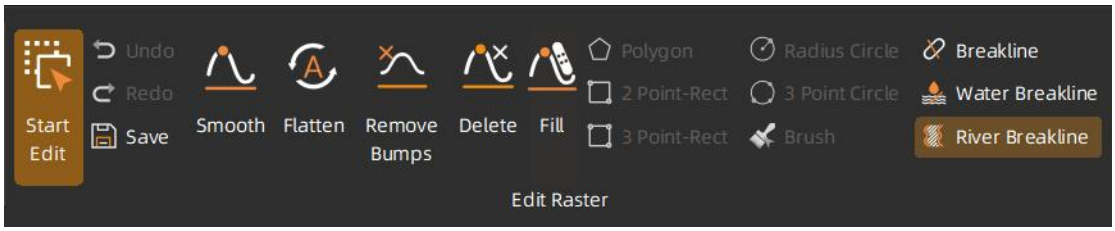


Figure: River Breakline Button



Figure: River Breakline Dialog Box

3. Set the Start Elevation and End Elevation in the dialog box. You can manually enter specific elevations or click the "Pick Elevation" button to select points in the view; their elevations will automatically fill the corresponding input boxes.

4. Draw the first polyline by clicking multiple points in the view. Double-click to end drawing.

5. Draw the second polyline by clicking multiple points in the view. Double-click to end drawing. The elevation of the area between the two lines is automatically adjusted to a uniform gradient based on the set start and end elevations.

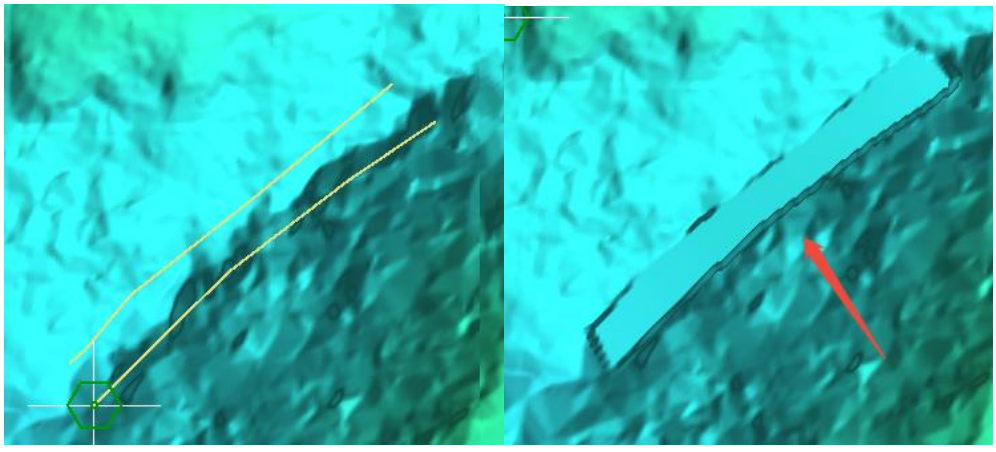


Figure: River Breakline Result

2.6.11Contour Editing

2.6.11.1Start Editing

Function Description:

Starts contour editing.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button. The function buttons in the Contour Editing group are activated (normally grayed out).



Figure: Activate Start Editing

2. Click Terrain Module -> Contour Editing -> Start Editing button again. The Start Editing button is grayed out. The function buttons in the Contour Editing group are also grayed out.

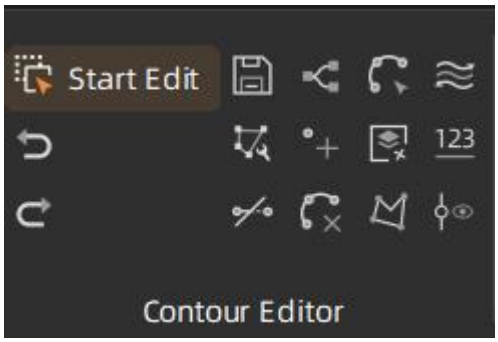


Figure: Click Start Editing Again

2.6.11.2Undo

Function Description:

Undoes the previous contour editing result.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out). Perform contou r editing, then click the Undo button to undo the previous editing result.

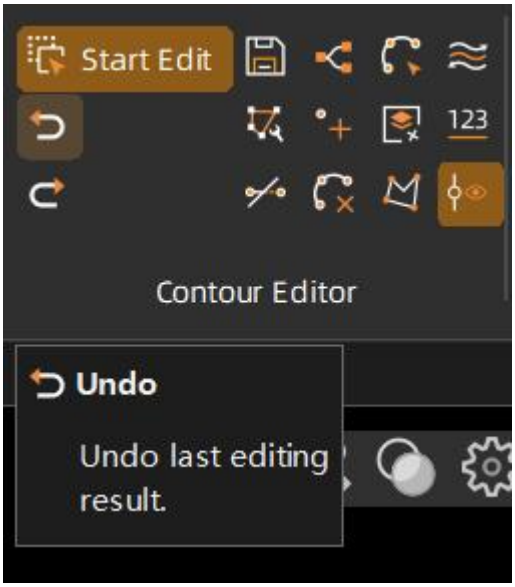


Figure: Undo Button

2.6.11.3Redo

Function Description:

Redoes the previously undone contour editing result.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat

e the Contour Editing group buttons (normally grayed out). Perform contou r editing, then click the Undo button to undo the previous editing result. Cl ick the Redo button to restore the last undone editing result.

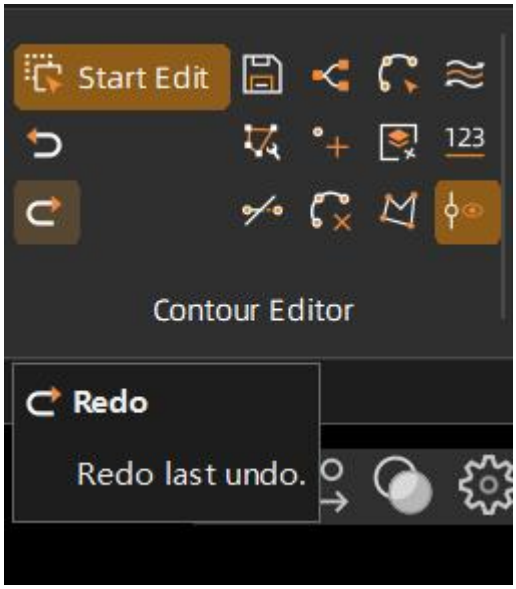


Figure: Redo Button

2.6.11.4Save

Function Description:

Saves the contour editing results.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Save button. The Save Drawing Settings dialog b ox appears.

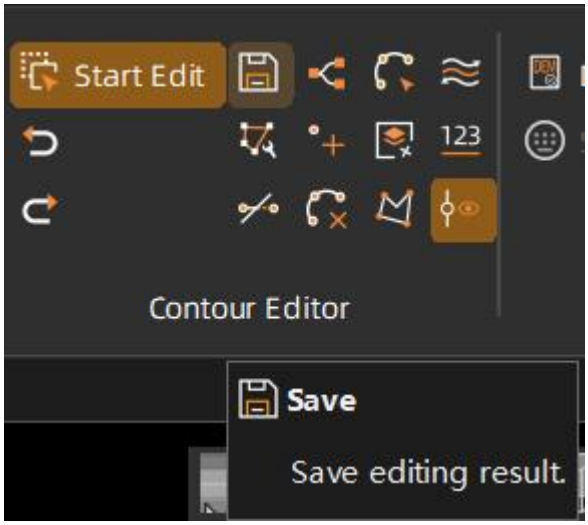


Figure: Save Button

3. Choose a path, enter a file name, select a save type, and click the Save button to save the contour editing drawing.

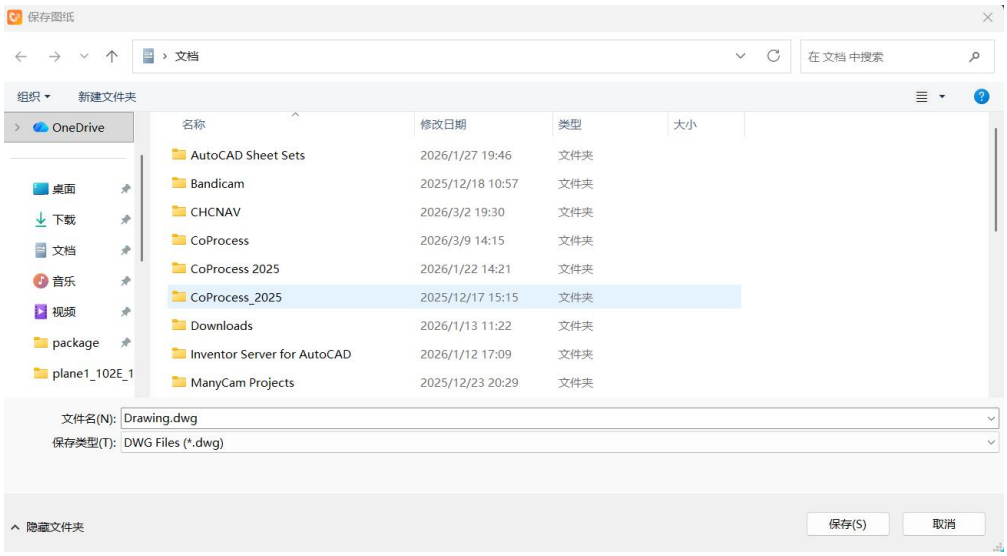


Figure: Save Drawing Settings Interface

2.6.11.5Contour Refinement

Function Description:

Draws a polyline on an existing contour to refine and replace a local segm ent of the contour.

Operation Steps:

1. Click Terrain Module -> Start Editing button -> Refine button.

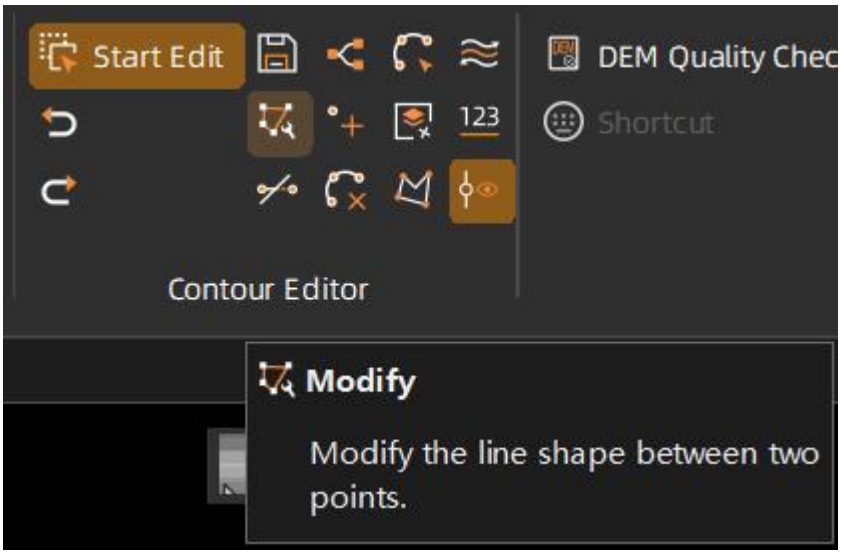


Figure: Refine Button

2. Set the refinement fitting flag.

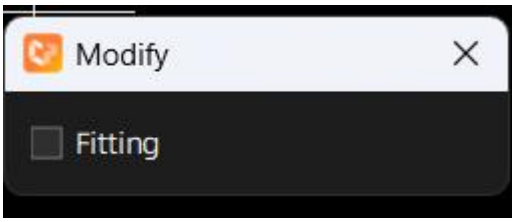


Figure: Fitting Settings

3. Move the mouse. Click the left mouse button sequentially to draw a pol yline. Ensure the polyline intersects the target contour at two or more poin ts.

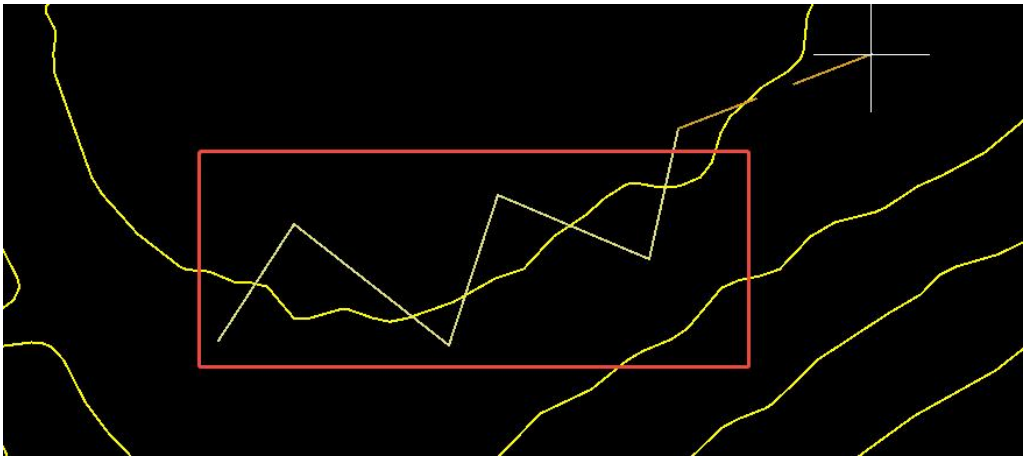


Figure: Draw Polyline

4. Right-click to open the context menu.

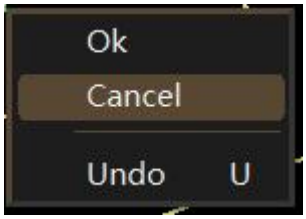


Figure: Right-click Menu

5. Press Enter or click Confirm to complete the refinement operation.

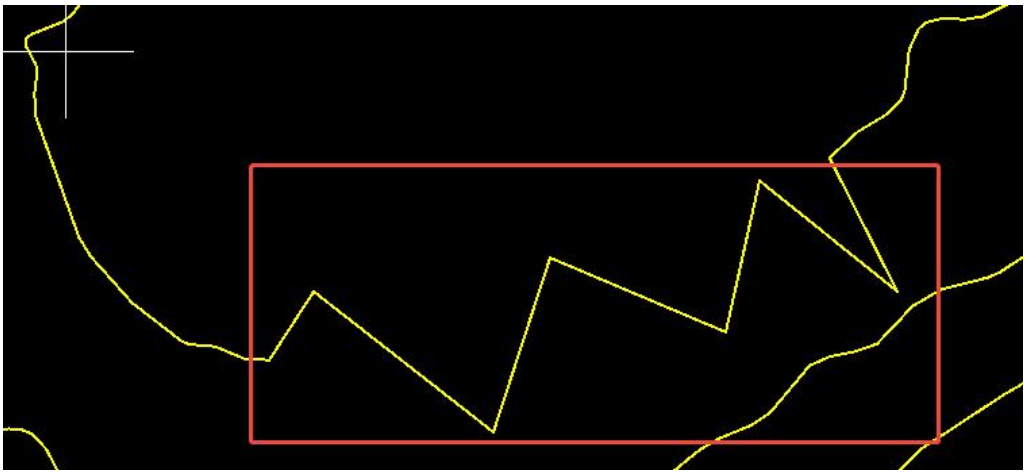


Figure: Complete Refinement

6. Press Esc or click Cancel to interrupt the refinement operation.

7. Click Undo Point (or press U) to delete the last drawn node (button gray ed out if no node to delete).

2.6.11.6Contour Break

Function Description:

Breaks an existing contour into several subsets.

Operation Steps:

1. Click Terrain Module -> Start Editing button -> Break button.

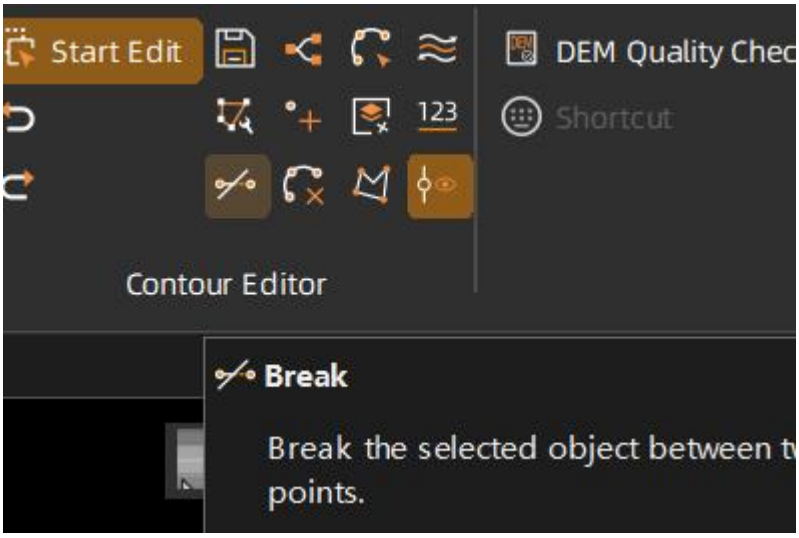


Figure: Break Button

2. Left-click on an existing contour as the break start point.

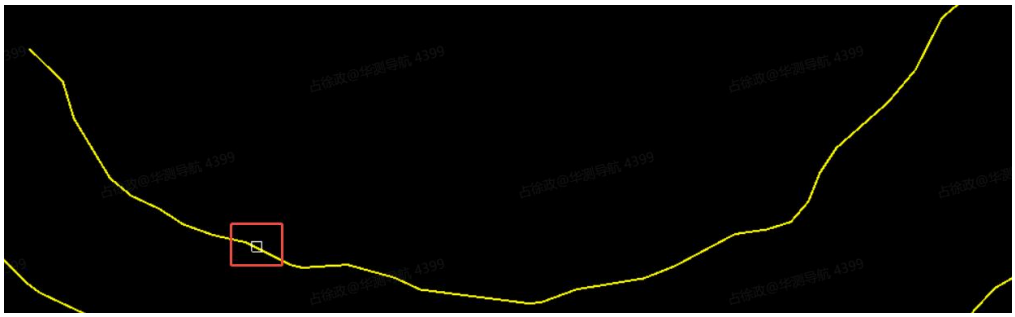


Figure: Break Start Point

3. Drag the mouse. The contour will be divided into segments. The grayed-out part is the segment to be deleted. The highlighted parts are the retain ed sub-segments.

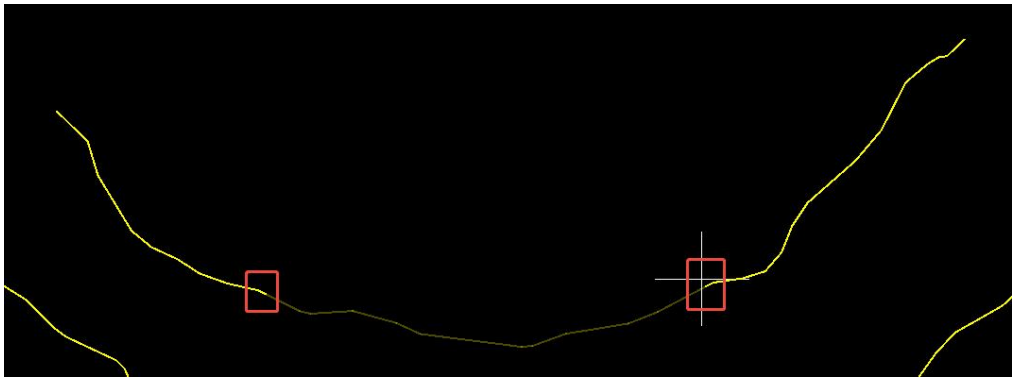


Figure: Mouse Interaction

4. Right-click to open the context menu.

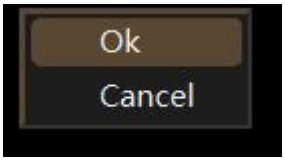


Figure: Right-click Menu

5. Press Enter, click Confirm, or left-click to complete the break operation.



Figure: Complete Break

6. Press Esc or click Cancel to interrupt the break operation.

2.6.11.7Connect

Function Description:

Draws a range. Connects broken contours within that range.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Connect button. The Batch Connect dialog box a ppears, with "Fit" selected by default.



Figure: Connect Button

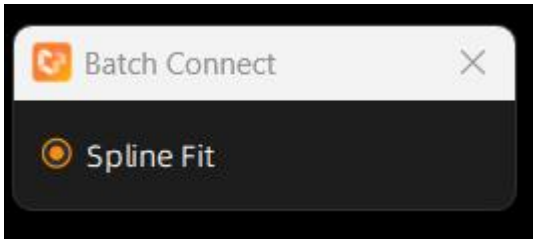


Figure: Batch Connect

3. Draw a range line in the view. Right-click the Confirm button. Broken co ntours within the range are automatically connected.

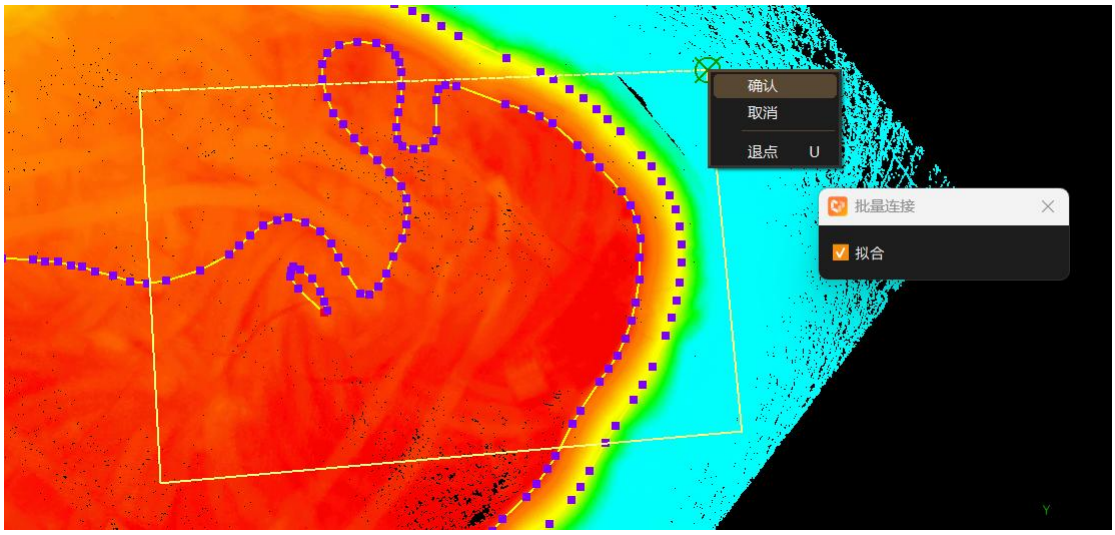


Figure: Draw Range Line

2.6.11.8Add Vertex

Function Description:

Adds a vertex to a contour.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Add Vertex button. The cursor changes to a cros shair.

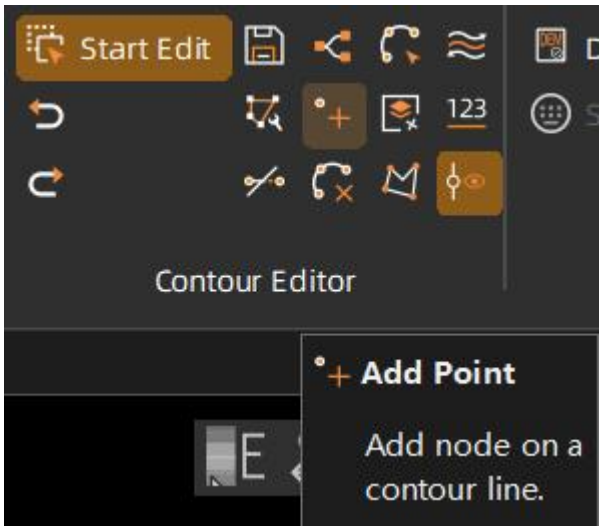


Figure: Add Vertex Button

3. Left-click on the contour between two adjacent vertices to enter add vert ex mode. Left-click again at any desired location in the view to add the ver tex.

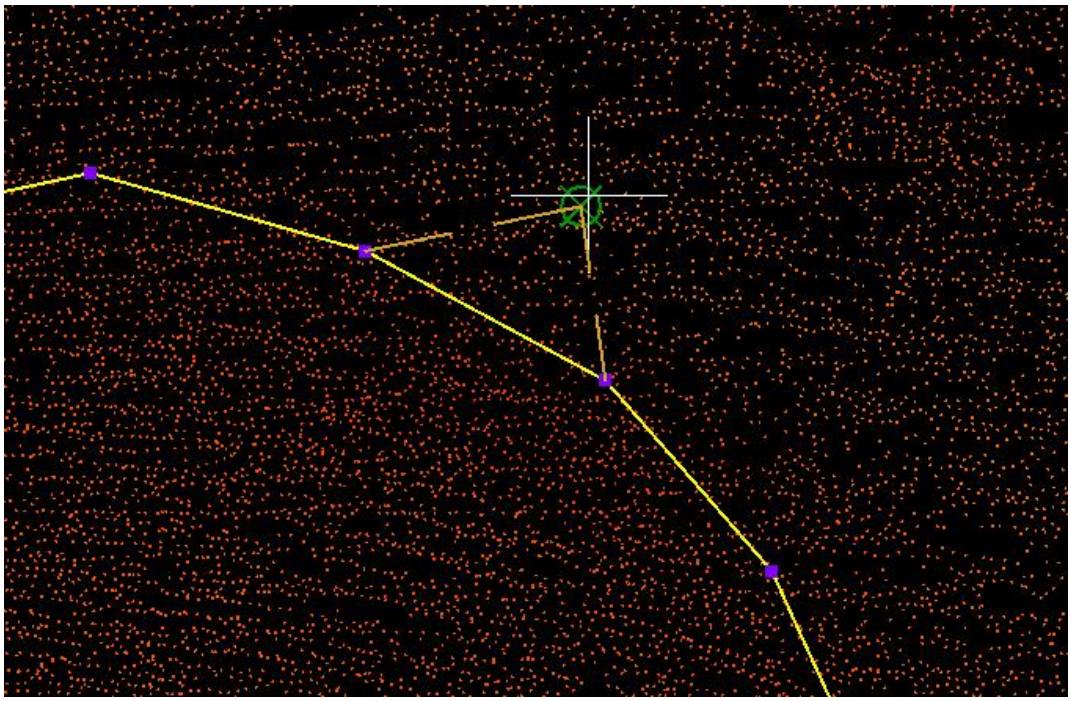


Figure: Add Vertex

2.6.11.9Delete Vertex

Function Description:

Deletes a vertex from a contour.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Delete Vertex button. The cursor changes to a c rosshair.

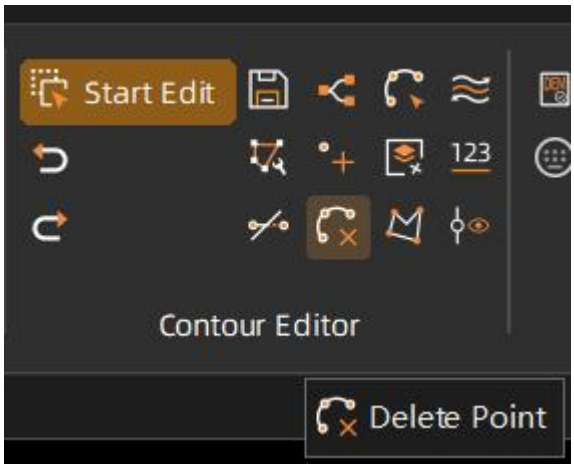


Figure: Delete Vertex Button

3. In the view, select the vertex to delete. The vertex is deleted, and its adj acent vertices are automatically connected.

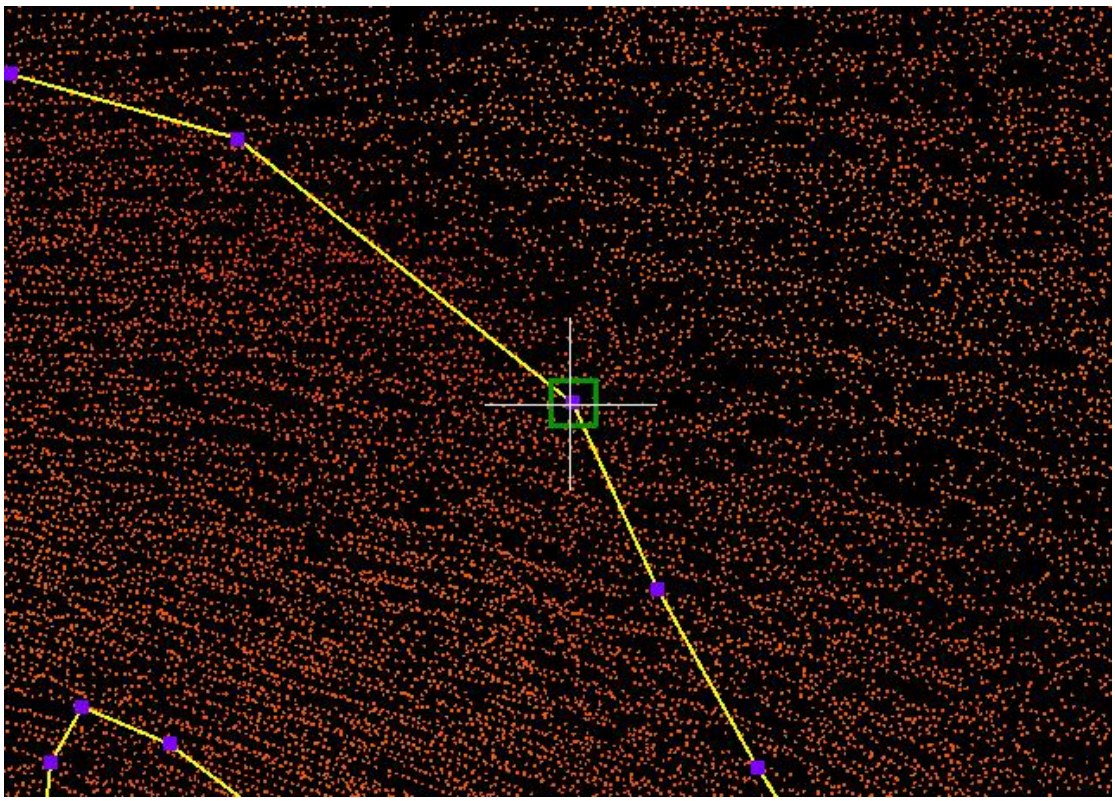


Figure: Delete Vertex

2.6.11.10Move Vertex

Function Description:

Moves a vertex on a contour.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Delete Vertex button. The cursor changes to a c rosshair.

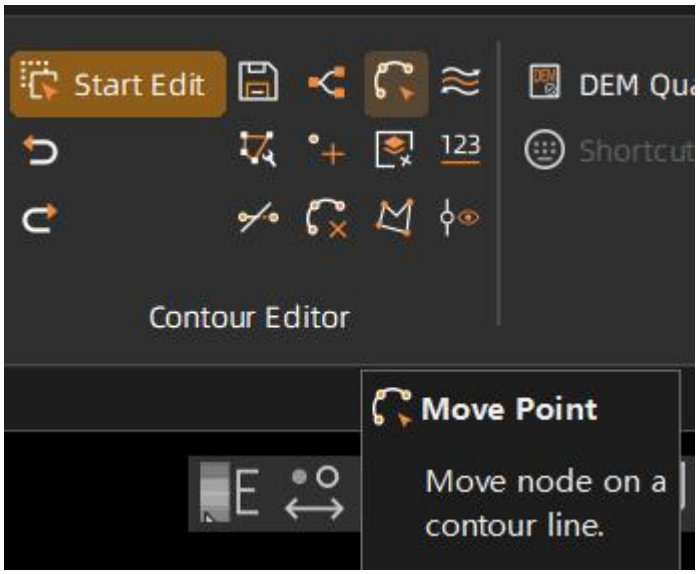


Figure: Move Vertex Button

3. In the view, select the vertex to move. Then left-click at any desired loca tion in the view to move the vertex to that position.

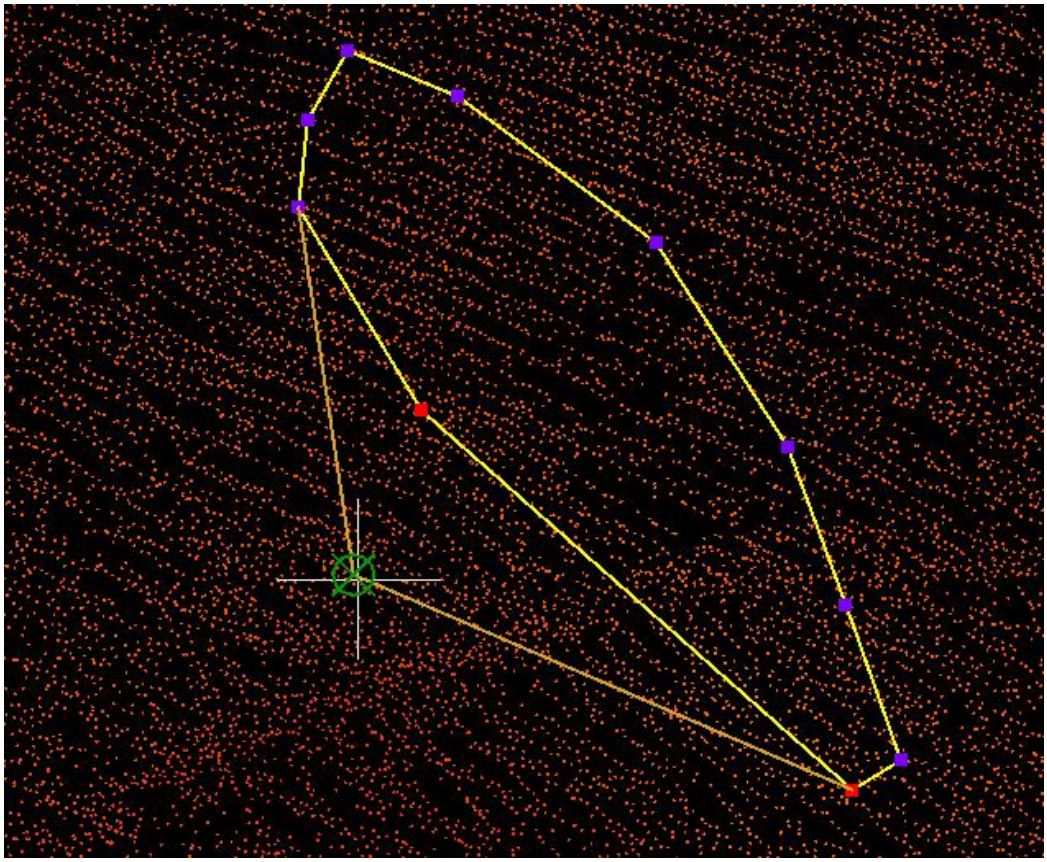


Figure: Move Vertex

2.6.11.11Clip by Layer

Function Description:

Clips line segments in one layer using polygons from another layer.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Clip by Layer button. The Clip by Layer dialog b ox appears.

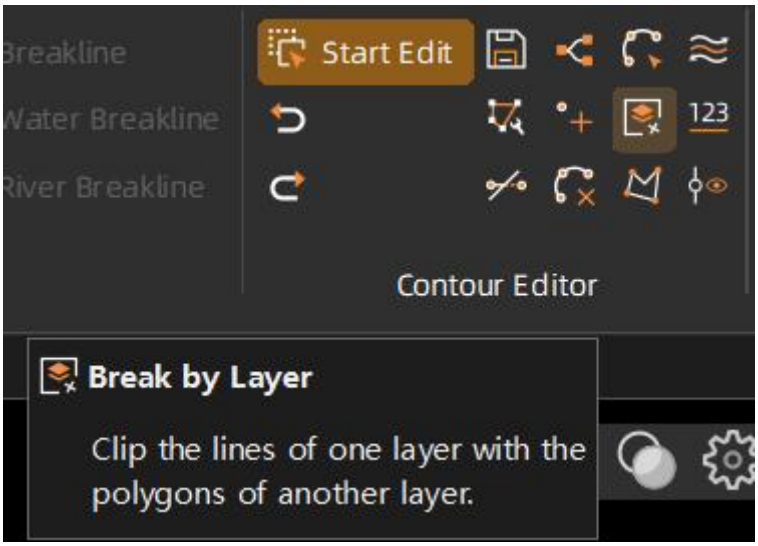


Figure: Clip by Layer Button

3. Set the Target Layer and Boundary Layer. Choose to keep the exterior o r interior. Click the Confirm button to complete the layer clipping.

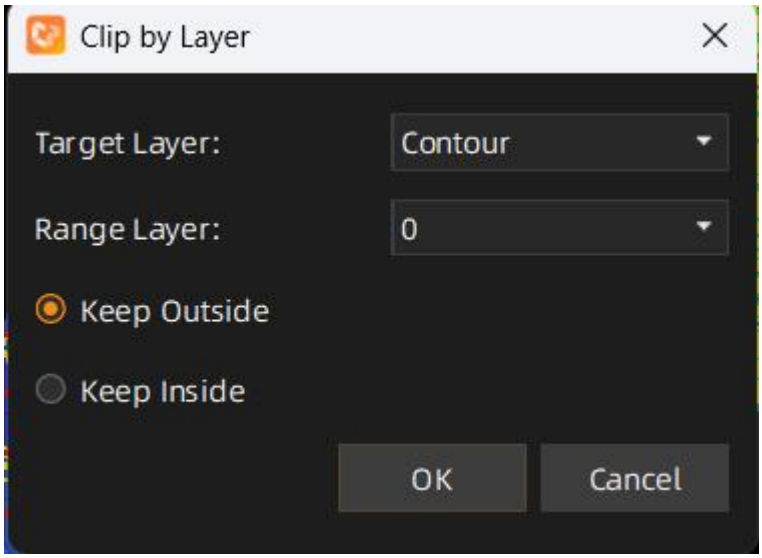


Figure: Clip by Layer

2.6.11.12Draw Contour

Function Description:

Manually draws a contour with a specified elevation value.

Operation Steps:

1. Click Terrain Module -> Start Editing button -> Draw Contour button.

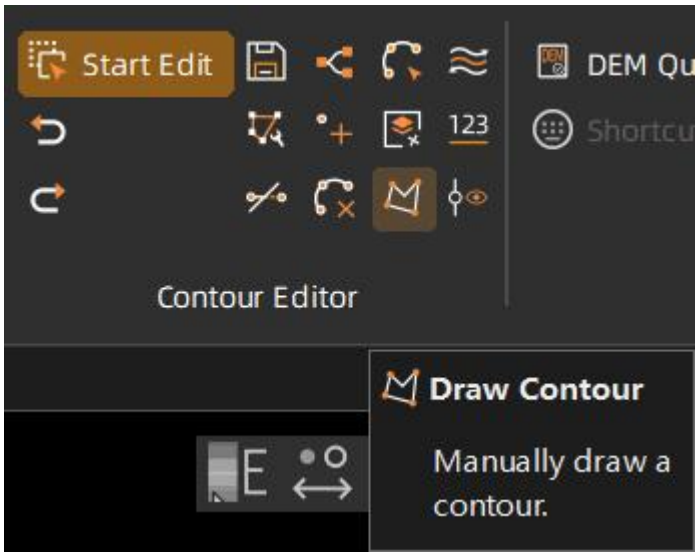


Figure: Draw Contour

2. Set the elevation value for the contour to be generated.



Figure: Set Elevation

3. Move the mouse in the view. Click the left mouse button sequentially to draw a polygon.

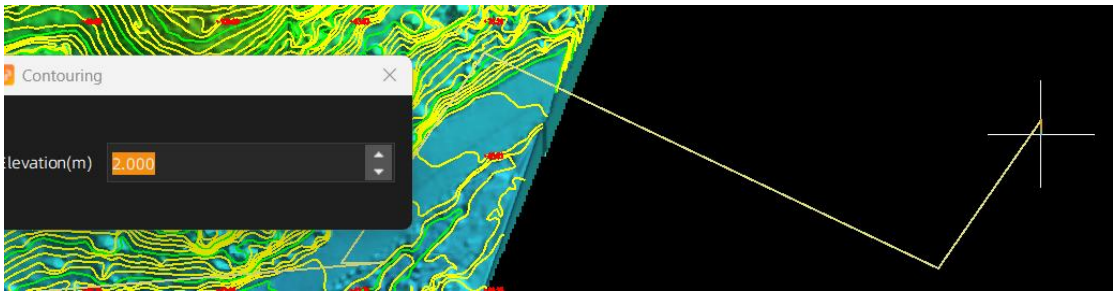


Figure: Draw Polygon

4. Right-click to open the context menu.



Figure: Right-click Menu

5. Press Enter or click Confirm to generate the contour.

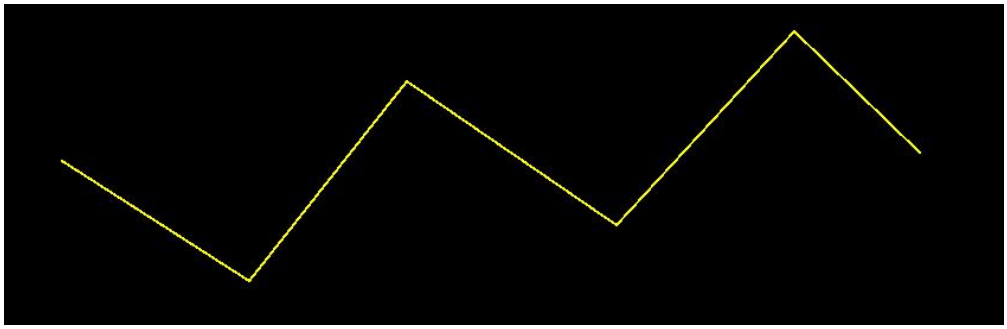


Figure: Confirm Generate Contour

6. Press Esc or click Cancel to interrupt the drawing operation.

7. Click Undo Point (or press U) to delete the last drawn node (button gray ed out if no node to delete).

2.6.11.13Smooth Simplify

Function Description:

Makes contours smoother.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Smooth/Simplify button. The Smoothing Settings

dialog box appears.

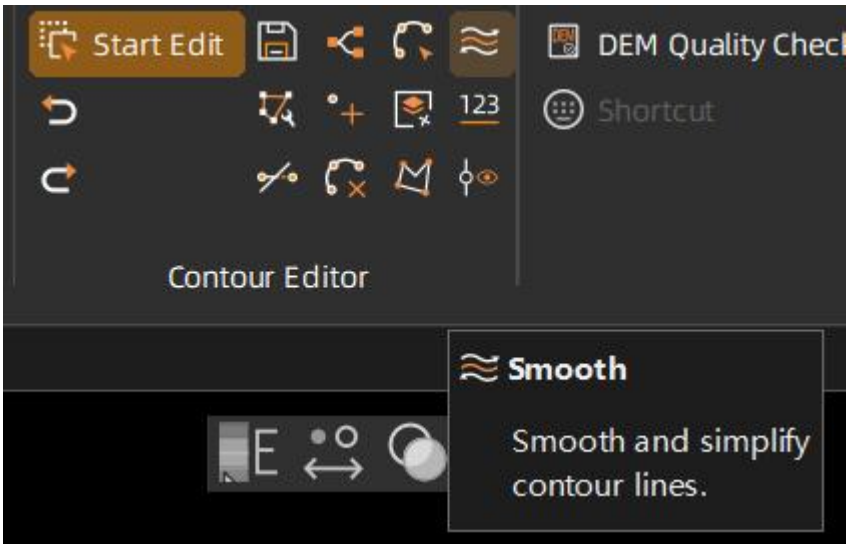


Figure: Smooth Settings Button

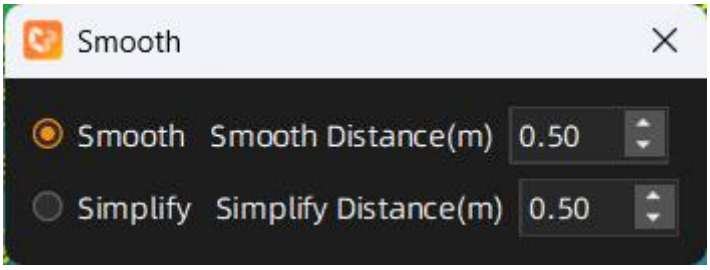


Figure: Smoothing Settings Dialog Box

3. Choose Smooth or Simplify. Set the corresponding distance parameter. L eft-click any contour. The contour is automatically smoothed or simplified.

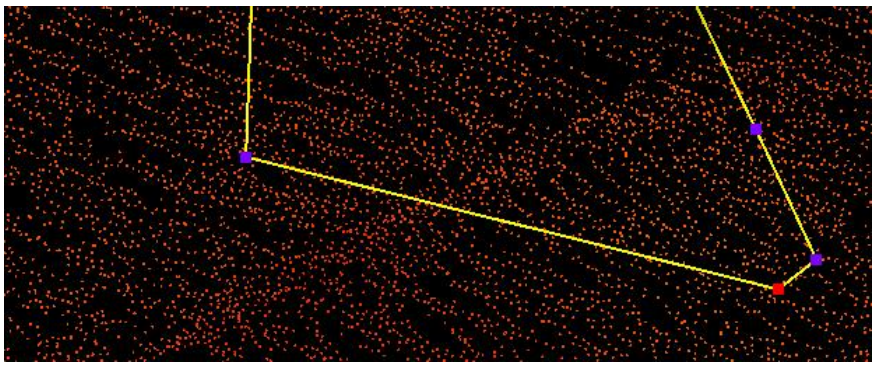


Figure: Smooth/Simplify

2.6.11.14Contour Annotation

Function Description:

Draws a line that crosses contours. Generates annotation points at the intersections.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activate the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Contour Annotation button. The Contour Annotation Decimal Places Setting dialog box appears.

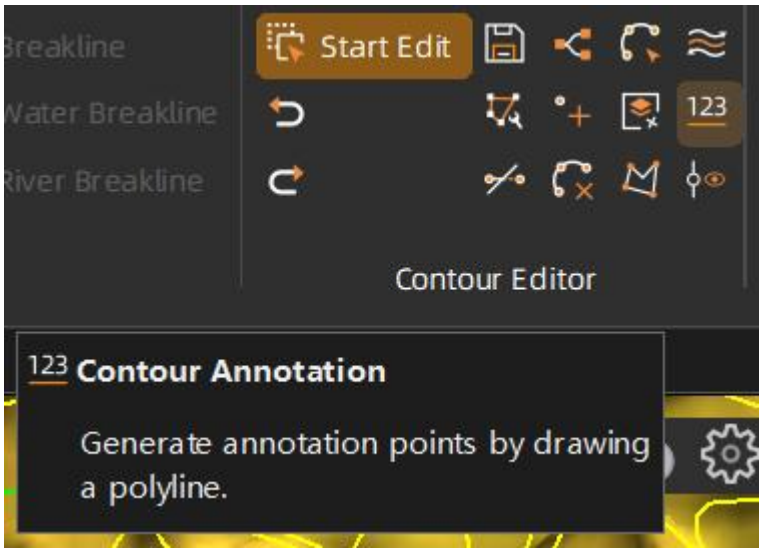


Figure: Contour Annotation Button

3. Set the number of decimal places. Draw a line crossing the contours. Right-click and click Confirm. Annotation points are generated at the intersections.



Figure: Contour Annotation Decimal Places Setting Dialog Box

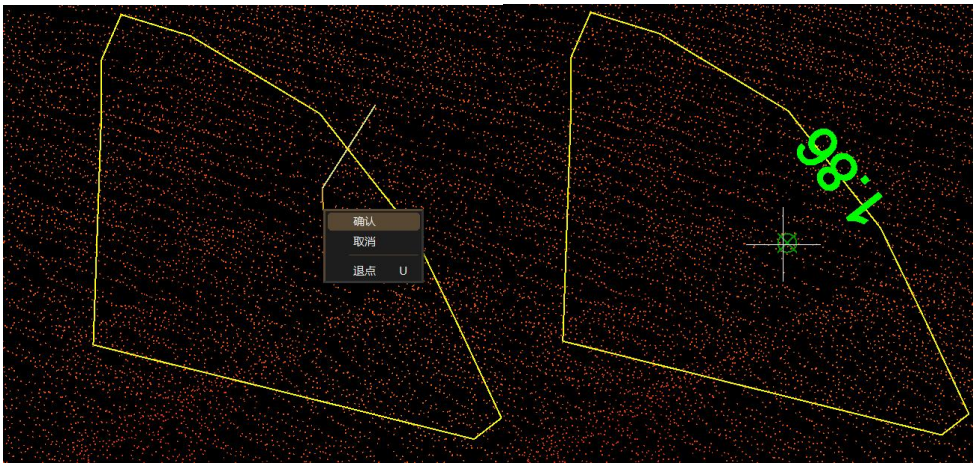


Figure: Contour Annotation

2.6.11.15 Show Vertices

Function Description:

Displays vertices on contours.

Operation Steps:

1. Click Terrain Module -> Contour Editing -> Start Editing button to activat e the Contour Editing group buttons (normally grayed out).

2. Click Contour Editing -> Show Vertices button. Vertices are displayed on t he contours.

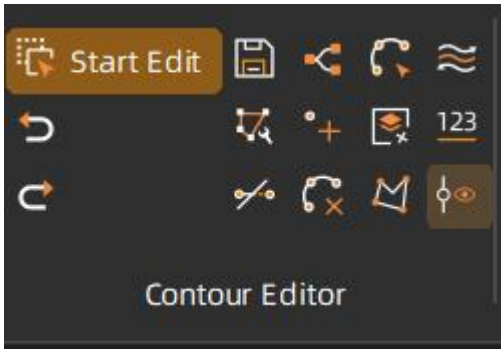


Figure: Show Vertices Button

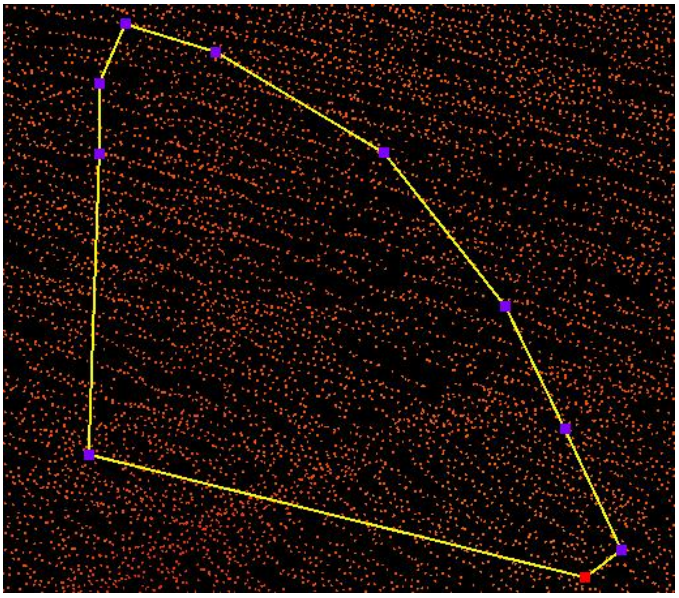


Figure: Show Vertices

2.6.12DEM Accuracy Assessment

Function Description:

Checks the elevation accuracy of a DEM based on checkpoints.

Operation Steps:

1. Click Terrain -> DEM Accuracy Assessment button.

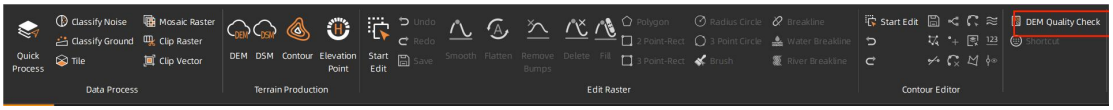


Figure: DEM Accuracy Assessment Button

2. In the DEM Accuracy Assessment interface, click the Add button to add t he DEM file(s) to be assessed.

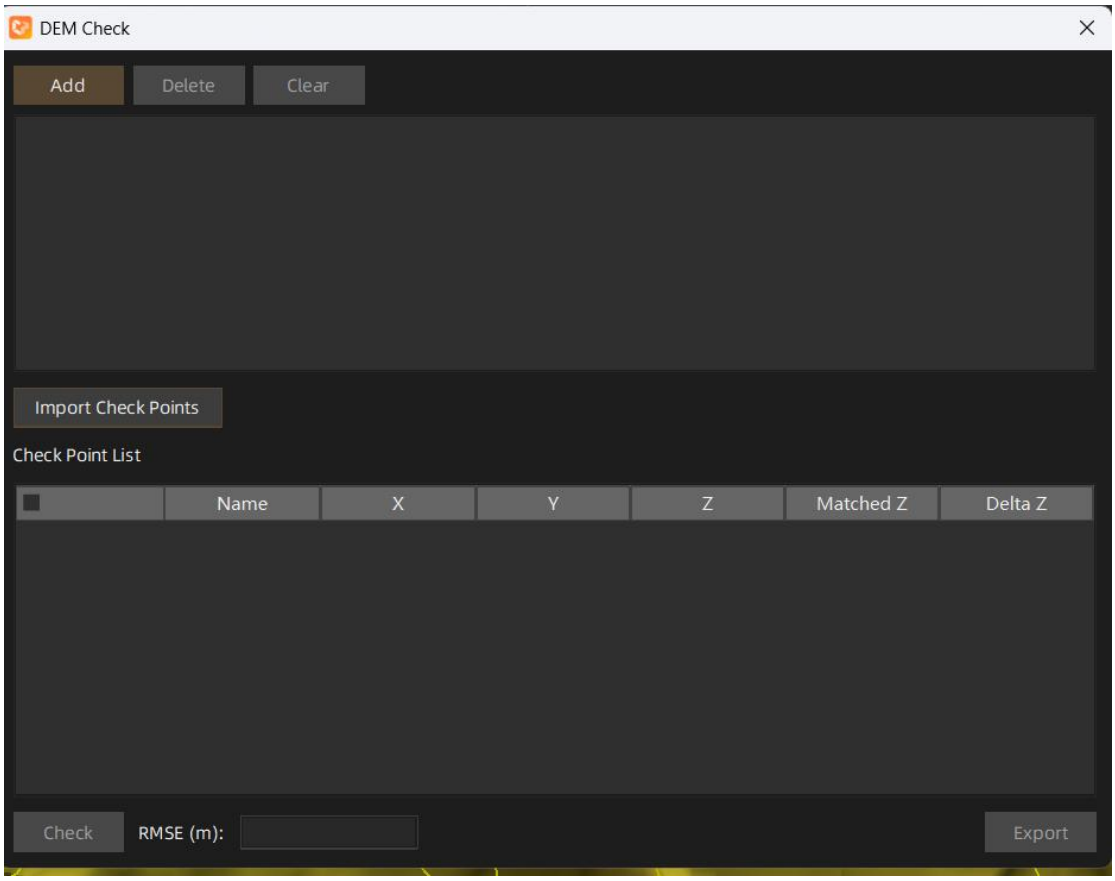


Figure: Add DEM File

3. Click the "Import Checkpoints" button to import the prepared checkpoint file.

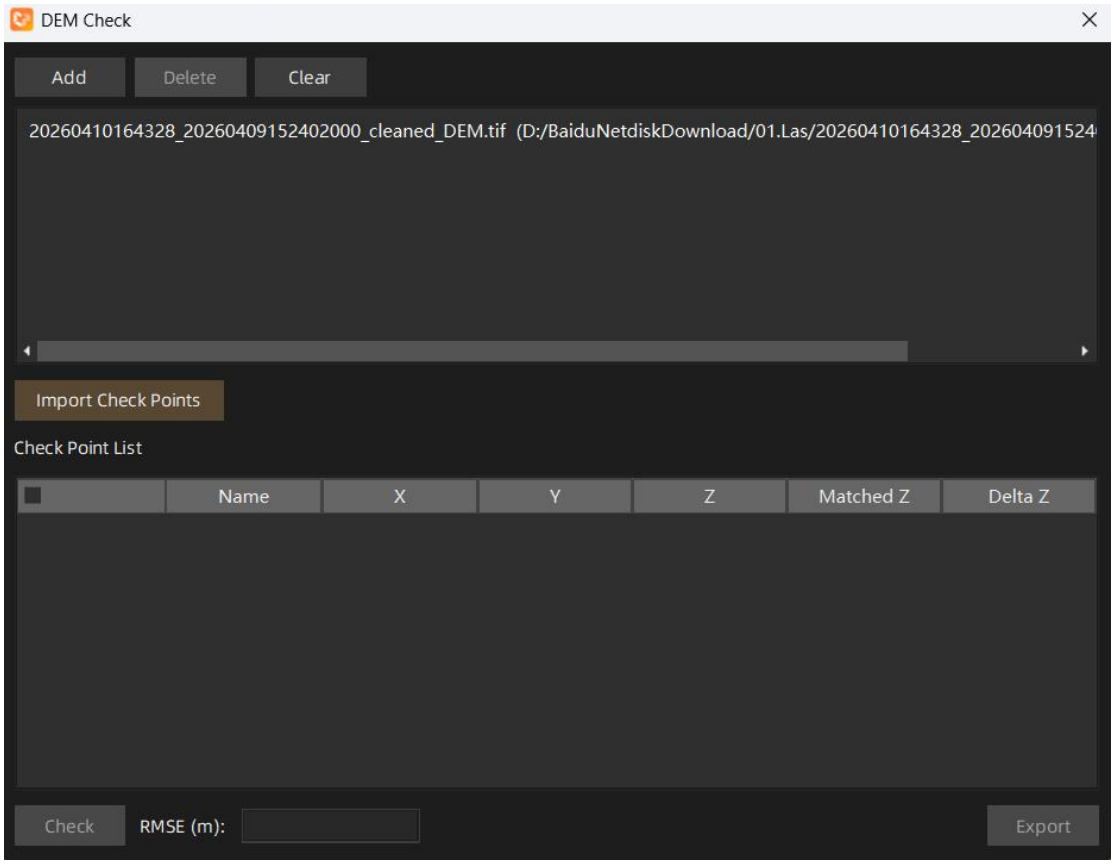


Figure: Add Checkpoints

4. Check the checkpoints to be used in the assessment. Click the "Check" button at the bottom left of the interface.

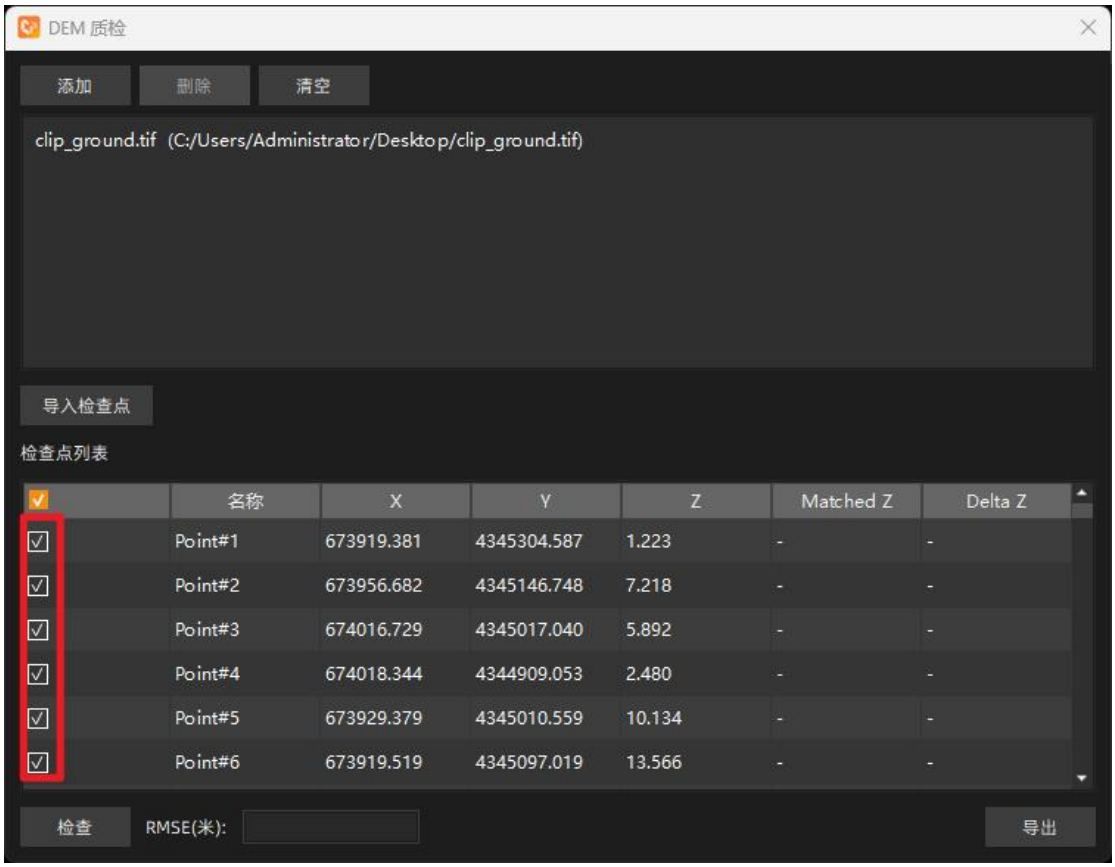


Figure: Check Coordinate Point Data

5. After the check is complete, points successfully matched to the DEM will have their Matched Z and Delta Z values filled in the checkpoint list. Points not matched will show '-'. Points not yet matched will show empty.

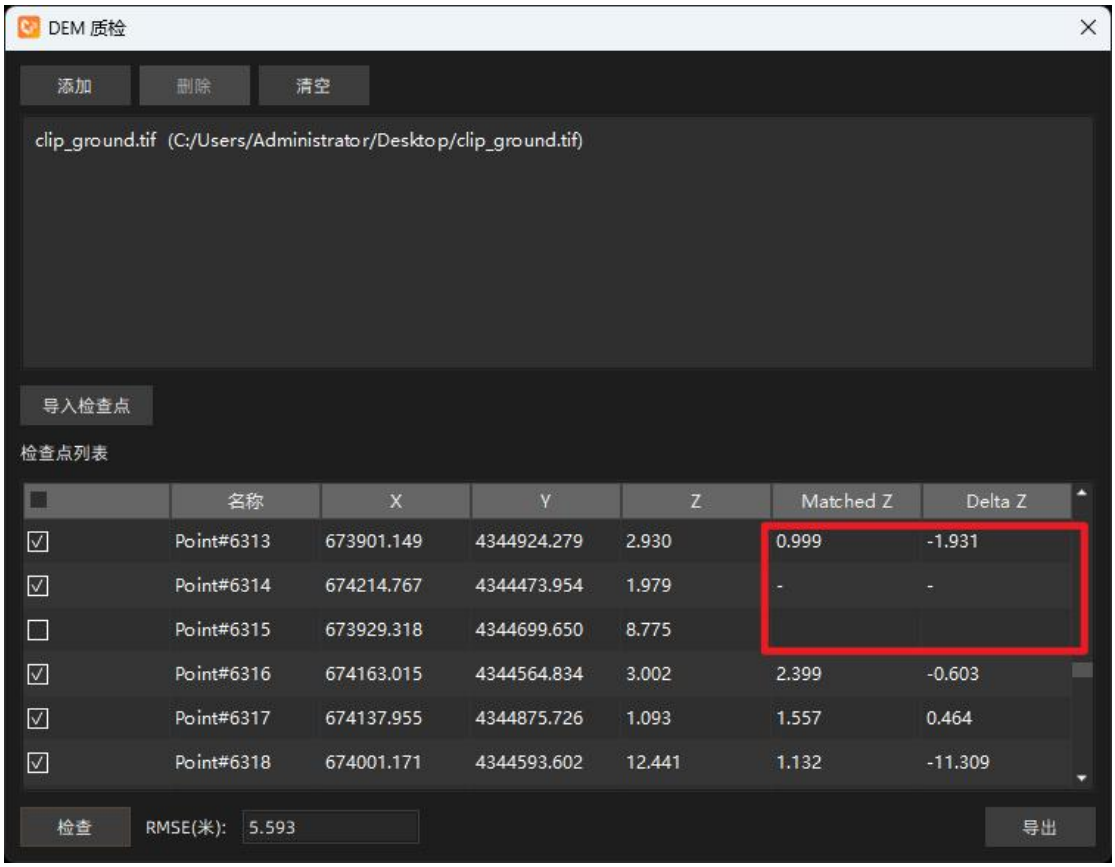


Figure: Check Result

6. Click the bottom right corner of the interface to select an output location and export the accuracy assessment report.

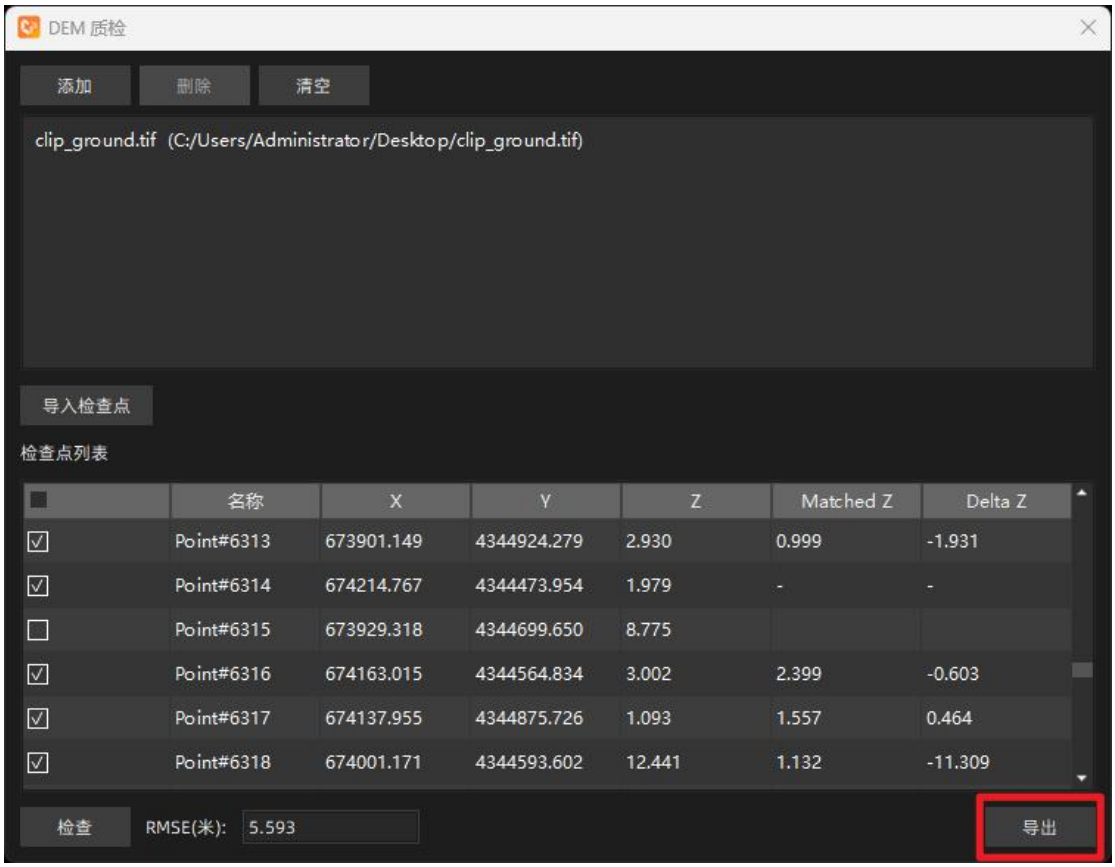


Figure: Export Accuracy Assessment Report

2.7 Engineering Module

2.7.1 One-Click Volume Calculation

Function Description:

Calculates point cloud volume based on TIN/Grid methods. Calculated results include Net Volume (Fill - Cut), Fill Volume, Cut Volume, Projected Area, and Surface Area.

Operation Steps:

1. Click Engineering -> Volume Calculation -> One-Click Volume Calculation. The Volume Calculation dialog box opens.

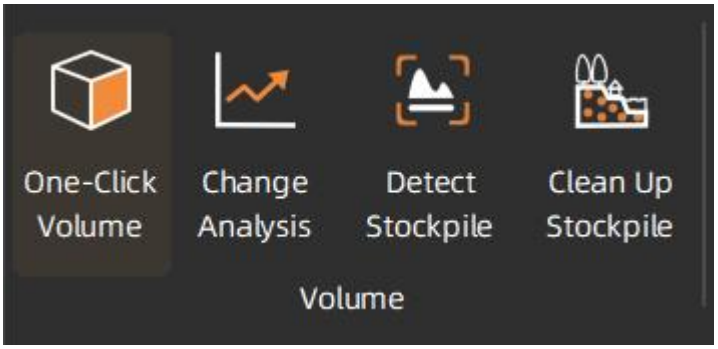


Figure: One-Click Volume Calculation Button

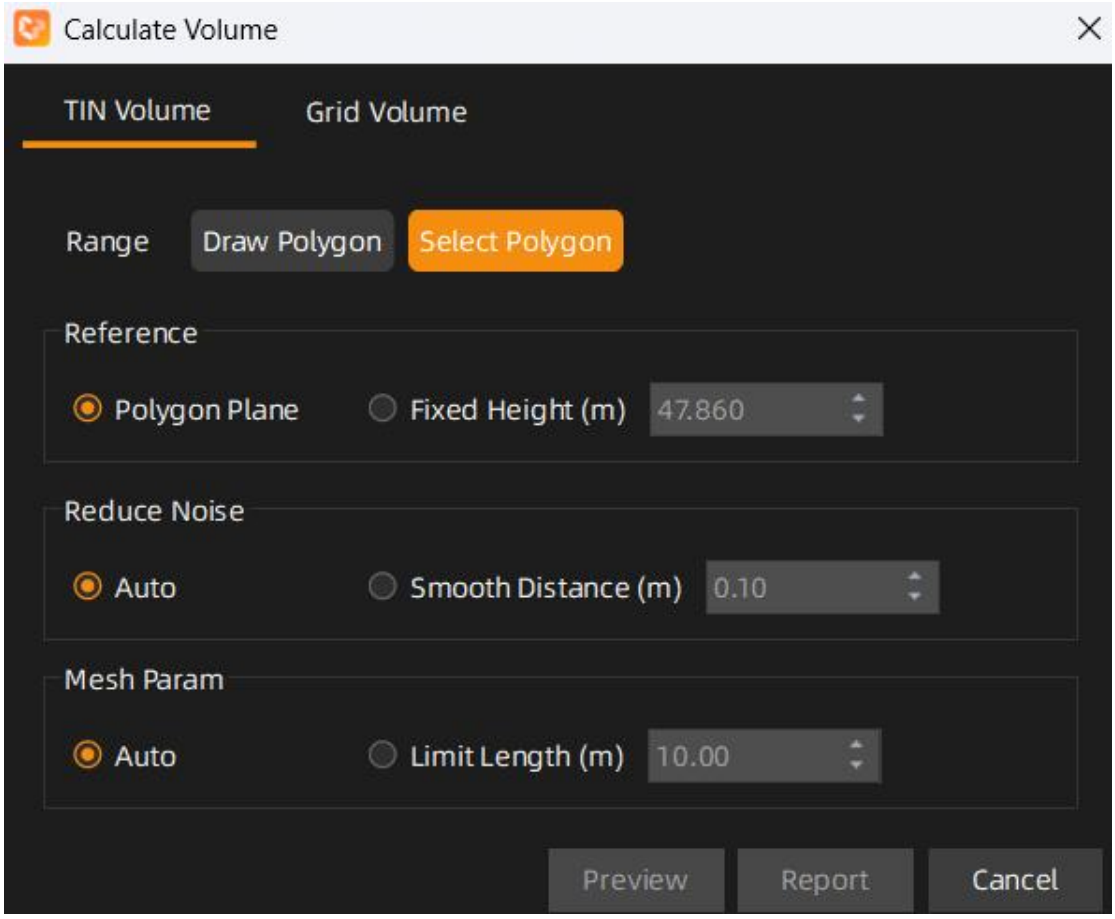


Figure: Volume Calculation Dialog Box

2. Select the volume calculation algorithm. Switch between "TIN Method" and "Grid Method" via tabs.

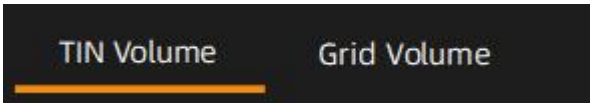


Figure: Volume Calculation Dialog Box

3. Boundary Line Setting: Default is "Draw Boundary Line". You can draw one or more vector polygons in the view as the target area for volume measurement. Selecting "Select Polygon" allows selecting existing vector polygons in the view as the target area.

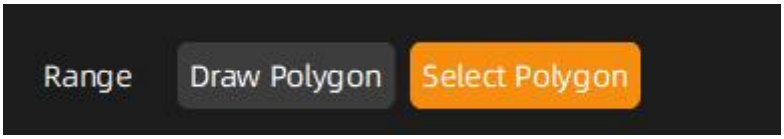


Figure: Boundary Line Setting

4. Reference Plane Setting: Default selects "Polygon Range", which directly closes the TIN within the polygon range for volume calculation. Selecting "Fixed Height" requires entering an elevation. A horizontal plane is displayed at that elevation relative to the data. Its position changes with the set elevation value.



Figure: Reference Plane Setting

5. Noise Reduction Setting: Unique to the TIN Method. Default is "Auto", which automatically calculates a denoising parameter. Selecting "Smoothing Distance" requires manually setting a parameter; larger values result in a sparser TIN and a smoother scene.

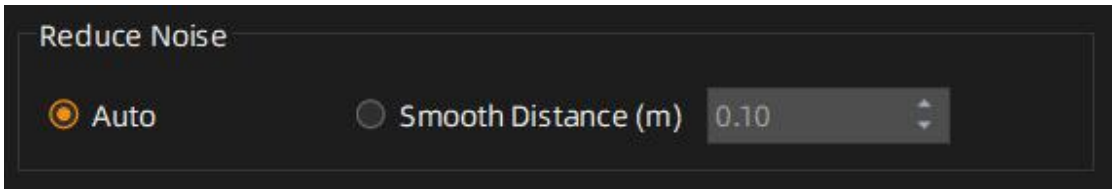


Figure: Noise Reduction Setting

6. TIN Construction Parameter Setting: Unique to the TIN Method. Default is "Auto", which fills all holes by default, then clips the TIN to the boundary line. The boundary does not participate in the calculation. Selecting "Limit

Edge Length" requires entering an edge length value. This forces a maximu m edge length constraint during TIN construction. Excessively long edges m ay cause holes; holes are not included in later volume calculations.



Figure: TIN Construction Parameter Setting

7. Grid Cell Size Setting: Unique to the Grid Method.



Figure: Grid Cell Size Setting

8. Click the Preview button. The task progress is shown. After volume calcu lation is complete, the volume for each polygon is displayed (named Pile1, Pile2...).

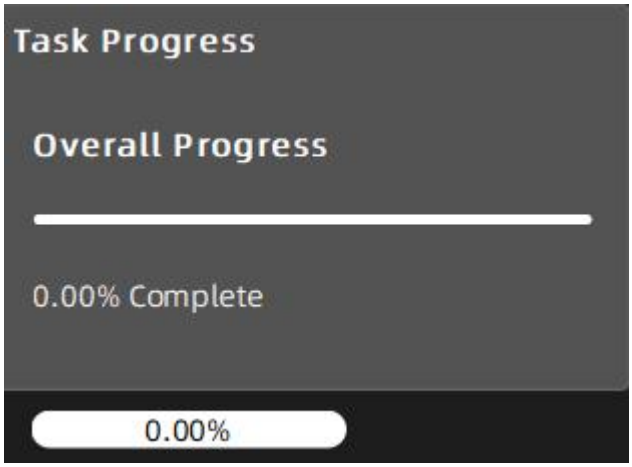


Figure: Task Progress

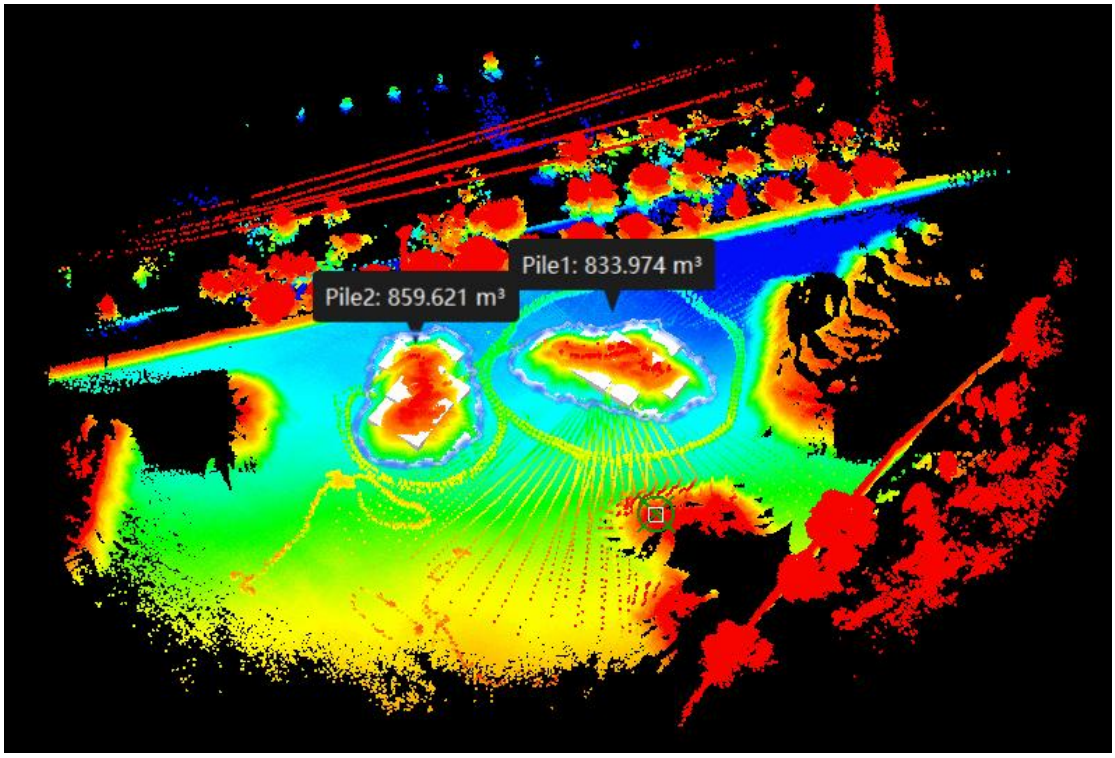


Figure: Volume Calculation Result

9. Click the Generate Report button. The Report Settings dialog box appears. After completing the settings, confirm to generate a PDF report. Default filename: VolumeCalculateReport_YYYYMMDD.pdf (the Grid Method also generates N dwg files, one for each grid method shape, default names pile1, pile2...).

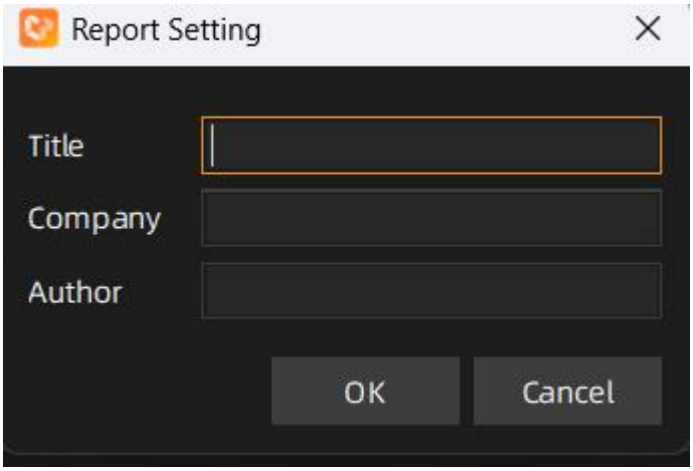


Figure: Report Settings

Stockpile Volume Calculation Report

Date: 2026.04.21

Company: CHC Navigation

Author: DZ233

Range	Volume (m^3)	Cut Volume (m^3)	Fill Volume (m^3)	Projected Area (m^2)	Surface Area (m^2)
Pile 1	16456.120	16456.120	0.000	363.540	4629.017

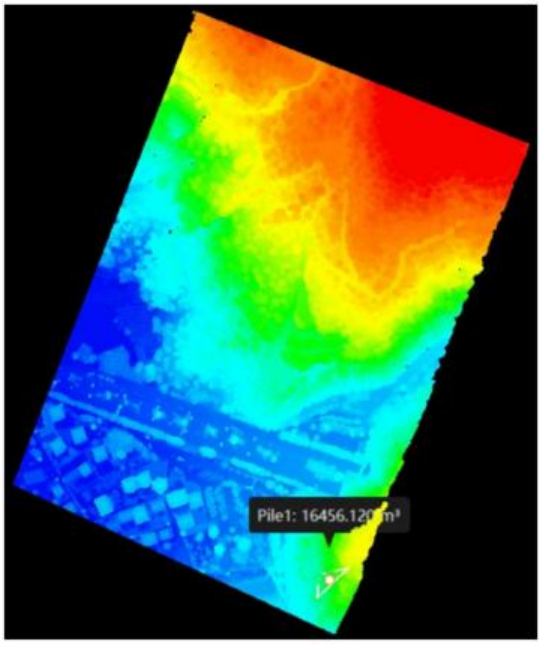


Figure: Report Style

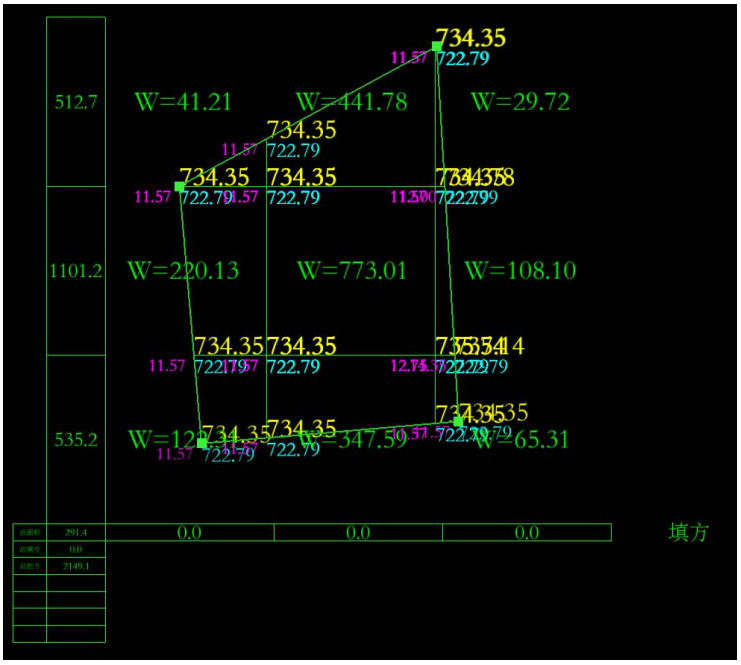


Figure: dwg Drawing

2.7.2 Change Analysis

Function Description:

Compares two epochs of point cloud data to monitor earthwork volume changes in construction areas and roughly calculate stockpile volume. Also supports detecting change areas, generating heatmaps, and one-click report generation.



Figure: Change Analysis Dialog Box

At least 2 point cloud files and 1 vector file must be added, otherwise Change Analysis cannot proceed.

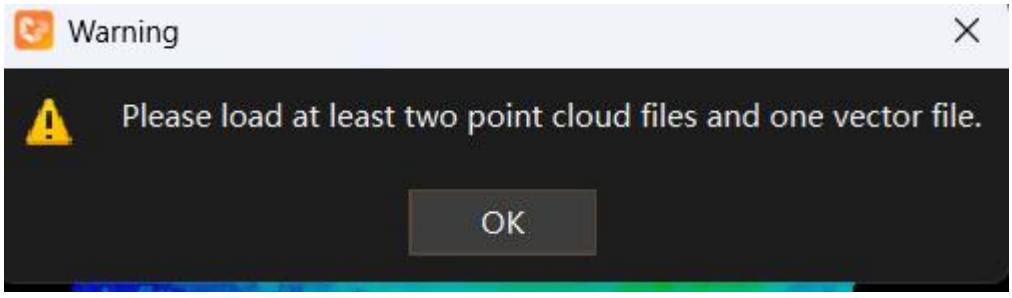


Figure: Prompt to Load Data

Operation Steps:

1. Load the point clouds to be compared and the constraint vector into th e project. The vector can be drawn in the active drawing or imported from an external drawing.

2. Click Engineering -> Volume Calculation -> Change Analysis.

3. Check the point cloud data for the first and second epochs, and the sur vey area boundary.

4. Select the calculation method.

5. Click Confirm. The Report Settings dialog box appears. Set the report pat h, title, company, and author.

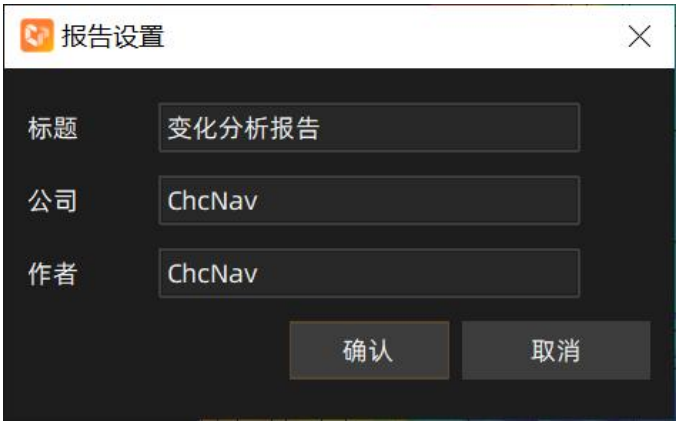


Figure: Report Settings Dialog Box

6. After setting, click Confirm. The software starts calculating the differences between the two point cloud epochs, automatically generates a report, an d exports it.

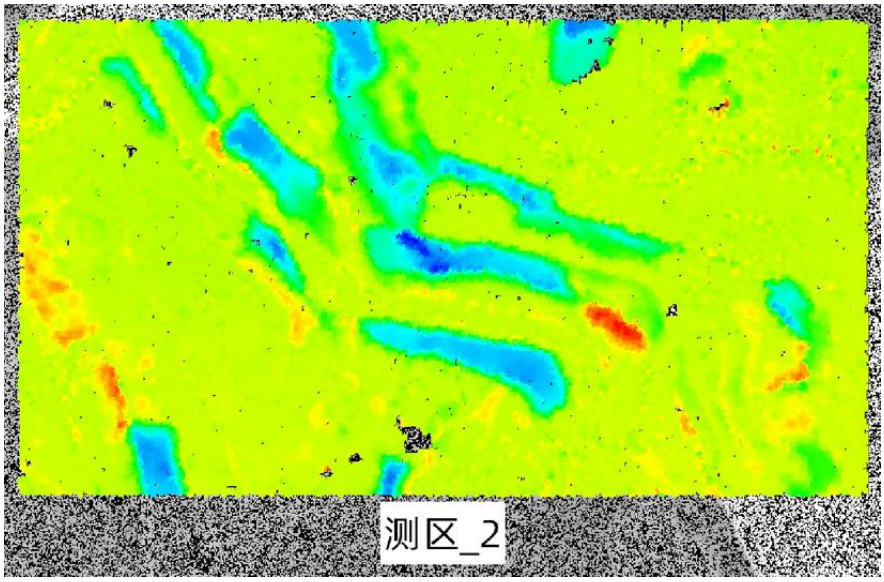


Figure: Change Area Calculated by Grid Method

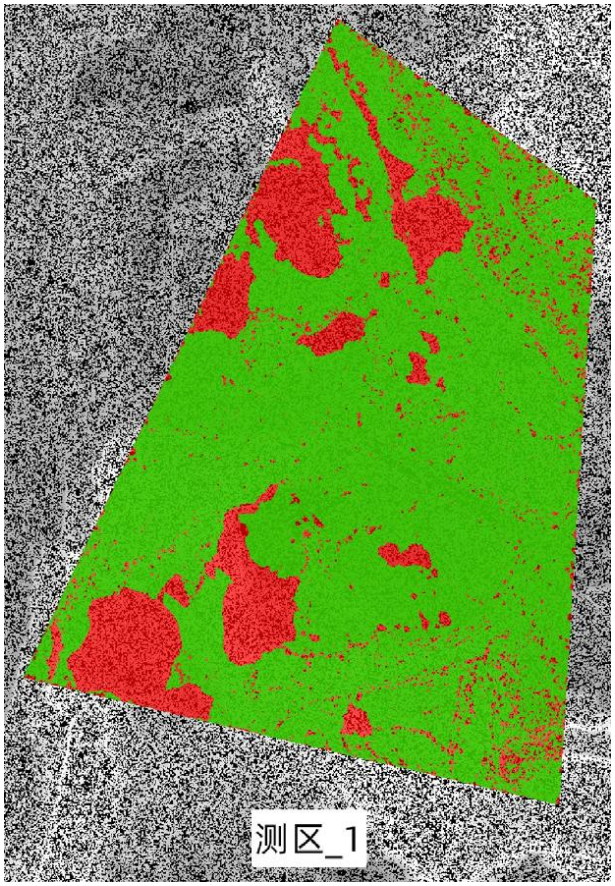


Figure: Change Area Calculated by TIN Method

Parameter Description:

[TIN Method]: Calculates change areas by generating a TIN.

[Grid Method]: Calculates change areas using a grid.

[Grid Cell Size]: The side length of each cell in the generated heatmap.

2.7.3 Stockpile Identification

Function Description:

Identifies stockpiles from point clouds and extracts their boundary vectors.

Operation Steps:

1. Click Engineering -> Volume Calculation -> Stockpile Identification. The Stockpile Identification dialog box opens.

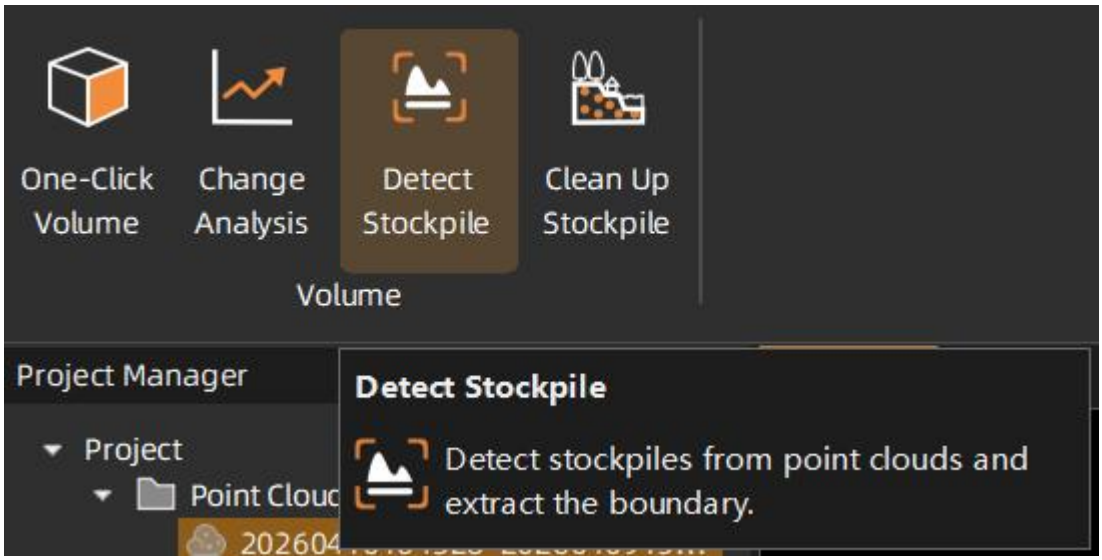


Figure: Stockpile Identification Button

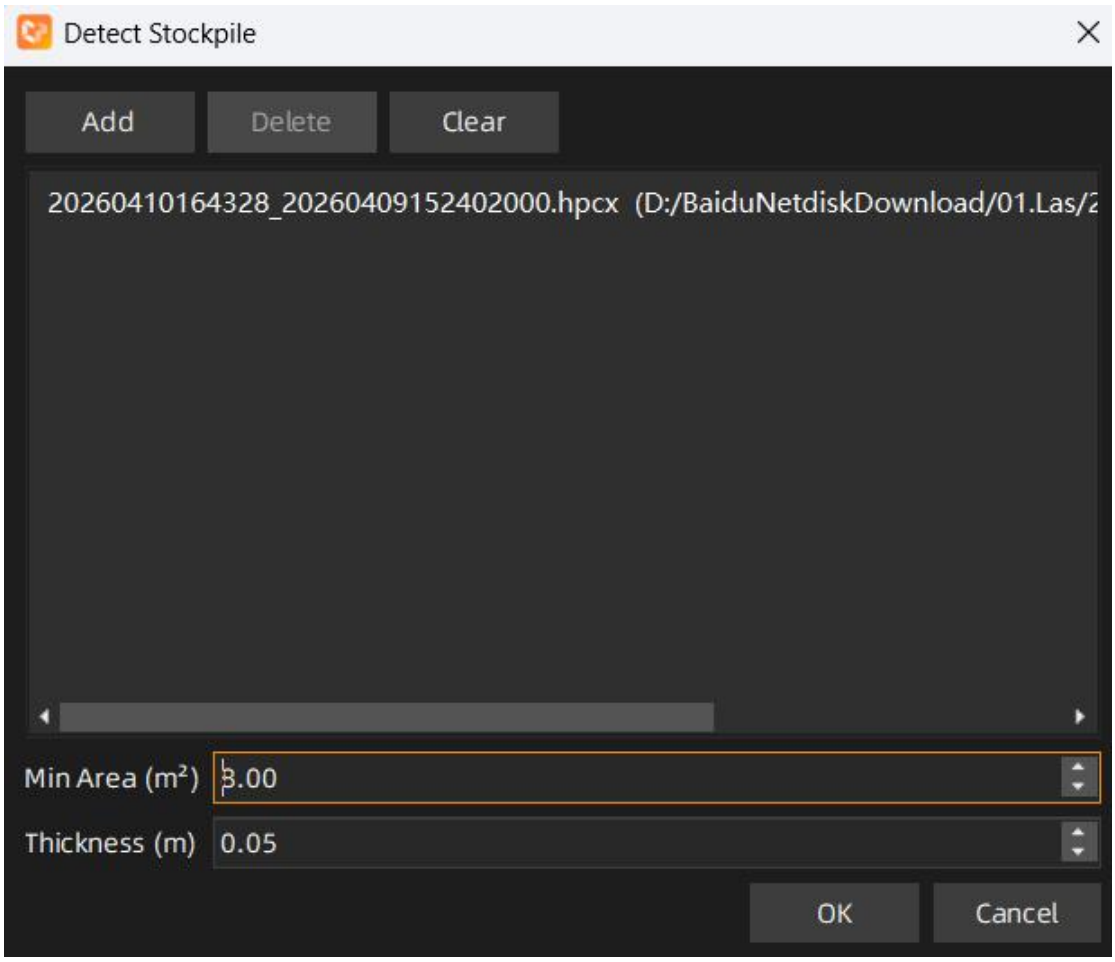


Figure: Stockpile Identification Settings Dialog Box

2. Add point cloud(s). Set the Minimum Area and Point Cloud Thickness.

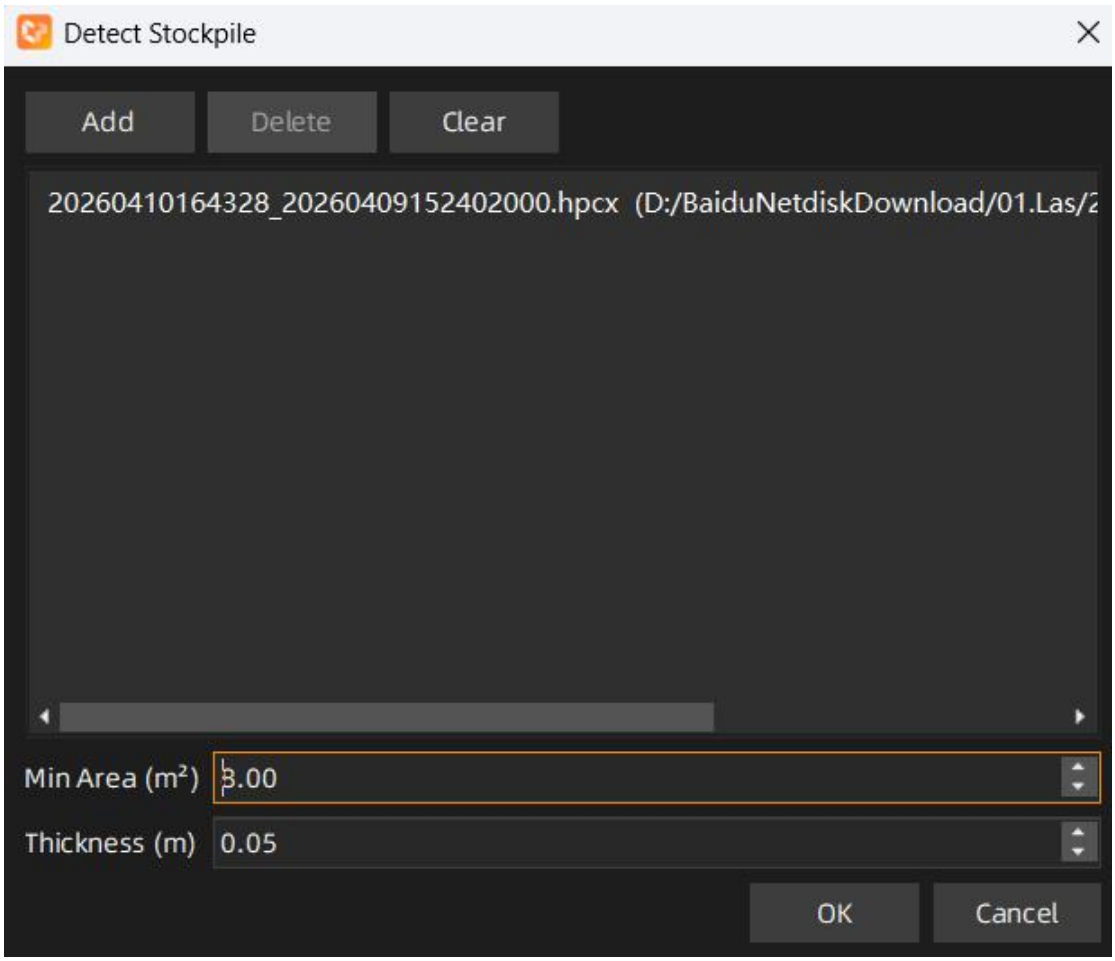


Figure: Add Point Cloud, Complete Settings

3. Click Confirm to start stockpile identification. The task progress is displayed.

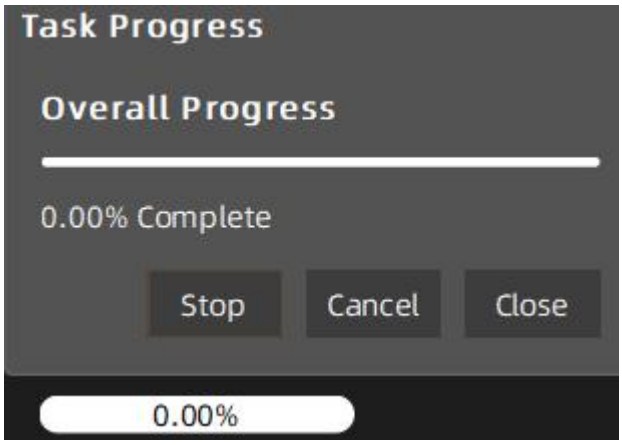


Figure: Stockpile Identification Progress

4. After identification is complete, a prompt shows identification information and boundary lines are generated.

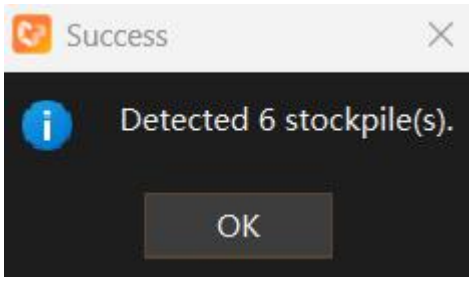


Figure: Stockpile Identification Prompt

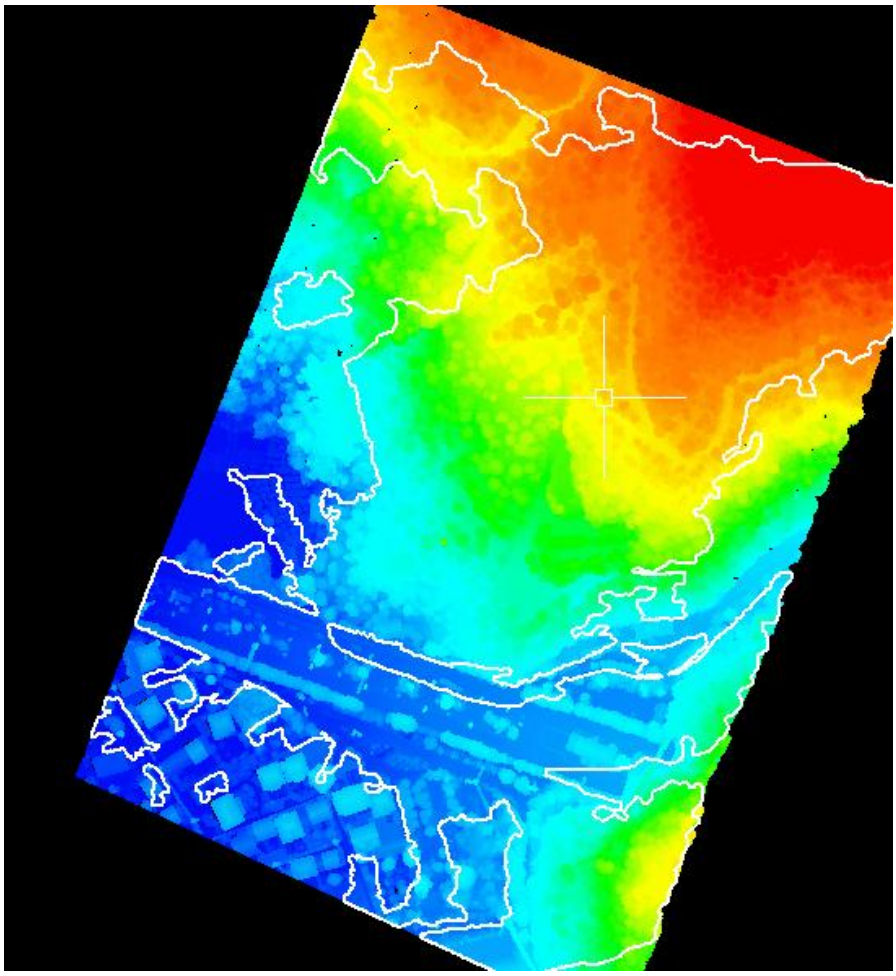


Figure: Generated Boundary Lines

2.7.4 Point Cloud Cleaning

Function Description:

Removes pedestrians, noise points, etc., from the point cloud, retaining only ground points. After cleaning, a new file is generated with the suffix "_cleaned" in the same path as the original data.

Operation Steps:

1. Click Engineering -> Volume Calculation -> Point Cloud Cleaning. The Poin t Cloud Cleaning dialog box opens.

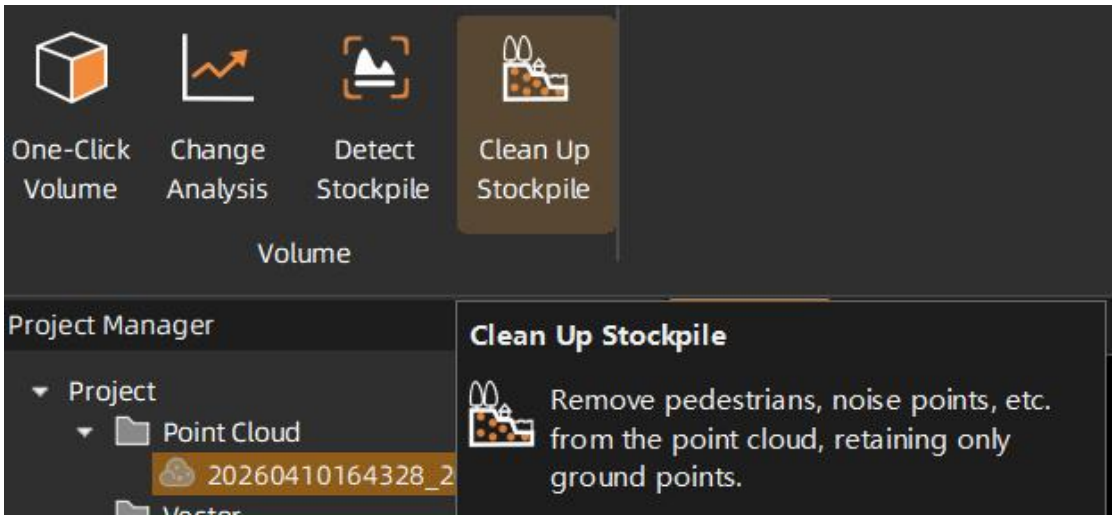


Figure: Point Cloud Cleaning Button

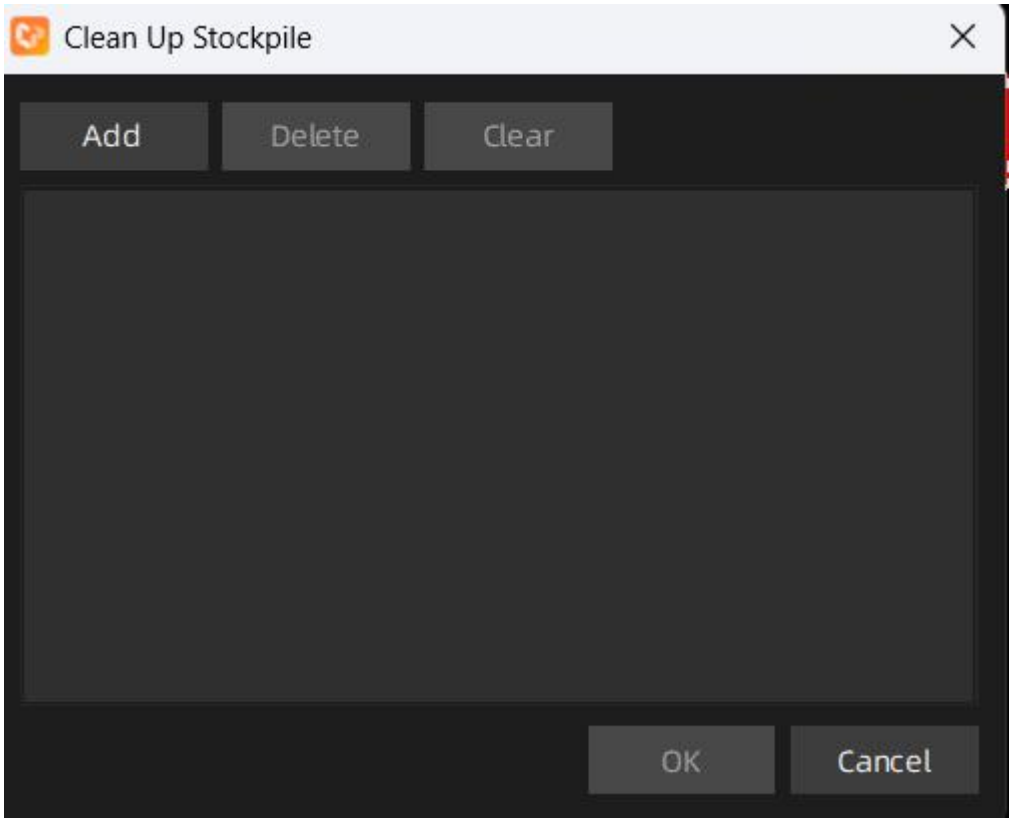


Figure: Point Cloud Cleaning Dialog Box

2. Click the Add button in the Point Cloud Cleaning dialog box to add the point cloud(s) to be cleaned.

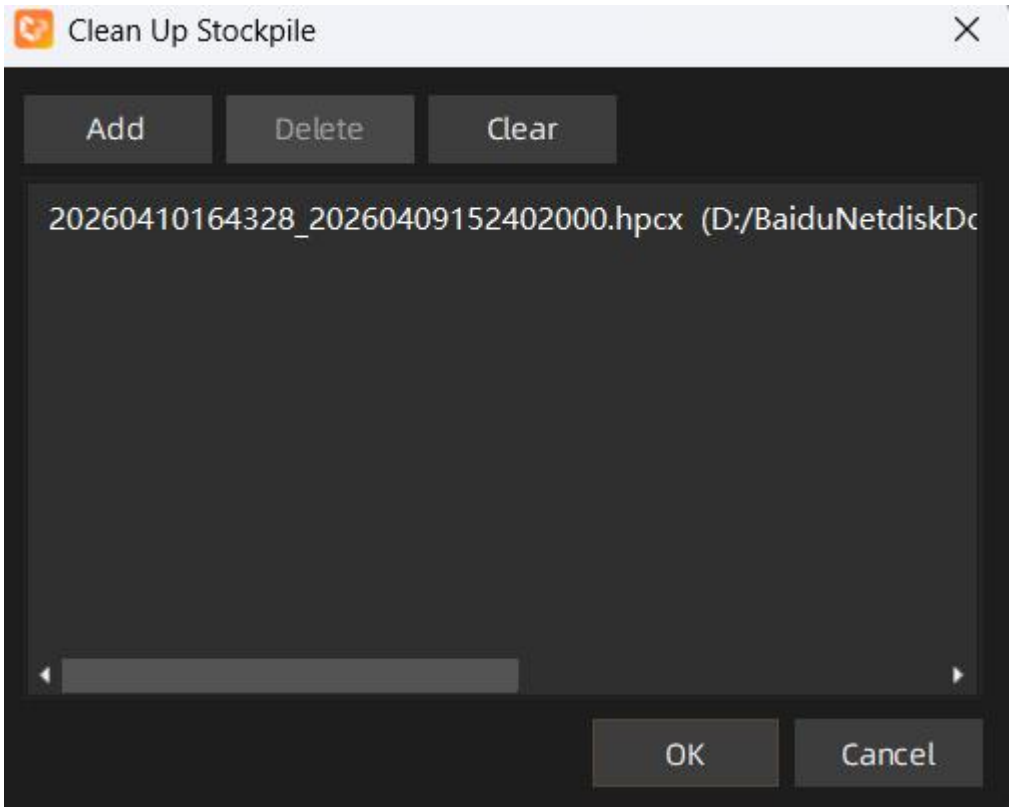


Figure: Add Point Cloud

3. Click Confirm to start point cloud cleaning. The task progress is displaye d.

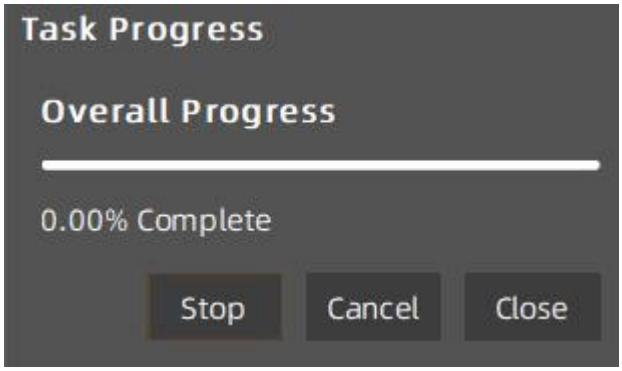


Figure: Point Cloud Cleaning Progress

4. Point cloud cleaning is completed. A file with the "_cleaned" suffix is aut omatically generated. A prompt asks whether to load the processed data in

to the current project.

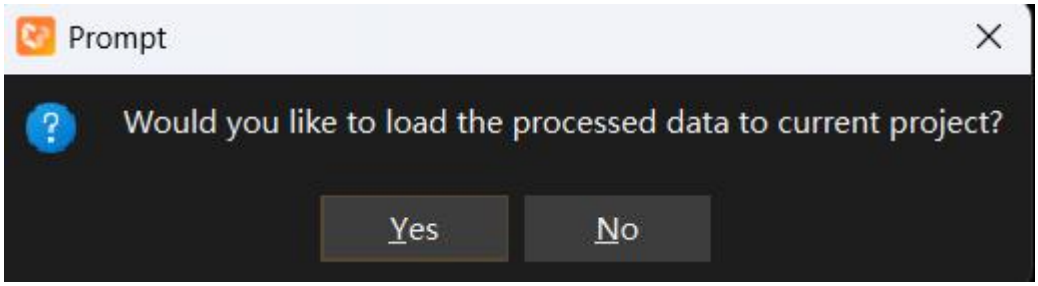


Figure: Prompt to Load Point Cloud Cleaned File

5. Confirm to load the processed data into the current project.

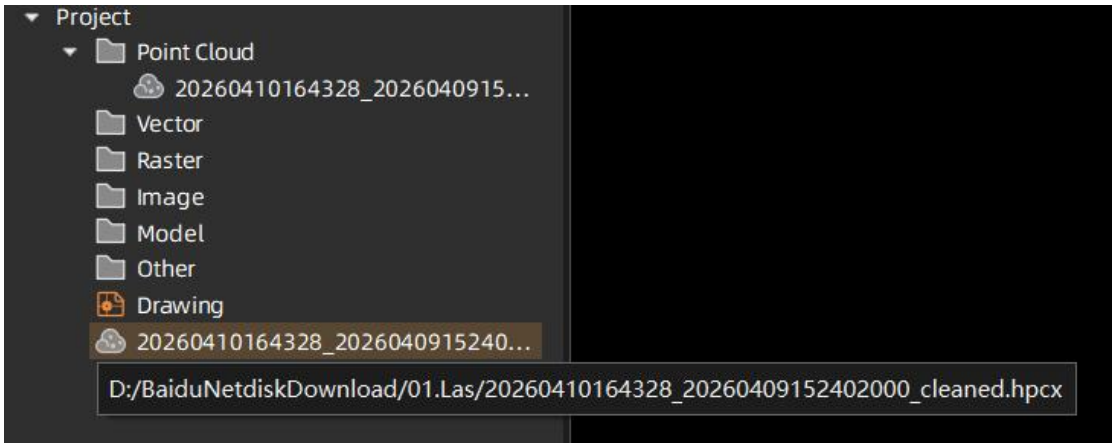


Figure: Load Point Cloud Cleaned File into Current Project

6. The point class of the processed data is Ground Point.

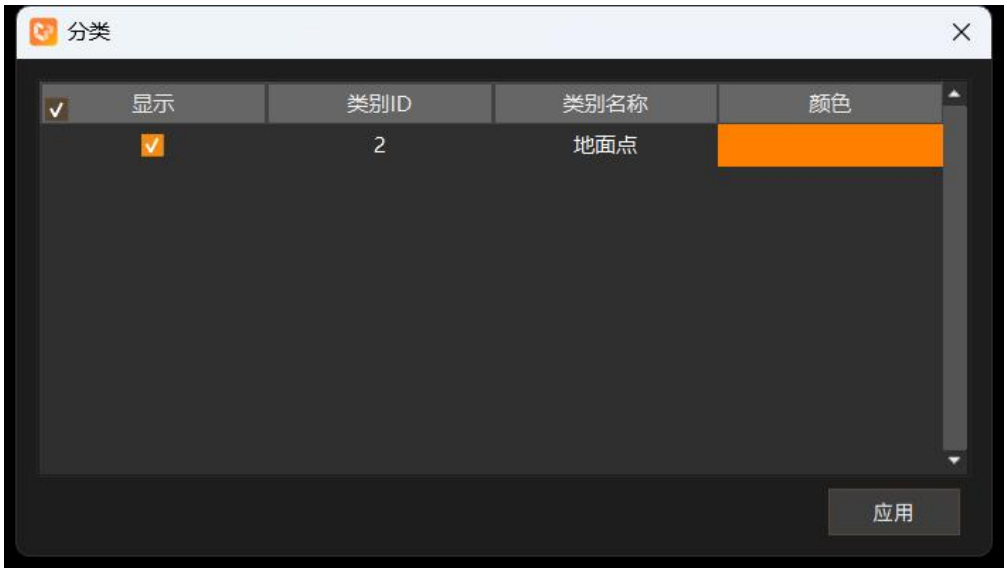


Figure: Point Class of Processed Data

2.8 Help

2.8.1 Help

2.8.1.1 Help

1. Click Help -> Help to open the help documentation.

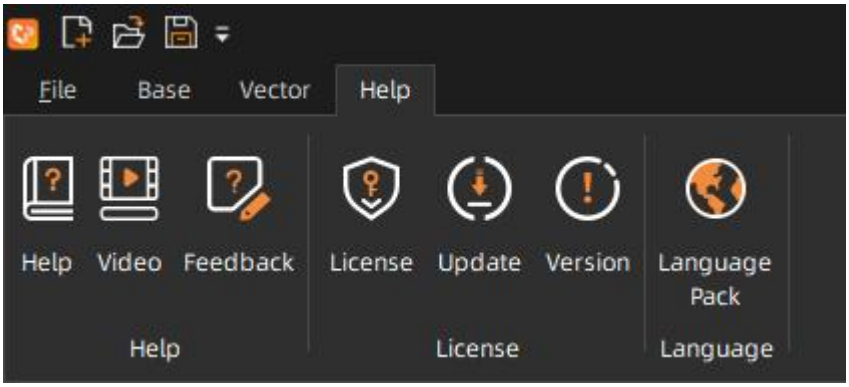


Figure: Help

2.8.1.2 Training Videos

1. Click Help -> Training Videos to open the official website for training vid eos.

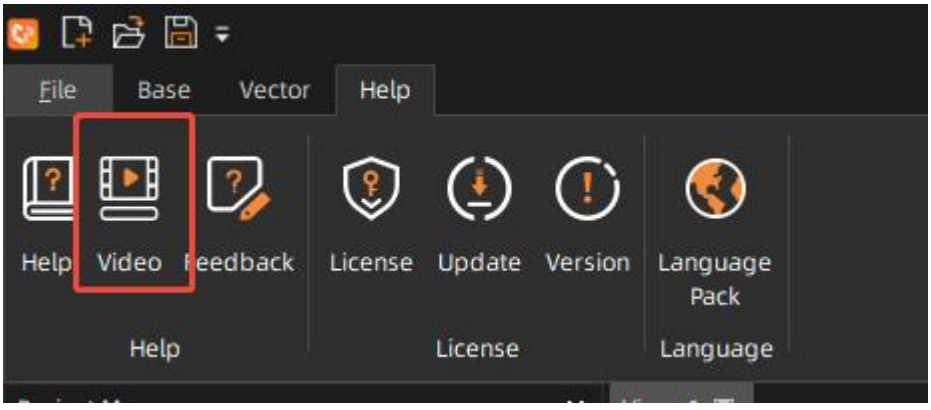


Figure Teaching videos

2.8.1.3 Feedback

1. Click Help -> Feedback to open the feedback website, where you can report difficulties encountered or suggestions for improvement.

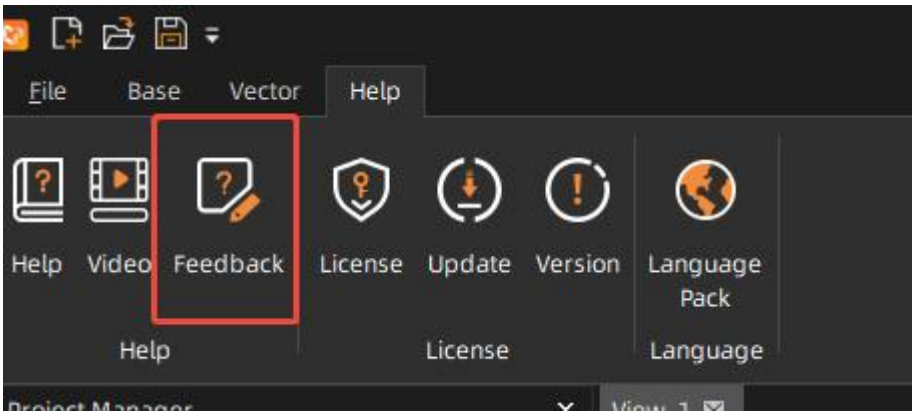


Figure Feedback

2.8.2 License

2.8.2.1 License

Function Description:

Click to view the software license status or activate it. If the software is not authorized or the license has expired, the License Manager interface will appear directly when starting the software. The software supports three registration methods: License Code, Redemption Code, and Dongle registration.

Operation Steps:

1. Click Help -> License. The License Manager dialog box appears, allowing you to view the current software license status.

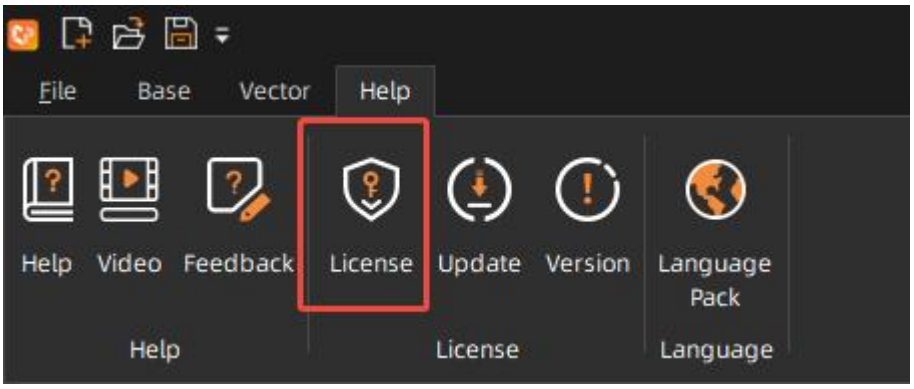


Figure: License

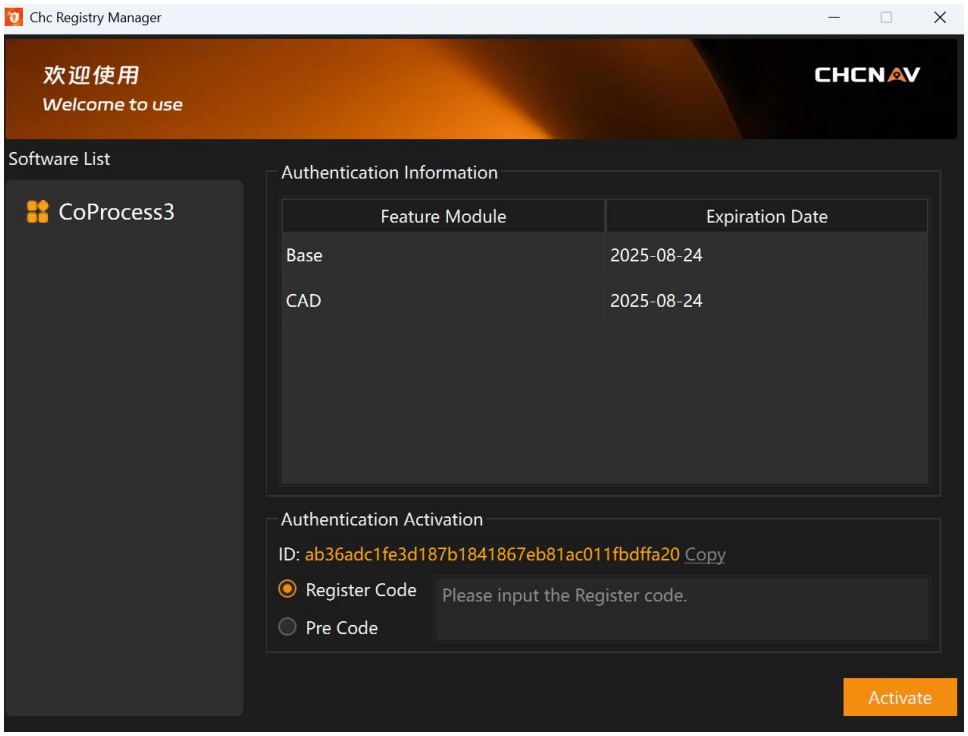


Figure: License Manager Interface

2.8.2.1.1 License Code Activation

Function Description:

Activates the software by entering a license code. Supports offline activatio n.

Operation Steps:

1. Click Help -> License. The License Manager dialog box appears. Or, if th ere is no permission, the License Manager dialog box appears directly whe n starting the software.

2. On the Authorization Activation page of the License Manager dialog box, copy the "Machine ID" and send it to the software support personnel to o btain a license code.

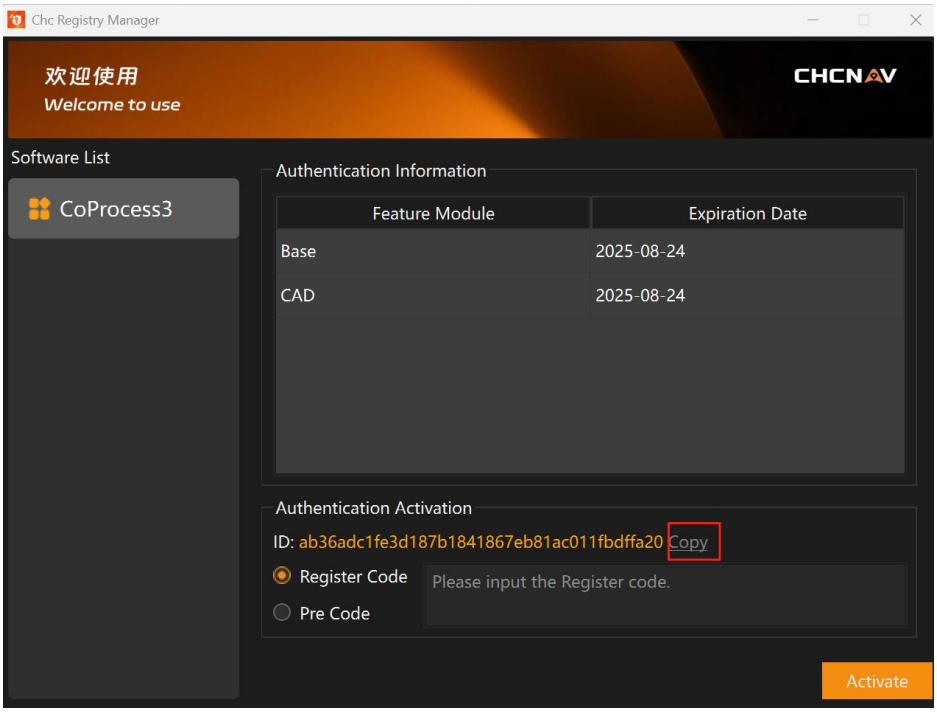


Figure: Copy Machine ID

3. Select "License Code". Enter the obtained license code in the input box.

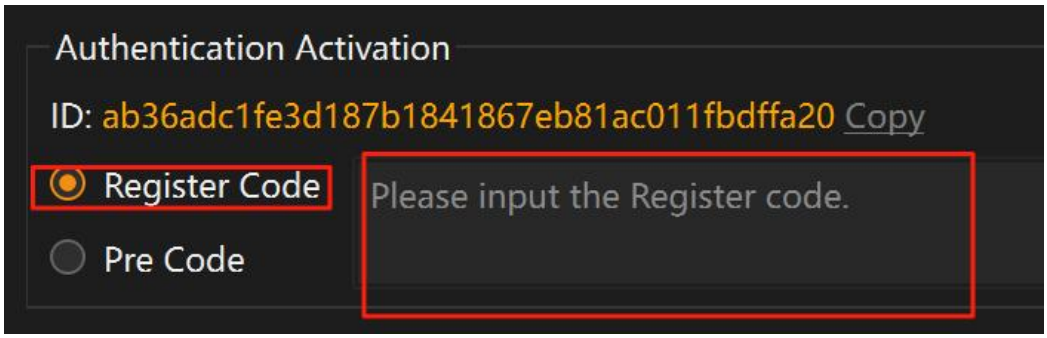


Figure: Enter Registration Code

4. Click "Activate". Upon successful activation prompt, you can start the soft ware and use the functions of the authorized modules normally.

2.8.2.1.2 Redemption Code Activation

Function Description:

Activates the software by entering a redemption code. When the machine is online, you can activate directly using the redemption code. Offline, the redemption code needs to be converted to a license code through other means, then activated via the "License Code Activation" method.

Operation Steps:

1. Click Help -> License. The License Manager dialog box appears. Or, if there is no permission, the License Manager dialog box appears directly when starting the software.

2. On the Authorization Activation page of the License Manager dialog box, copy the "Machine ID" and send it to the software support personnel to obtain a redemption code.

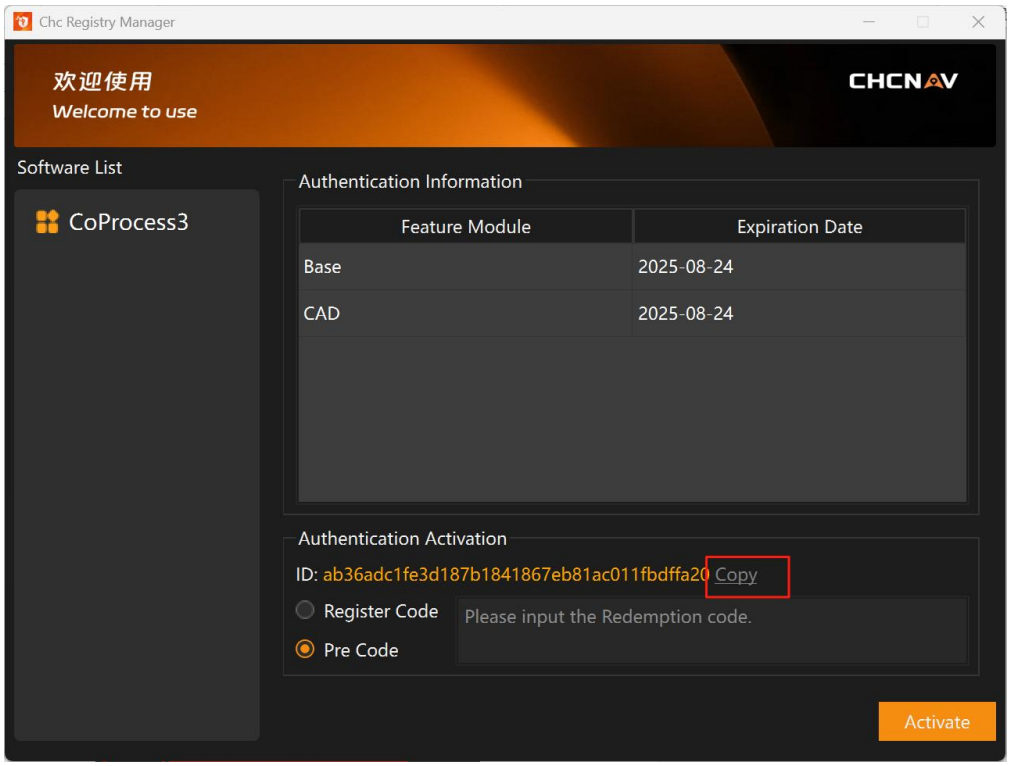


Figure: Copy Machine ID

3. Select "Redemption Code". Enter the obtained redemption code in the in put box.

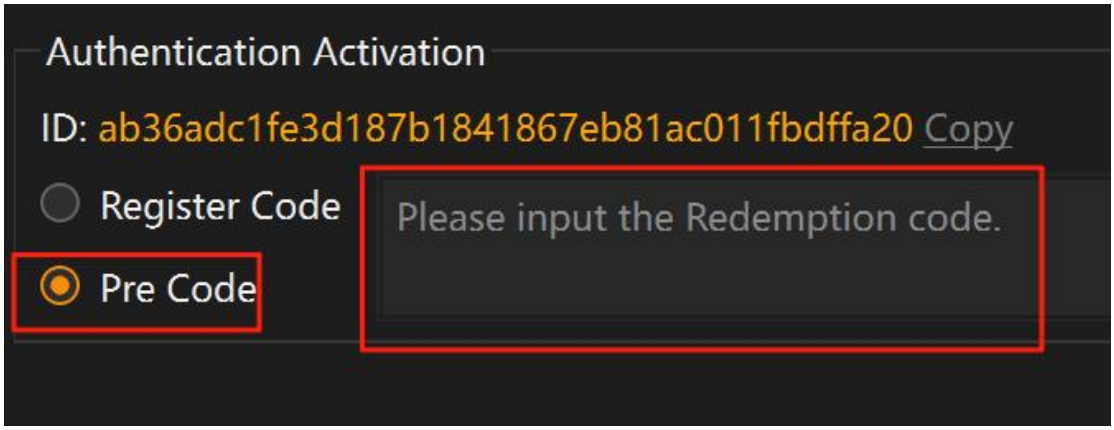


Figure: Enter Redemption Code

4. Click "Activate". Upon successful activation prompt, you can start the soft ware and use the functions of the authorized modules normally.

Note: Activation via redemption code requires an internet connection.

2.8.2.1.3 Dongle Activation

Function Description:

Inserts the dongle, then activates it by entering a license/redemption code t o obtain software authorization.

Operation Steps:

1. Insert an unauthorized dongle. Start the software / License Manager. The License Manager dialog box appears.

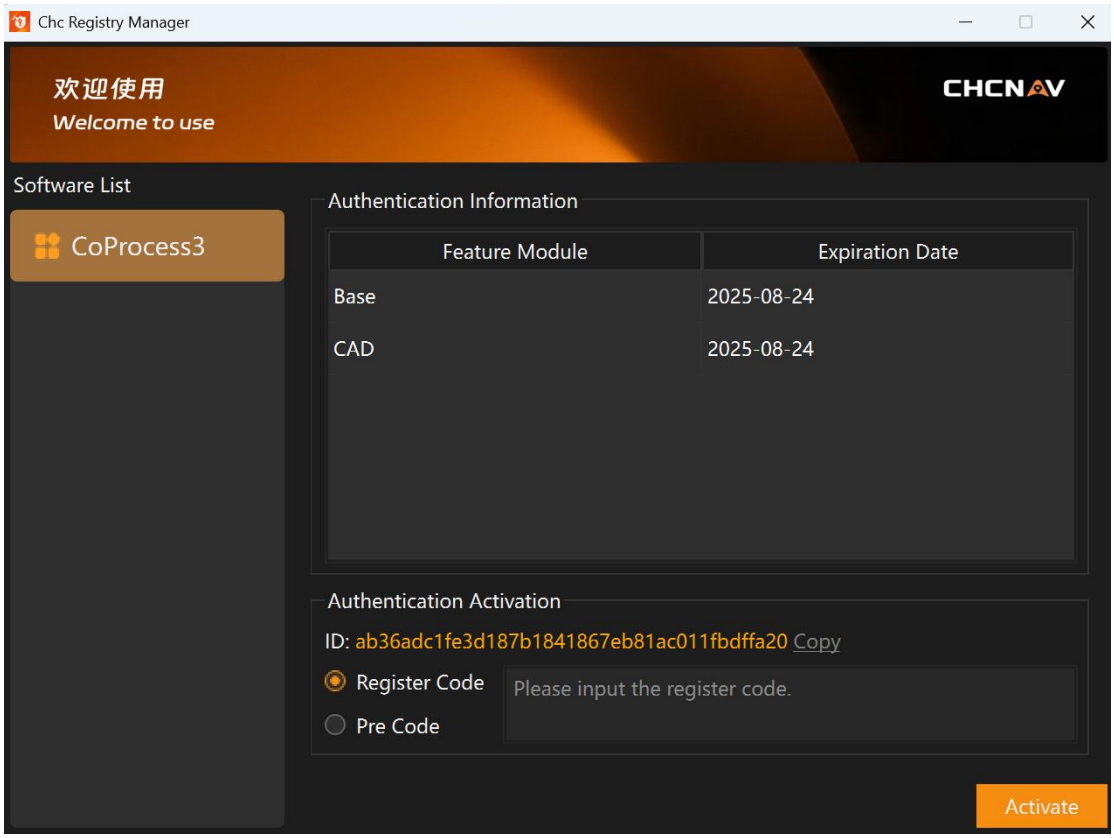


Figure: Registry Manager

2. Dongle activation can be done via License Code or Redemption Code.

(1) License Code Activation: On the Authorization Activation page of the License Manager dialog box, select "License Code". Enter the obtained license code in the input box. Click "Activate". Upon successful activation prompt, you can start the software and use the functions of the authorized modules normally.

(2) Redemption Code Activation: On the Authorization Activation page of the License Manager dialog box, select "Redemption Code". Enter the obtained redemption code in the input box. Click "Activate". Upon successful activation prompt, you can start the software and use the functions of the authorized modules normally.

2.8.2.2 Upgrade

Function Description:

Click the Upgrade button to check for the latest version. If the current soft ware is not the latest, this function can update it to the latest version.

Operation Steps:

1. If the current version is not the latest, clicking the "Upgrade" button ope ns the Update Content dialog box. If the current version is the latest, no di alog box appears, and the Output window prompts: The current version is the latest.
2. Click "Update Now" to download the latest installation package.
3. After the latest installation package is downloaded, proceed with the soft ware installation process. Refer to section "1.1 Software Installation".

2.8.2.3 Version

Function Description:

Click the Version button to view the current software version information.

Operation Steps:

1. Click Help -> License -> Version. The current version information of the CoProcess software appears, including copyright information and the downl oad address for the latest version.

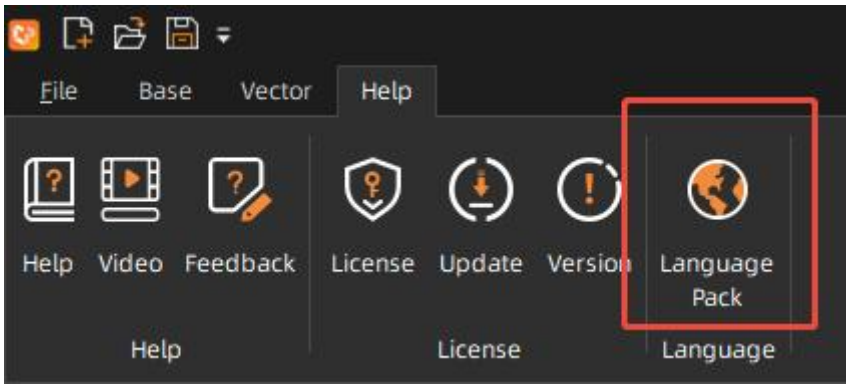


Figure: Language

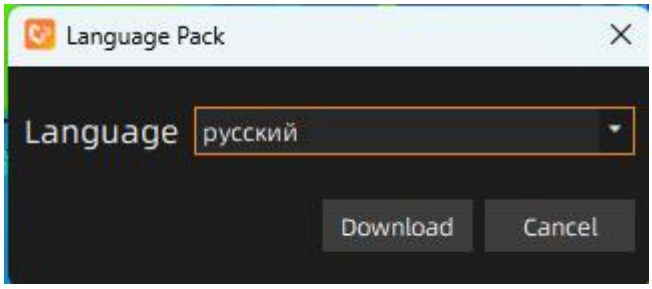


Figure: Language Pack Download Interface

2.8.3 Version

2.8.3.1 Language Pack

Function Description:

Downloads language packs already supported by the software. After downloading the required language pack and restarting the software, the language pack takes effect.

Operation Steps:

1. Click Help -> Language Pack. The Download Language Pack dialog box appears. Select the desired language to download. Currently supported languages for download: German, English, Russian.

2. After downloading, a prompt to restart appears. Click Yes. The software

restarts and applies the downloaded language pack. If you click Close or N o, the language pack will be applied the next time the software is manuall y restarted.

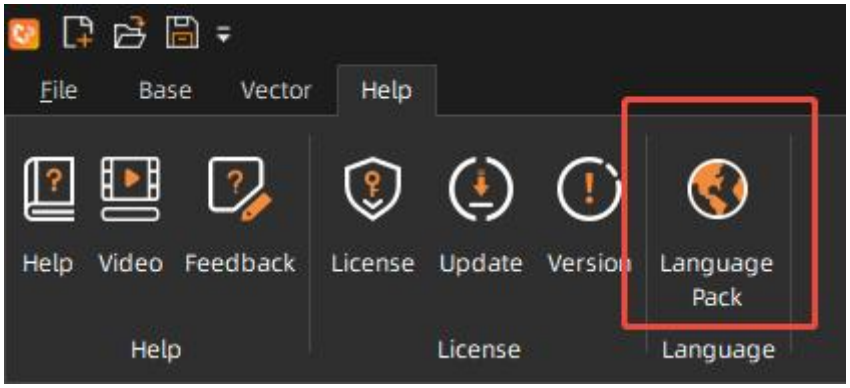


Figure: Language

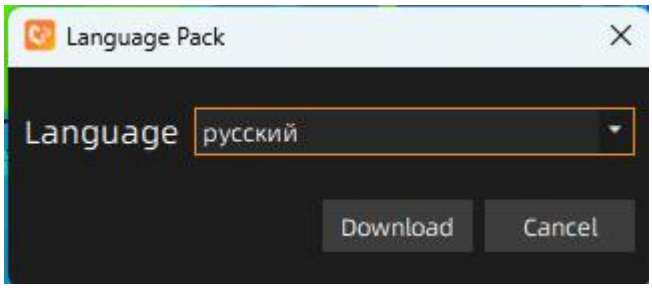


Figure: Language Pack Download Interface

3. Introduction to Operation Process

3.1 Basic Data Processing

3.1.1 Data Addition

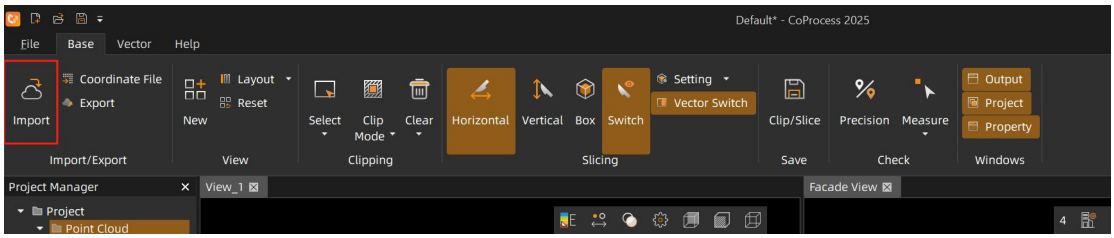
This section introduces how to add different types of data in CoProcess. Th e software supports loading and displaying point cloud data, vector data, ra ster data, and 3D model data.

3.1.1.1 Adding Point Cloud Data

Adding Point Cloud Data:

Point cloud data supported formats: las, laz, hpc, codata, e57, ptx, asc, txt, csv, dat, xyz.

Method 1: Click "Open Point Cloud" in the "Basic" function panel, select the point cloud data to open, and click OK.

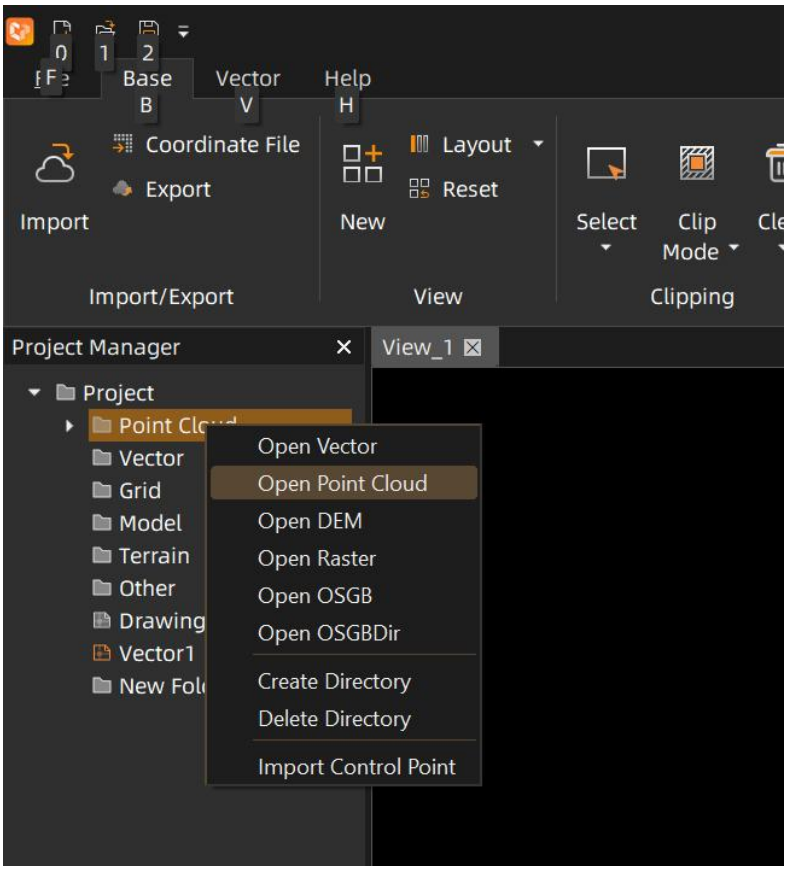


Figure：Open PointCloud

Method 2: In the file explorer, select the data to add, hold the left mouse button, drag it into the software interface, and release the mouse button.

Method 3: In Project Management, right-click on the Point Cloud node, select Open Point Cloud, add the point cloud data to load, and click OK.

In the Project Management list, right-click on the corresponding data to perform operations like "Close", "Redirect", "Open Folder".



Figure：RightMenu-Open PointCloud

3.1.1.2 Adding Vector Data

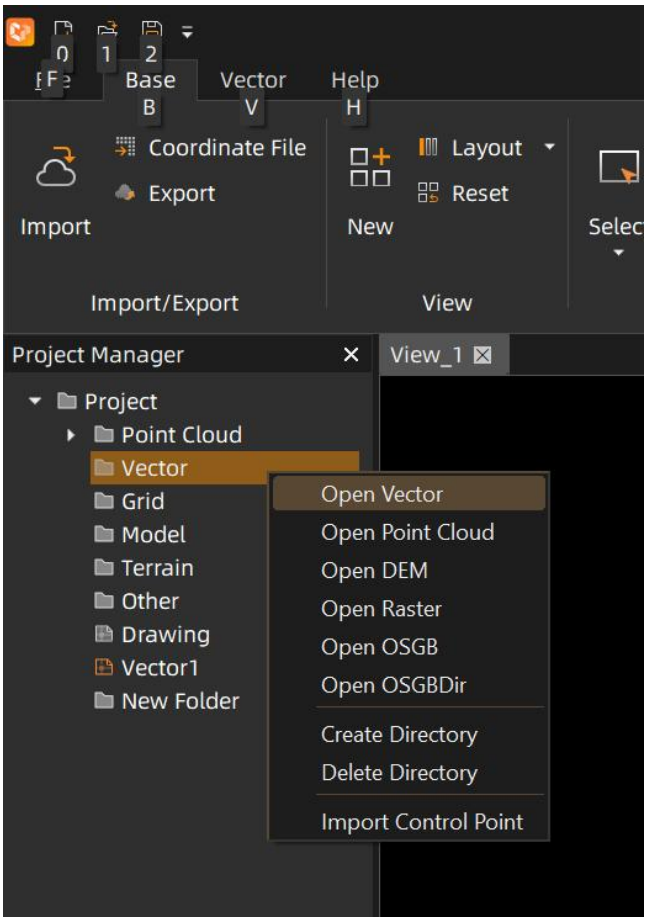
Adding Vector Data:

Vector data supported formats: dwg, dxf, etc.

Method 1: In the file explorer, select the data to add, hold the left mouse button, drag it into the software interface, and release the mouse button.

Method 2: In Project Management, right-click on the Vector node, select Open Vector, add the vector data to load, and click OK.

In the Project Management list, right-click on the corresponding data to perform operations like "Close", "Redirect", "Open Folder".



Figure：Open Vector

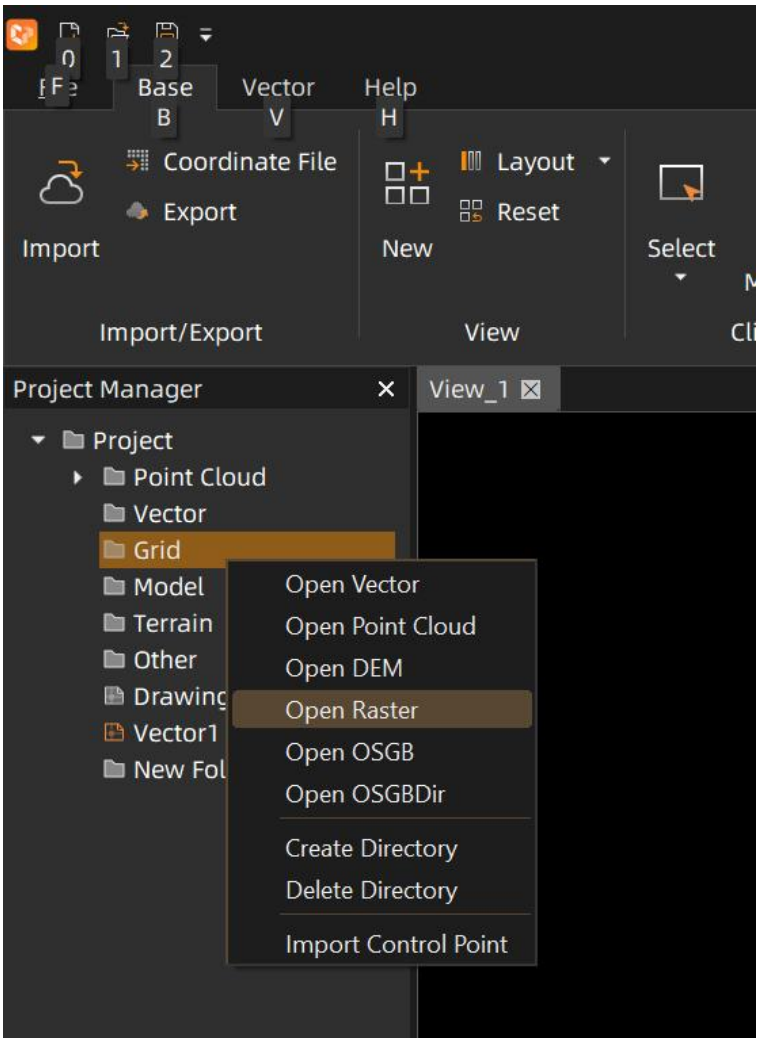
3.1.1.3 Adding Raster Data

Adding Raster Data:

Supports adding imagery, DEM, etc. Formats include jpg, jpeg, tif, tiff, bmp, png, img, etc.

Method 1: In the file explorer, select the data to add, hold the left mouse button, drag it into the software interface, and release the mouse button.

Method 2: In Project Management, right-click on the Raster node, select Open DEM or Open Imagery, add the raster data to load, and click OK.
In the Project Management list, right-click on the corresponding data to perform operations like "Close", "Redirect", "Open Folder".



Figure：Open Raster

3.1.1.4 Adding Model Data

Adding Model Data:

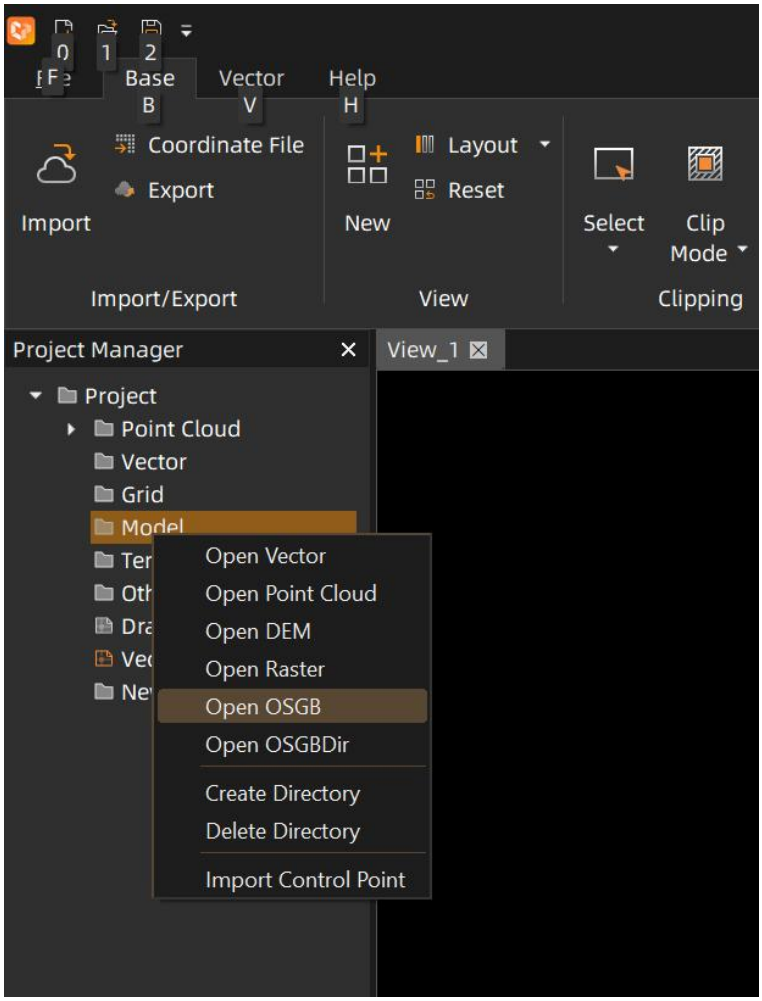
Model data can be added by selecting .osgb files or folders containing .osgb data.

Method 1: In the file explorer, select the data to add (.osgb file or folder), hold the left mouse button, drag it into the software interface, and release the mouse button.

Method 2: In Project Management, right-click on the Model node, select Op

en OSGB Model or Open OSGB Folder, add the model data to load, and cli ck OK. (When selecting a folder, choose the OSGB or Data level).

In the Project Management list, right-click on the corresponding data.



Figure：Open OSGB

3.1.1.5 Multi-View Setup

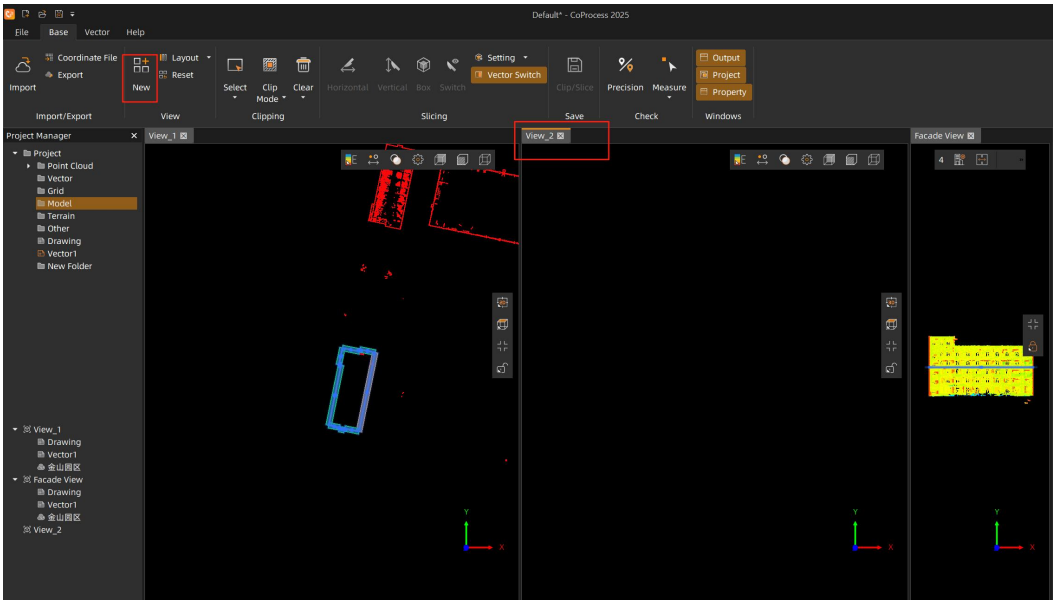
Multi-View Setup:

The software supports loading and browsing data in multiple views, with a maximum of 4 views displayed simultaneously.

Operation Method:

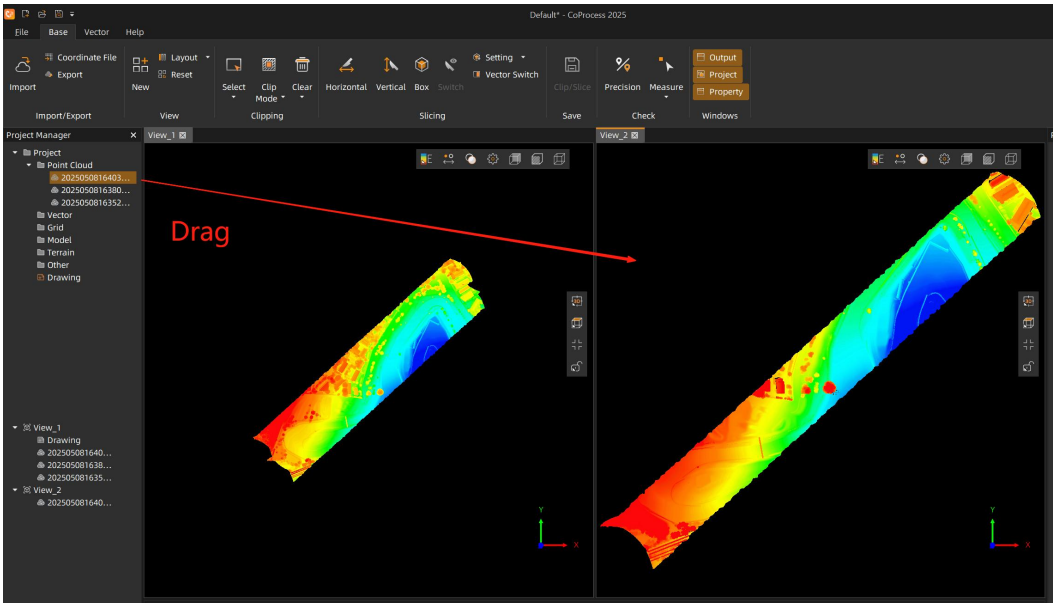
Adding a view: Click "New View" in the menu bar. A new empty view is ad

ded to the software interface. Click again to add more, up to four.



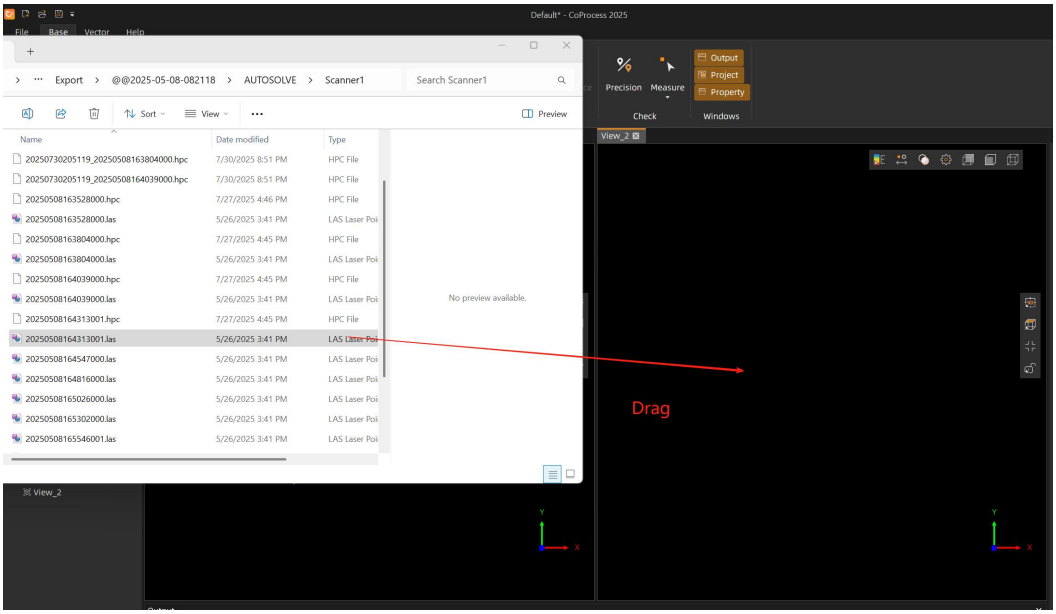
Figure：New View

Adding data: In the Project Management list, select the data to add to View 2. Hold the left mouse button and drag it to the View 2 interface. Release the mouse button. The added data is also displayed in View 2's list.



Figure： Add data to view

Alternatively, in the file explorer where the data is located, select the data to add, drag it to View 2. The data is added and appears in the Project Management list and View 2's list.



Figure：Add data to ViewNode

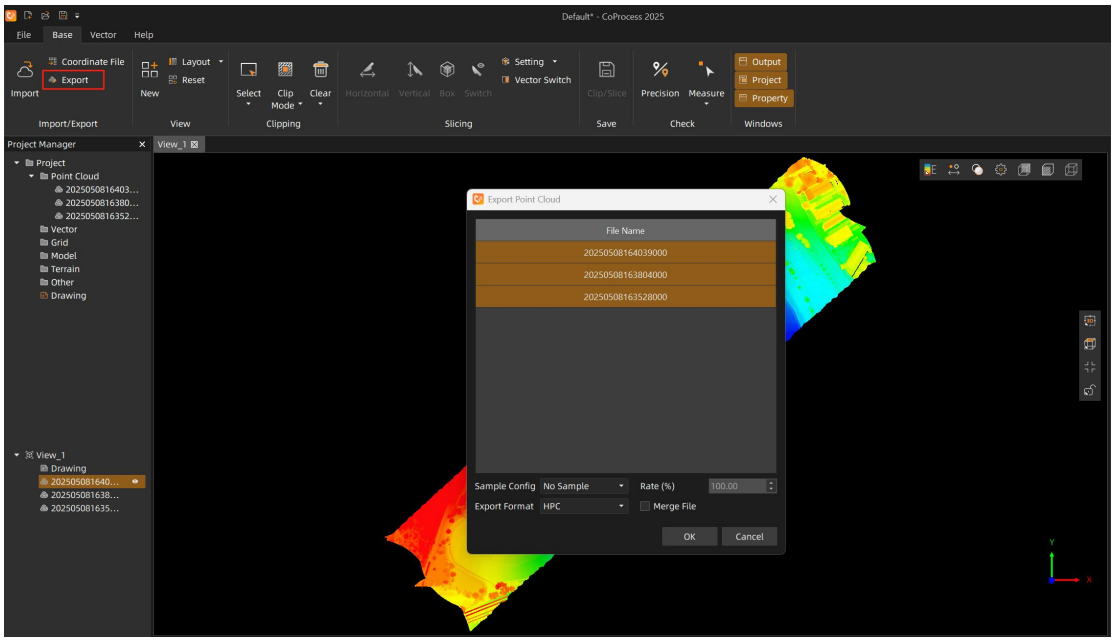
In the View list, right-click on the corresponding data to perform operations like Center, Show/Hide, Remove, etc.

3.1.2 Point Cloud Merging

This section describes how to merge point clouds in CoProcess. When data in las, laz, codata, etc., formats are added to CoProcess, the software automatically converts them to the hpc format.

1. Add the point cloud data. Add the point cloud data (2 or more) to be merged into the software.

2. Click the "Export Point Cloud" button in the Basic module. In the data list, select the point cloud data to merge. The selected items are highlighted in orange.



Figure：Export PointCloud

3. Parameter settings: Includes Sampling Setting, Sampling Rate, Export For mat, and Merge into Single File option. Set parameters according to actual needs. For example, for Random Sampling, set the Sampling Rate. For Grid Sampling, set the Grid Cell Size. Also, set the export format (hpc or las, wi th version options for las).

The key for merging point clouds is to check "Merge into Single File".

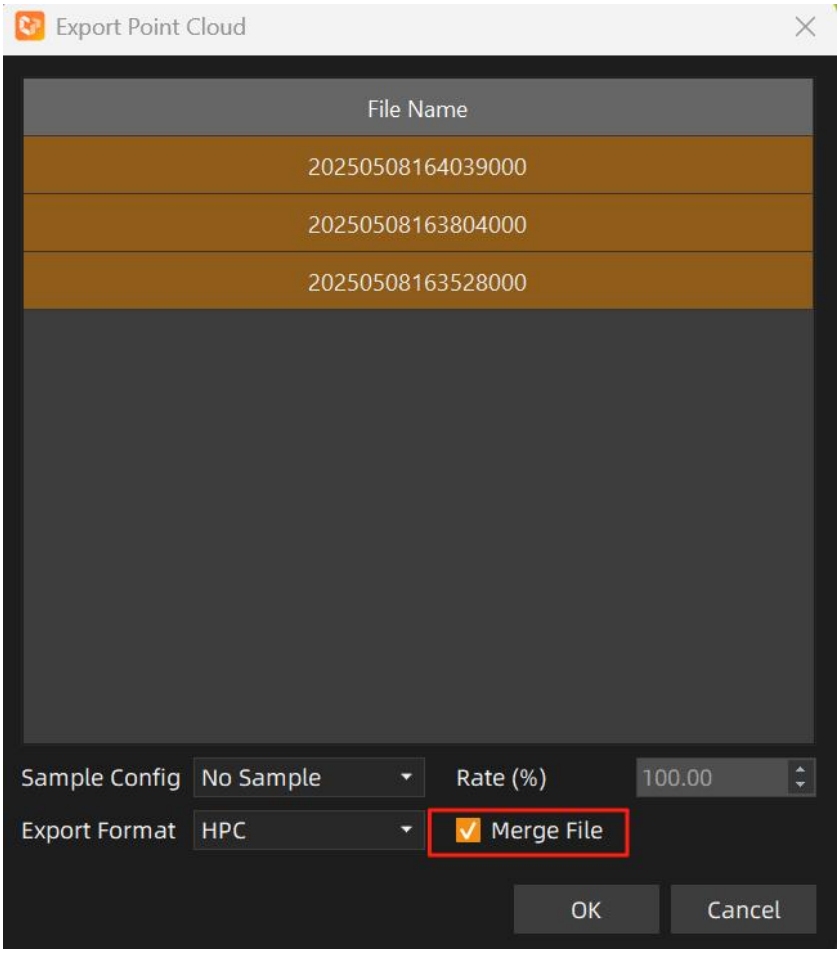


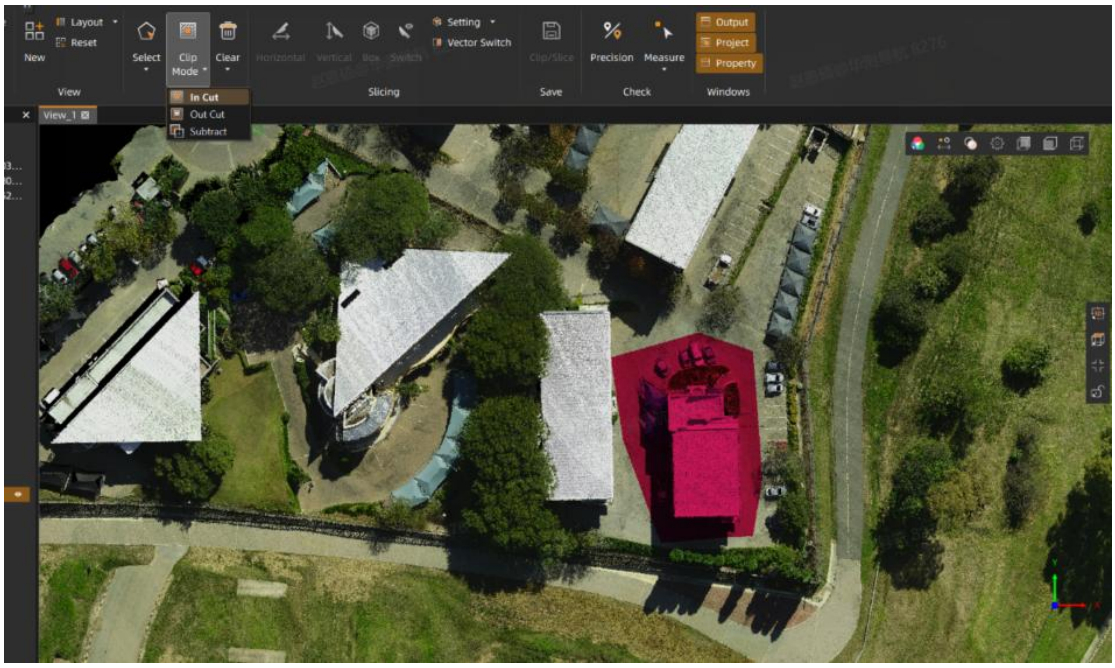
Figure: Merge data to single file

4. Export path selection: After confirming the point clouds to merge and the export parameters, click "Confirm". Choose the export path and name the exported point cloud file. The point cloud merge operation is then completed.

3.1.3 Point Cloud Clipping

This section describes how to clip point clouds in the software, including general clipping, slice clipping, and exporting clipped point clouds.

Point Cloud Clipping: In the Basic module, use the selection functions to select the point cloud to clip or retain. The selected point cloud is displayed in red.

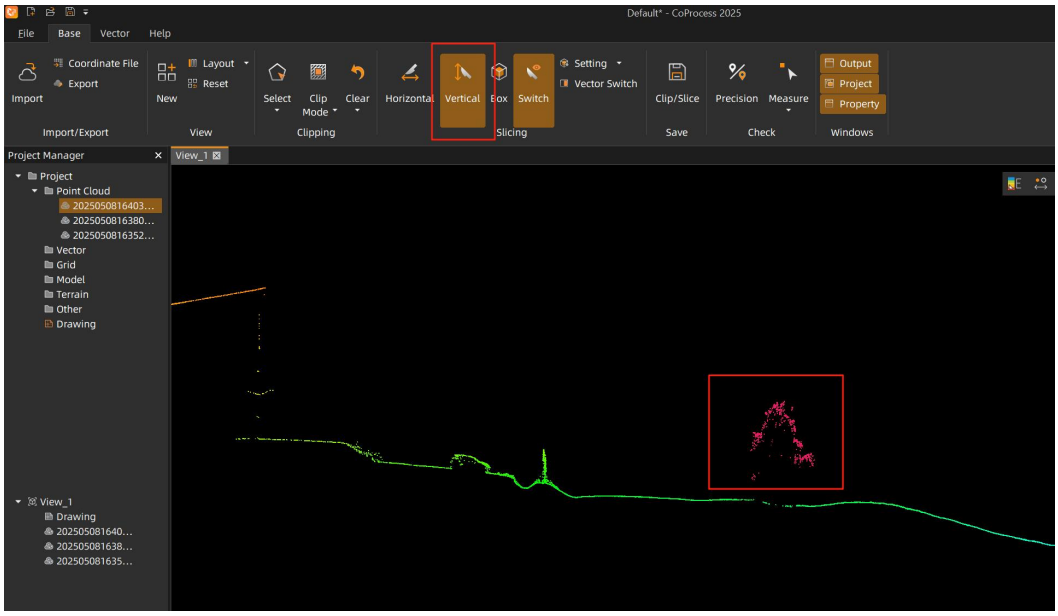


Figure：Select Cropping Selection

Select "Clip Inside" in the Clip menu to complete the point cloud clipping.

Slice Clipping: The software also supports clipping point clouds after perfor ming a slice operation.

1. Use the Slice function to slice the point cloud. Here, use Vertical Slice to create a tunnel profile.



Figure：Vertcial Slice

2. Use the selection function to select the point cloud to delete, then use

Clip Inside to delete the selected points.

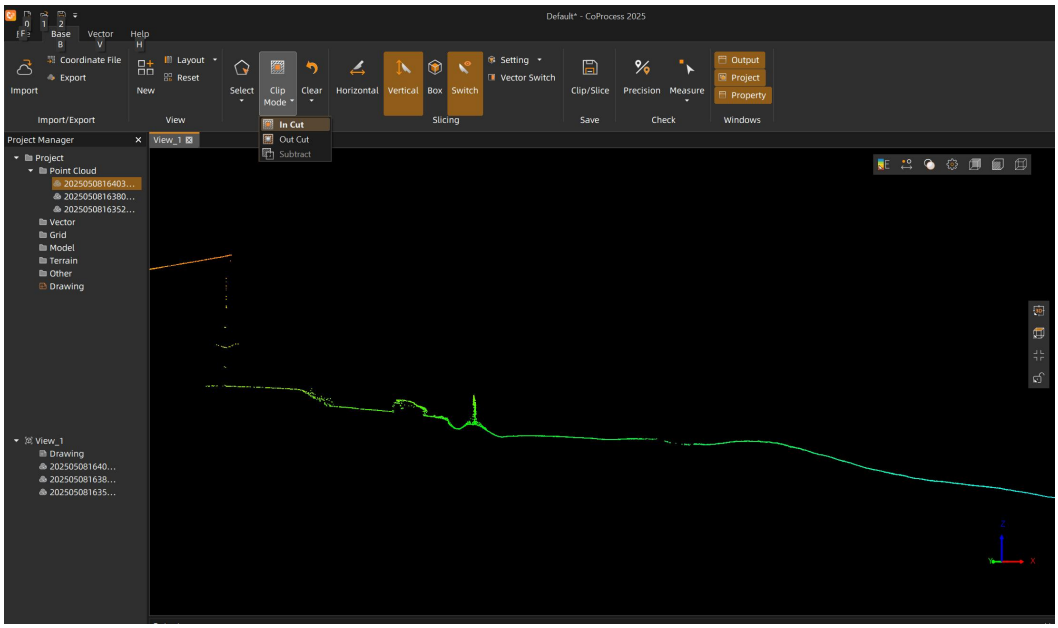


Figure:Select Cropping Selection

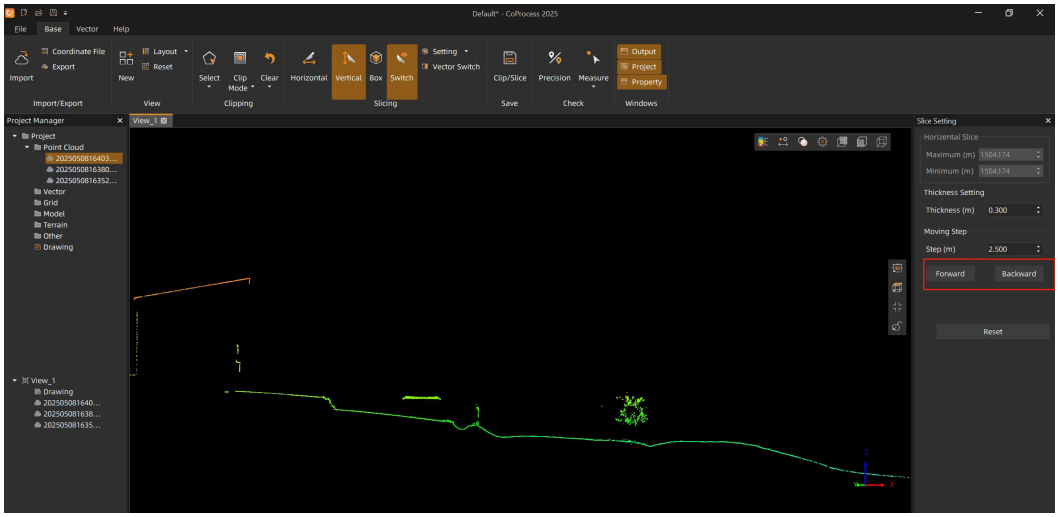


Figure: Internal Cropping

3. After deleting noise points in the current slice, you can click Forward or Backward in the slice settings panel on the right to adjust the slice positio n, and repeat step 2 to continue deleting noise points.

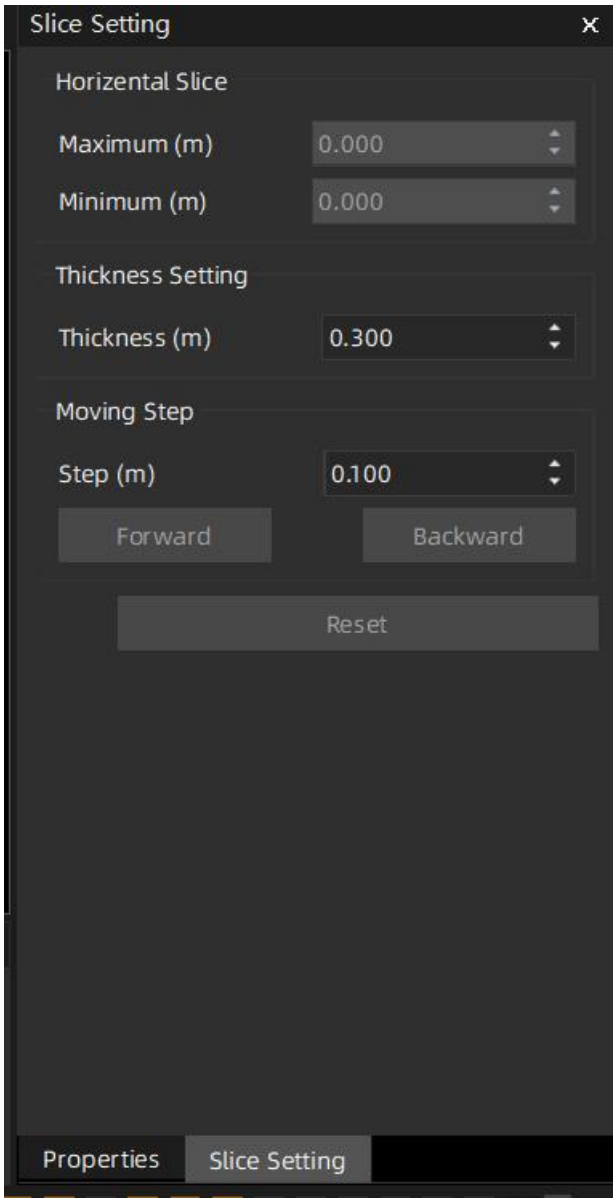


Figure: slice setting

4. Click "Save Clipped/Sliced" to export the clipped point cloud.

5. Sliced Point Cloud Export: Sliced point cloud export is slightly different. It only exports the point cloud from the current slice. Save Clipped retains the point cloud after deletion.

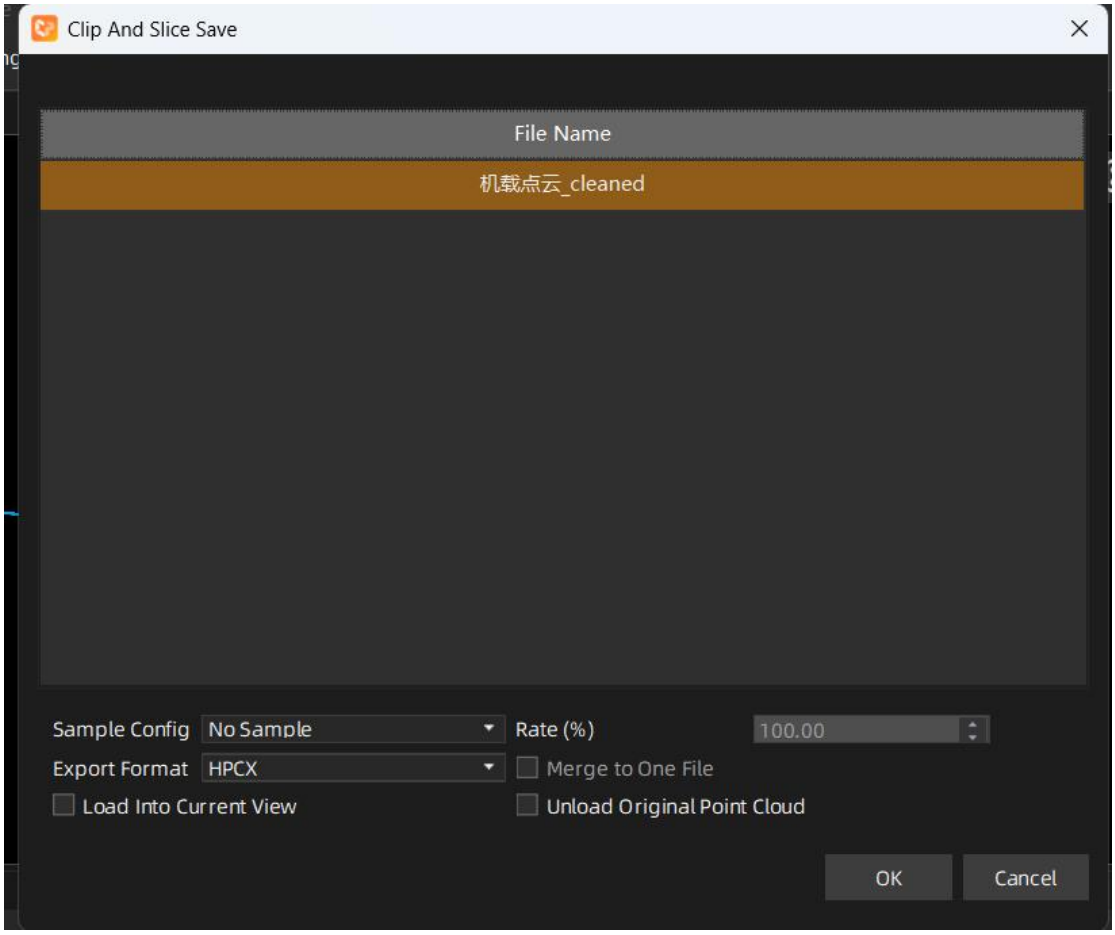


Figure: Clip and slice save

3.1.4 Precision Check

This chapter introduces how to perform precision check in CoProcess 2025. The software supports precision check of point clouds, Mesh models, orthophotos, and other data.

For precision check, after adding data to the software, click "Precision" in Check to pop up the precision check function panel.

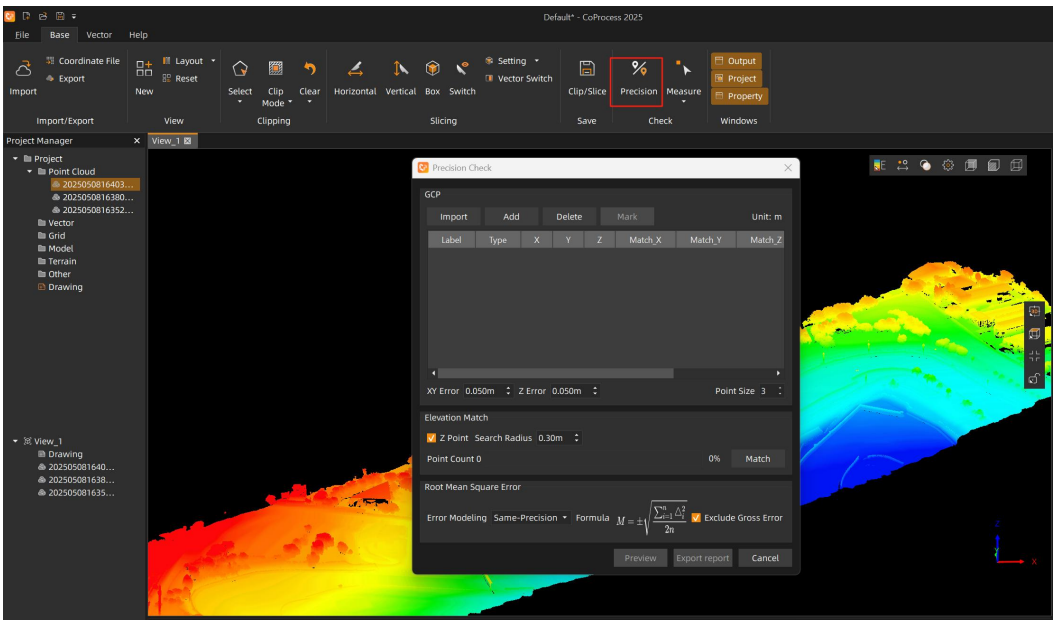


Figure: accuracy inspection

Import the control point file. The coordinates of the control point file need to be consistent with the coordinate system of the added data.

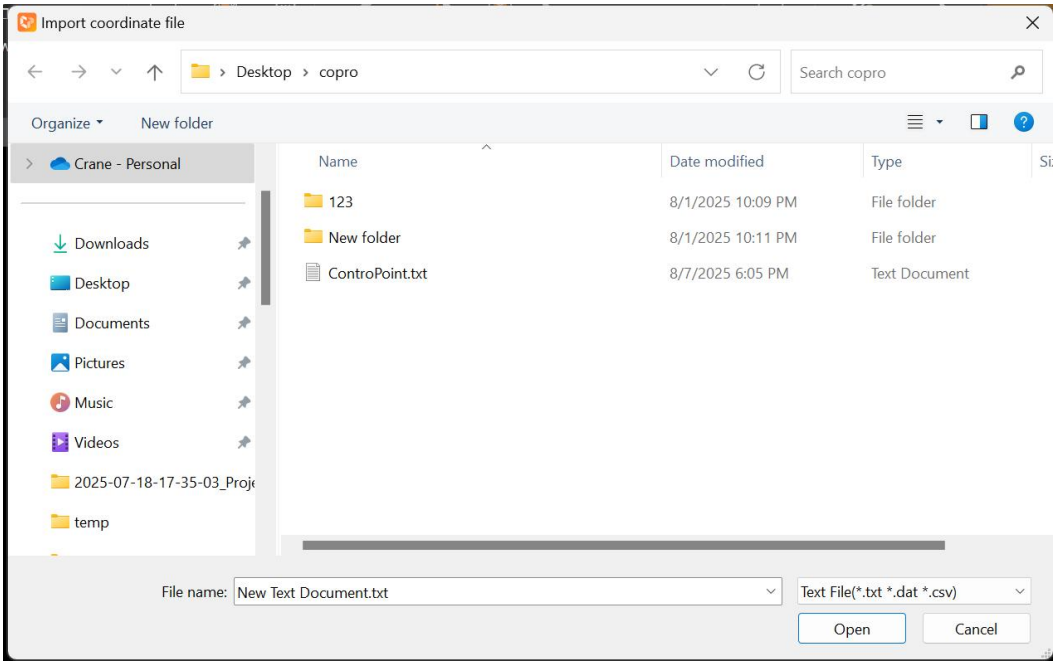


Figure: Choose Control-point File

In the import interface, first select the delimiter to ensure the imported control points are separated into columns. Then specify the properties for each column (Point Name, X, Y, Z coordinates, etc.). After setting, click "Confirm" to add the data.

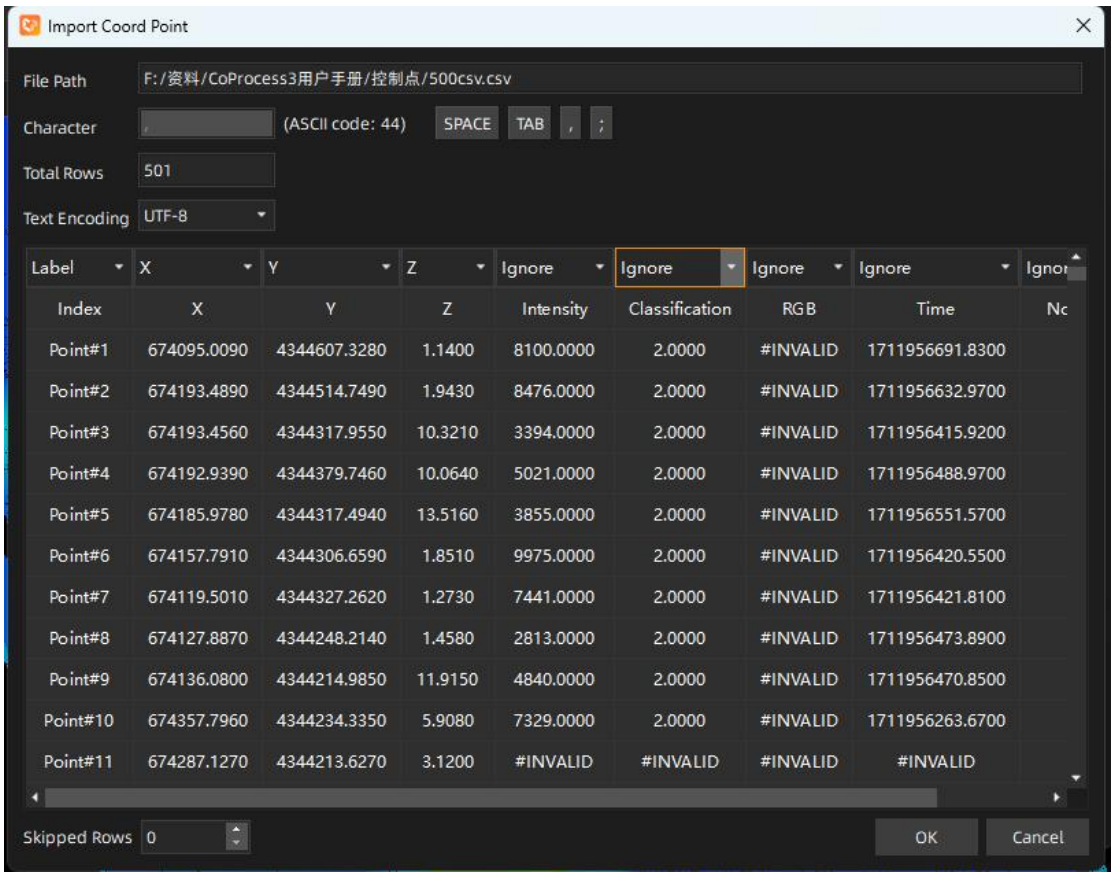


Figure: Specify Column Property

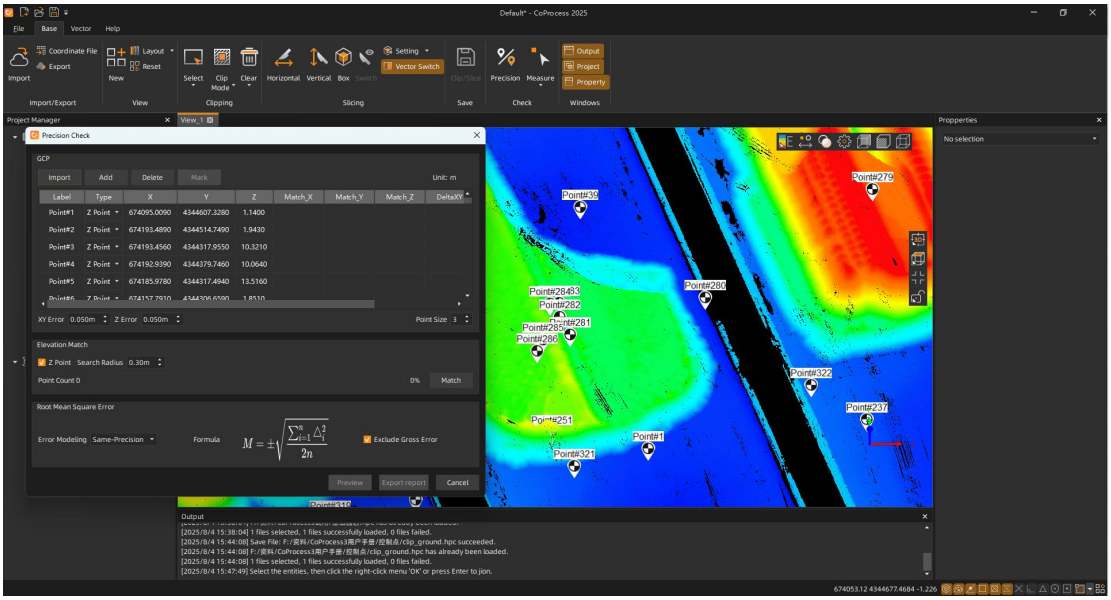


Figure: Add Control-points

After importing control points, set the point type based on the actual inspection requirements. Types include Elevation Point, Planar Point, and Planar/Elevation Point, corresponding to elevation check, planar check, and both.

Set the Planar RMSE Limit and Elevation RMSE Limit. Exceeding these limits will cause the corresponding control points to appear yellow or red in the list.

1. If only an elevation check is needed, you can set all point types to Elevation Point, then use the Elevation Matching function for quick matching. Check the Elevation Points checkbox and click Match.

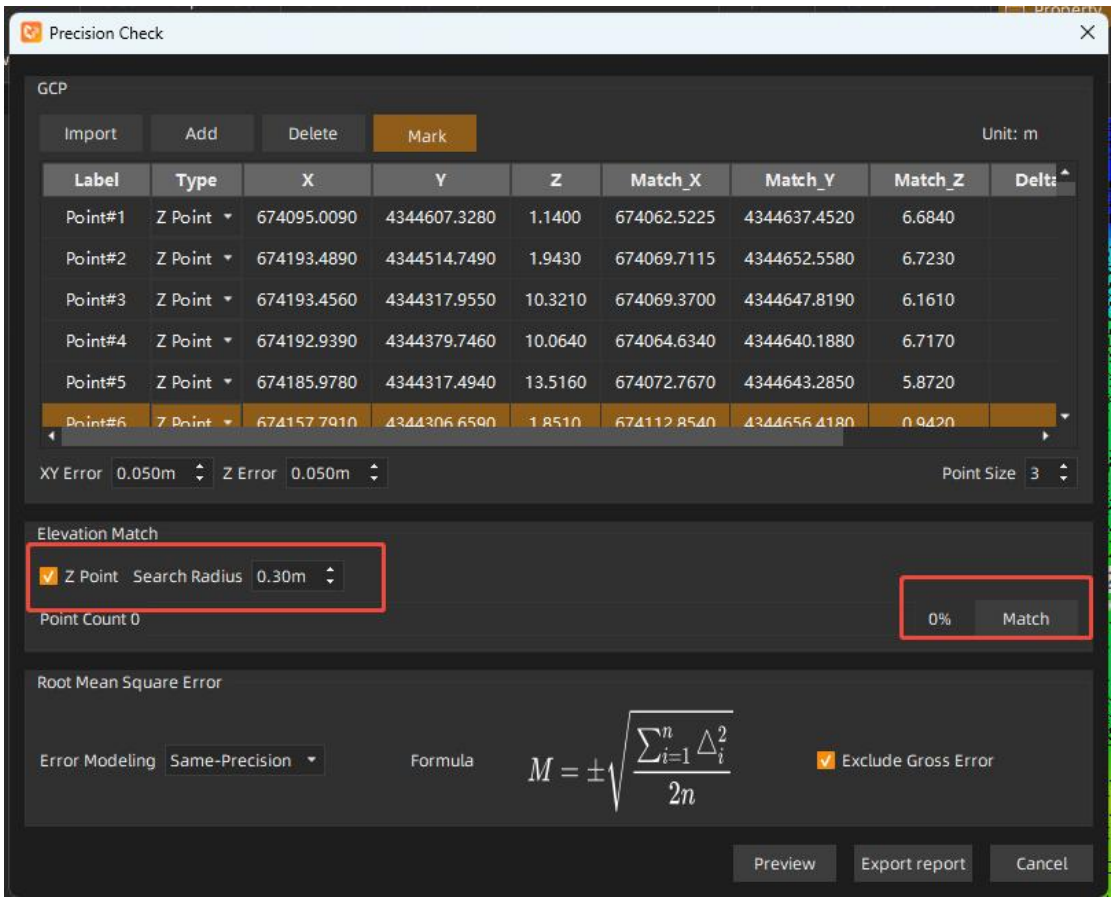


Figure: Match

After matching, the control point list displays the corresponding matched point coordinates (Match_X, Match_Y, Match_Z) and the elevation difference (DeltaZ).

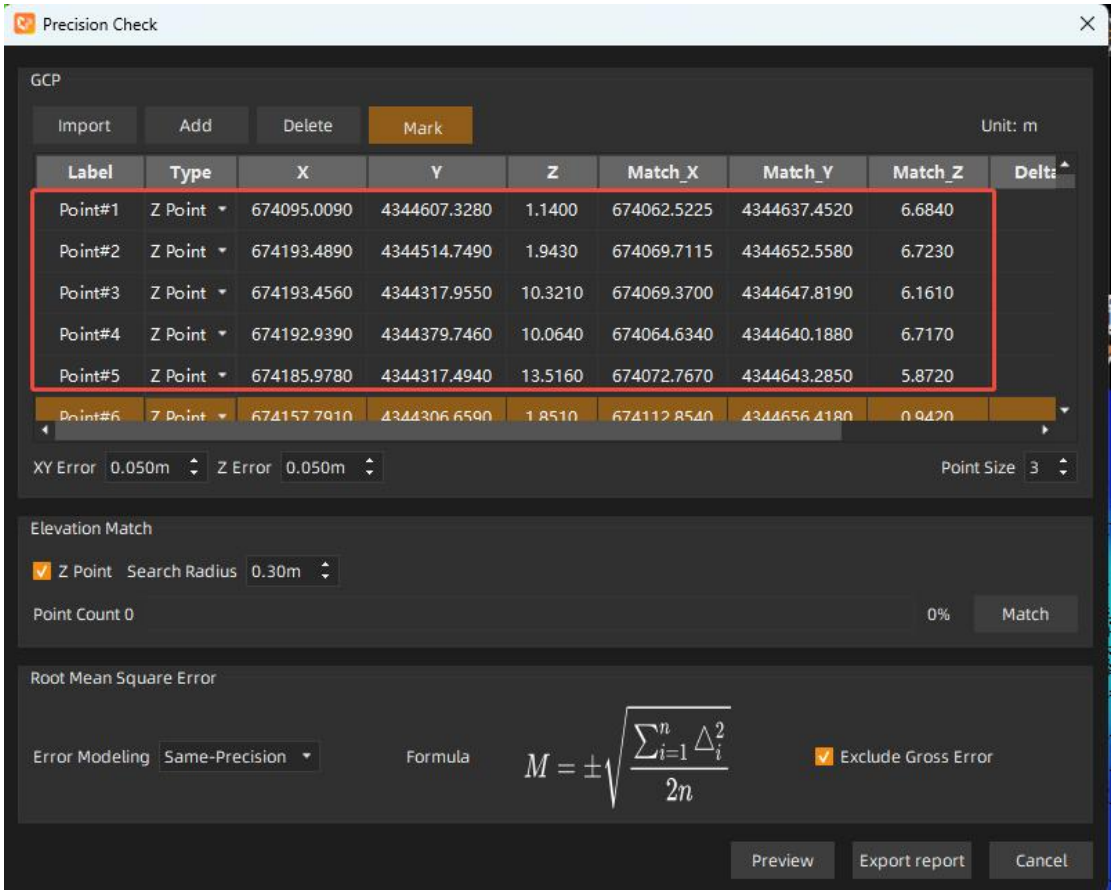


Figure: Match Result

Click Export Report to output the result report.

2. Planar and Planar/Elevation Check: For planar or combined checks, after setting the control point types, you need to perform point picking to confir m the check points.

Click the "Pick Point" function button to activate it. Select the control point in the list, right-click, and choose Locate to jump near that control point.

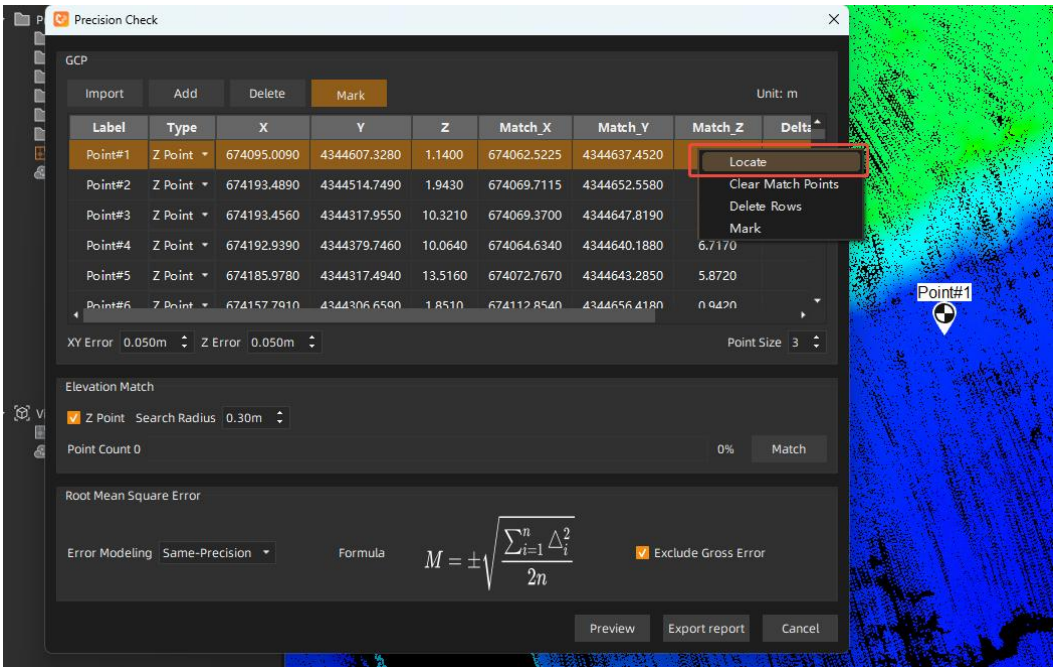


Figure: Jump to the control point position

Then left-click on the corresponding location on the point cloud, model, or orthophoto to pick the point. After picking, the check point coordinates and differences (XY and elevation) are displayed in the control point list. The picked point is also shown (prefixed with 'M').

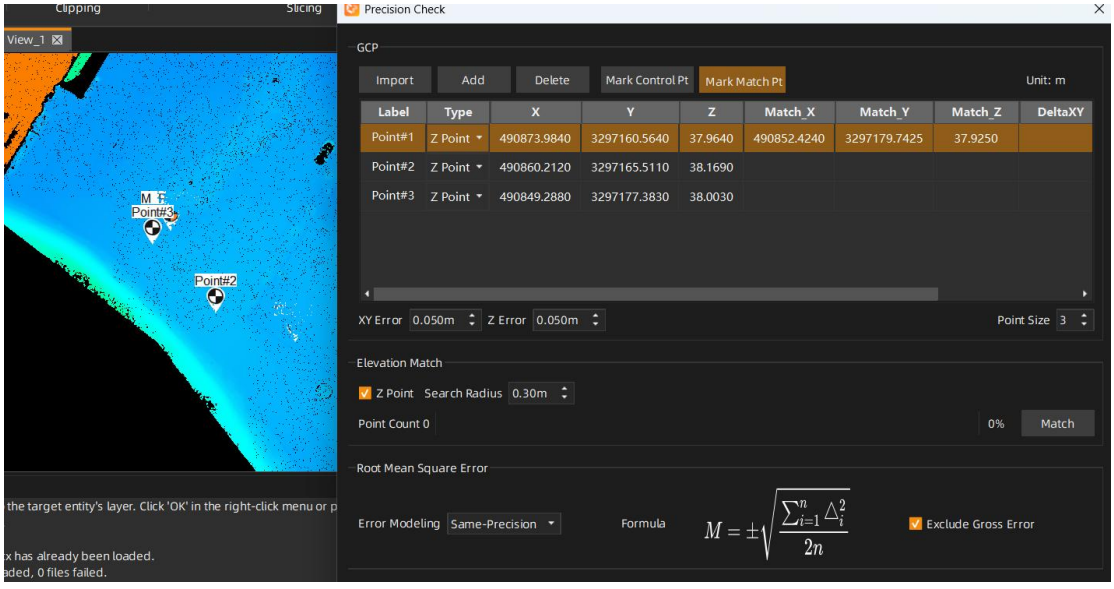


Figure: mark

If a point is picked incorrectly, you can pick again to overwrite it. If a control point should not be checked, right-click and delete the check point. Perform this picking operation for all control points sequentially.

After picking, select the desired RMSE calculation method. Click Preview to see the preview result, or directly click Export Report to output a PDF report.

3.2 Planar Drawing

Planar drawing is typically based on indoor point cloud data to draw planar vector results of buildings. The general processing workflow is as follows:

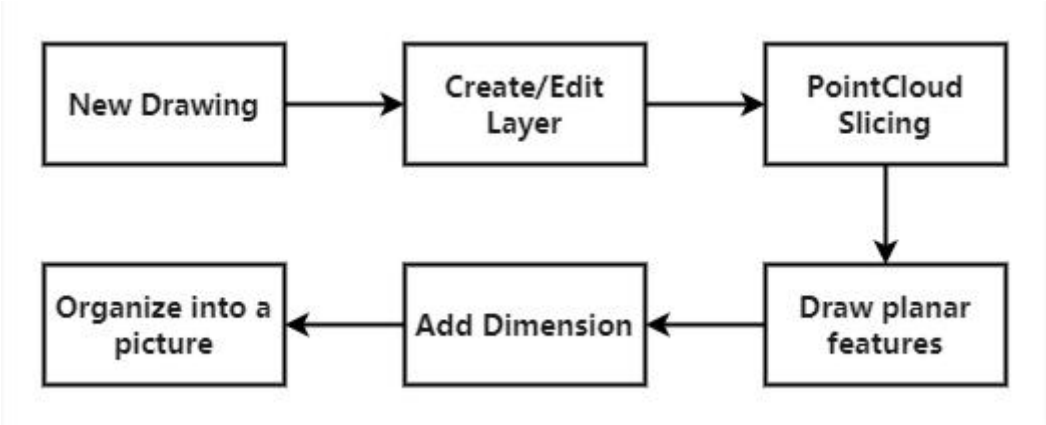


Figure: Plane Drawing Process

3.2.1 New Drawing

Before formally drawing planar features, you need to create a new drawing. The purpose is to store all drawn features in this drawing.

Click "New Drawing" in the Vector menu, choose a save path, name the drawing, and click OK to create it.

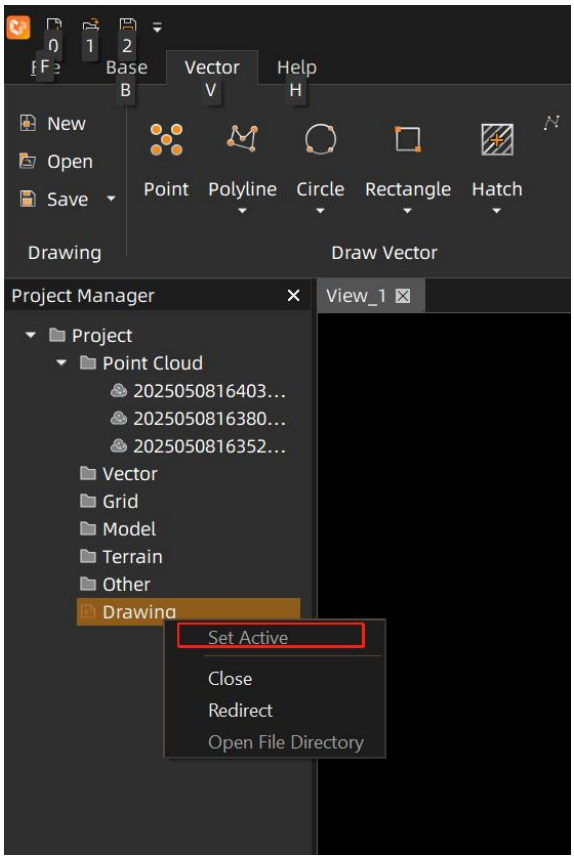


Figure: Set Activez

After creating the drawing, it appears in the Project Management list and V iew 1 list. Initially, the icon before its name is gray, indicating it is inactive.

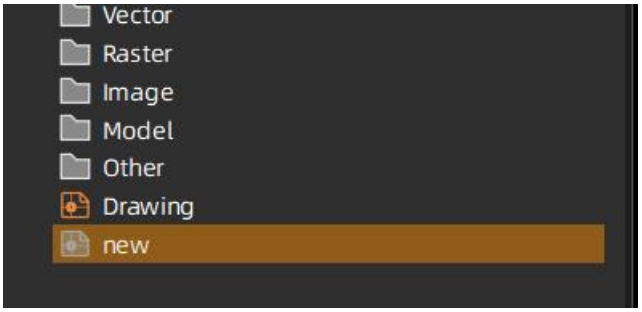


Figure: New Drawing Status – Inactive

Activate the Drawing: After creating a new drawing, you need to activate it. Features drawn afterwards will be saved to this active drawing.

In the Project Management panel, right-click and select Activate Drawing. Th e icon before the drawing name becomes highlighted, indicating it is active.

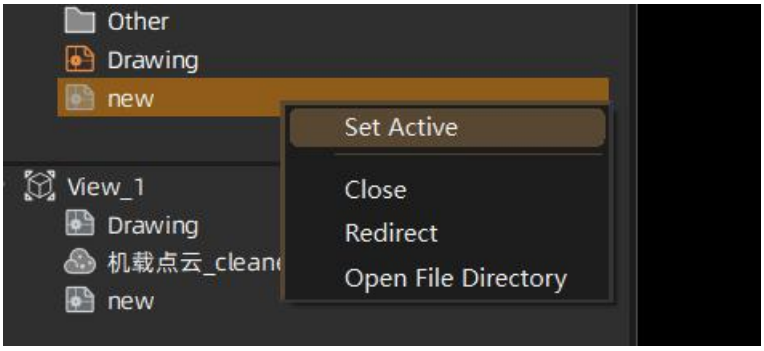


Figure: Activate Drawing

3.2.2 Create Layers

After creating the drawing, you need to create different feature layers based on the elements to be collected from the current data, such as Walls, Windows, Doors, Dimensions, etc.

Click the Layer button in the Vector menu, then click New Layer in the Layer Manager panel.

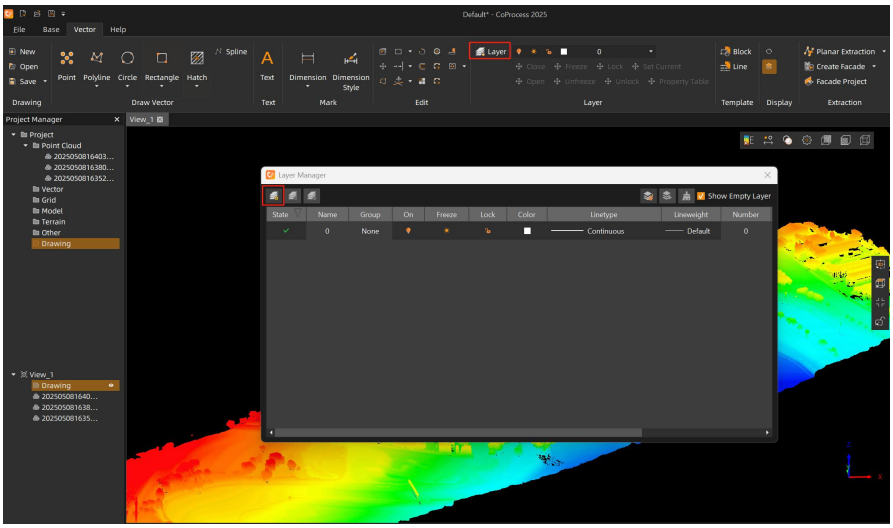


Figure: Create Layer

After creating a new layer, double-click the layer name to modify it, and click the color box to change the layer color for distinguishing different features.

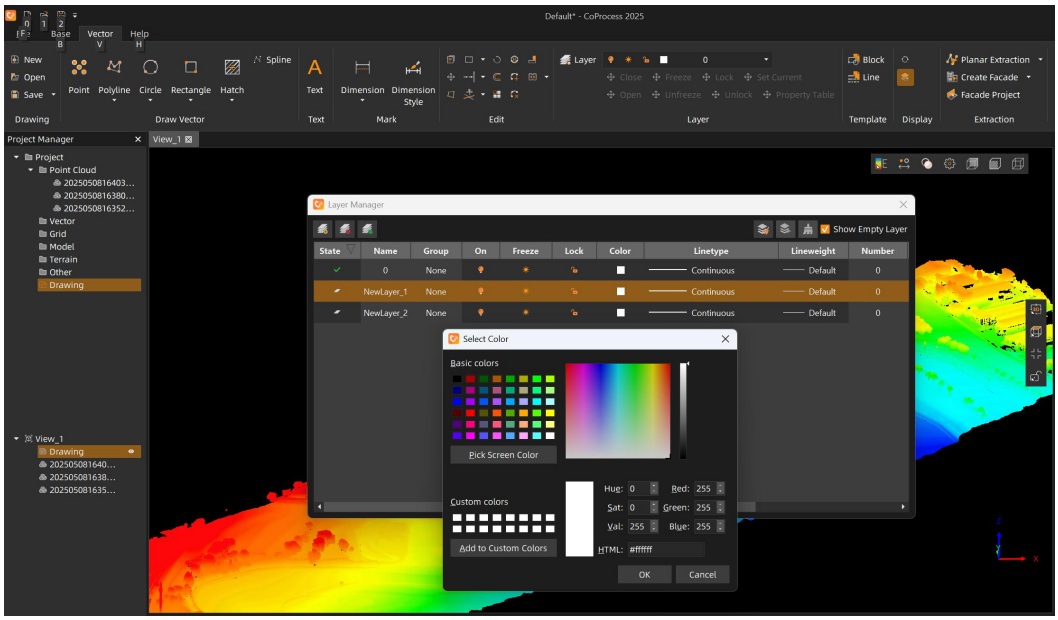


Figure: Modify Layer Color

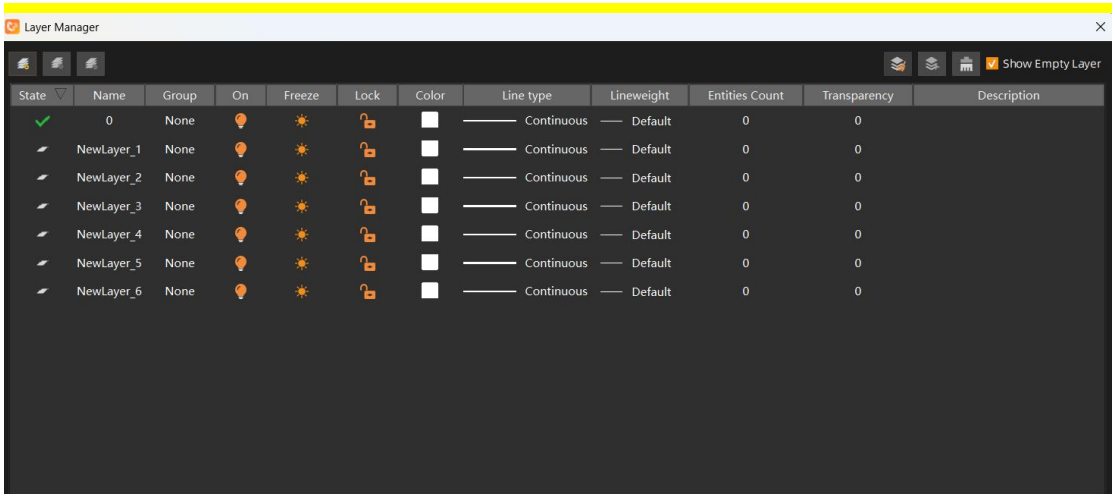


Figure: Create Different Feature Layers

3.2.3 Point Cloud Slicing

Before formally collecting planar features, you need to slice the added poin t cloud data for better viewing and reference during planar feature drawin g.

In the Basic menu, click the Horizontal Slice function. The cursor changes t o a knife shape, indicating the function is active. Left-click on the point clo ud data where you want the horizontal slice to create it.

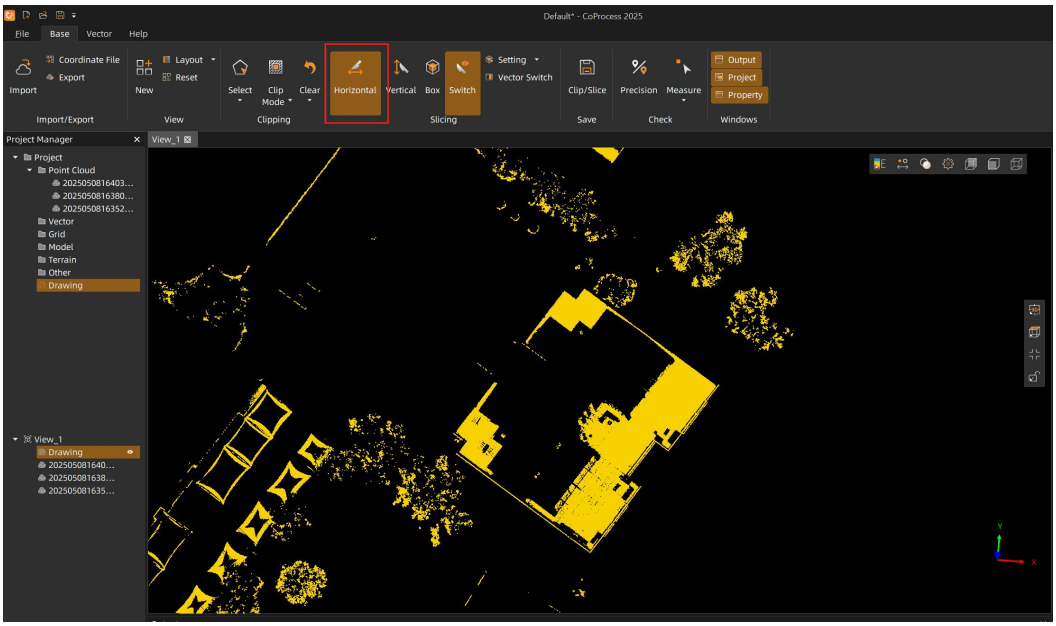


Figure: Horizontal Slice

Slice Adjustment: Hold the left mouse button and scroll the wheel to adjust the slice height. Hold the Shift key and scroll the wheel to adjust the slice thickness. Alternatively, adjust the slice's max/min values and thickness in the slice settings panel.

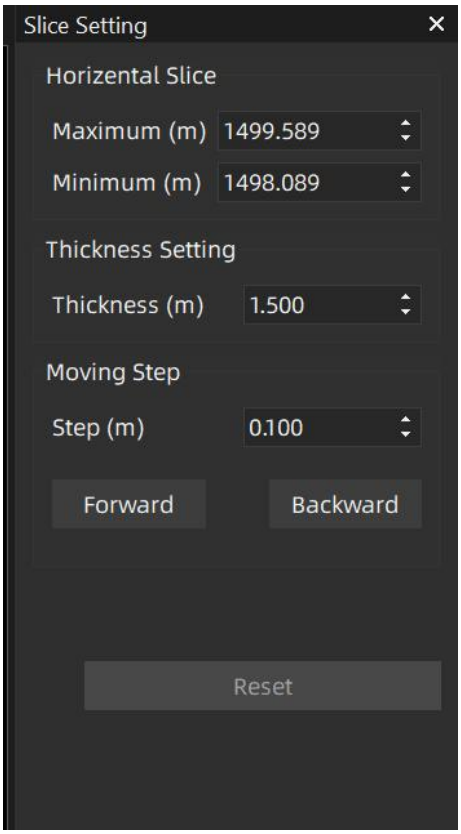


Figure: Slice Setting

The main purpose of slice adjustment is to obtain a clear planar outline of the point cloud, facilitating feature collection. Adjustments can be made dynamically during collection, with the ultimate goal of making feature drawing easier.

3.2.4 Planar Feature Drawing

Planar feature drawing includes walls, windows, doors, dimensions, etc. For easier viewing, you can set the view to 2D in the view settings on the right. In 2D mode, data can only be panned and rotated, not flipped.

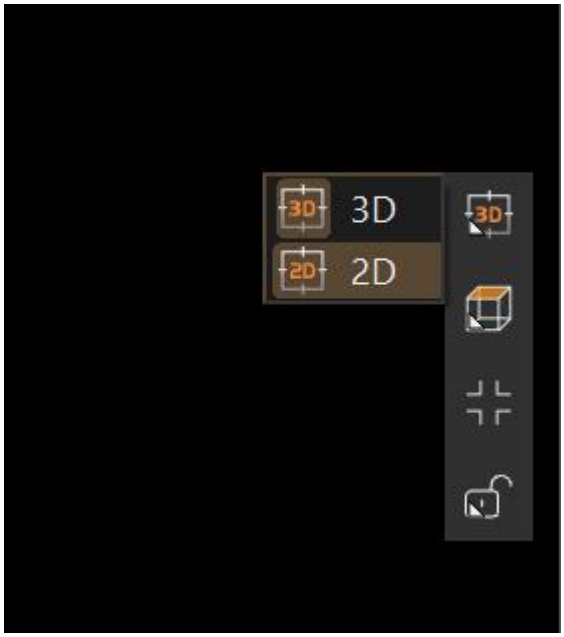


Figure: 2D View

Wall Drawing: Before drawing, set the current layer in the Layer menu to the feature you are about to draw. Here, we are drawing walls, so set the layer to Wall.

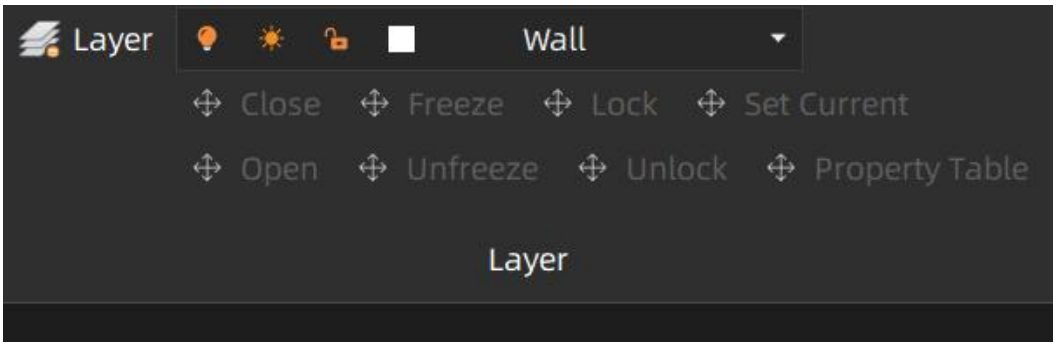


Figure: Set wall layer as current layer

For regular wall structures, you can use Right Angle Mode for drawing. Click the dropdown button under Polyline in the menu and select Right Angle Mode.

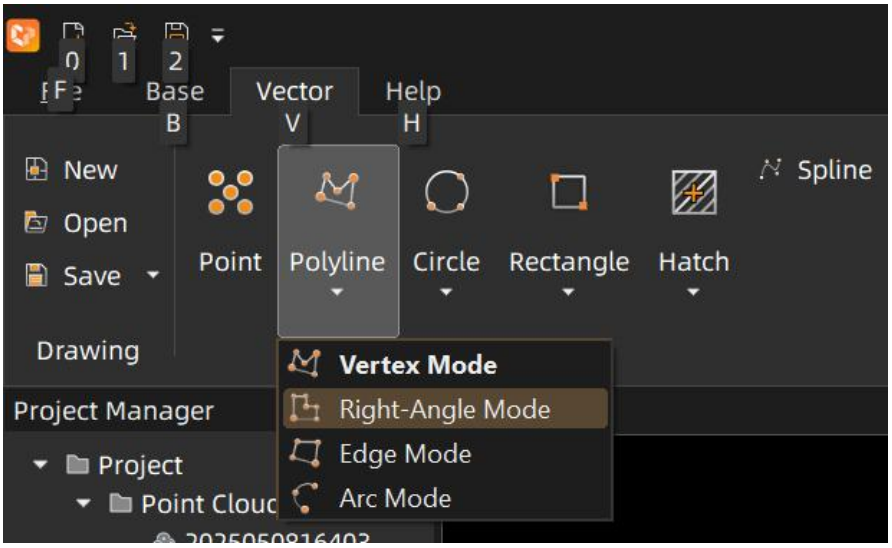


Figure: Right-Angle Mode

Start drawing on the point cloud. You can turn off Point Cloud Snap if needed and try to draw along the center of the point cloud. When a corner is needed, the software automatically creates a right angle.

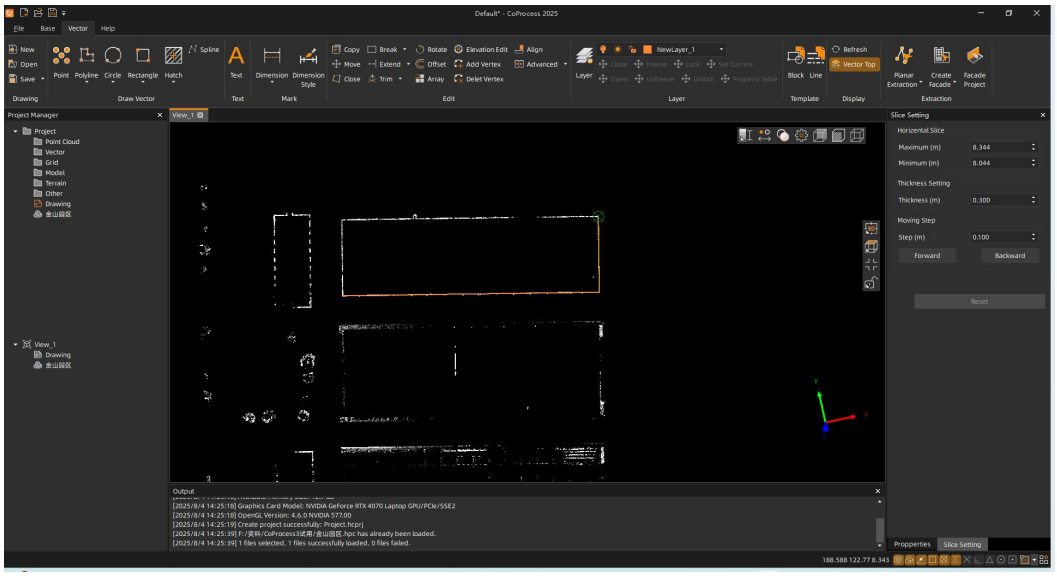


Figure: Right-Angle Mode

Double-click the left mouse button or right-click and select "Confirm" at the end of the drawing to finish.

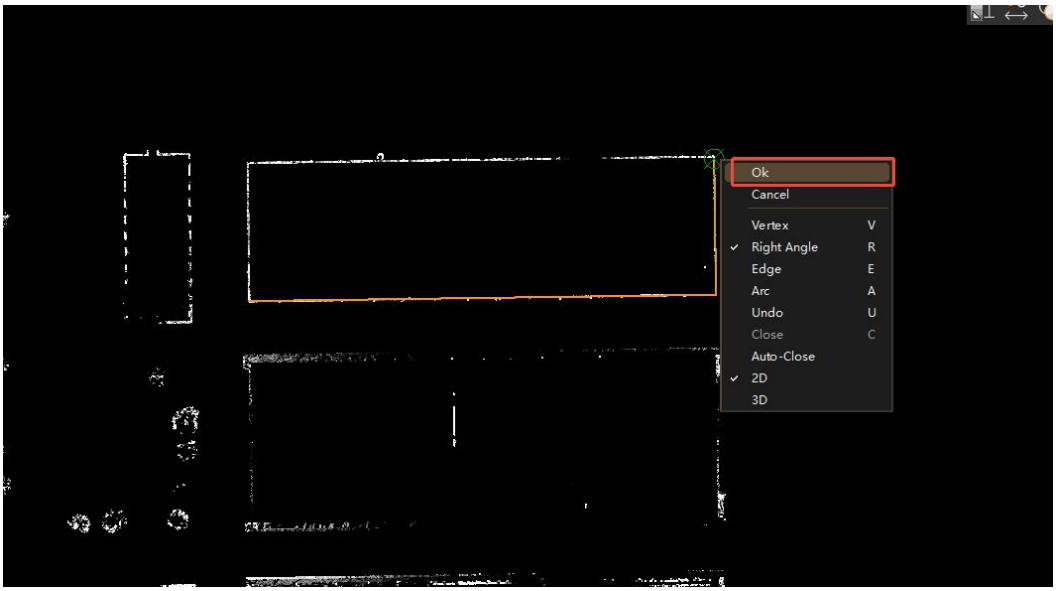


Figure: Finishing Drawing

Window Drawing: Window drawing is similar to wall drawing. Switch the layer to the Window layer before drawing. Use Vertex Mode (if the window is irregular). When drawing, snap the first point of the window to the endpoint of the previously drawn wall, then continue drawing.

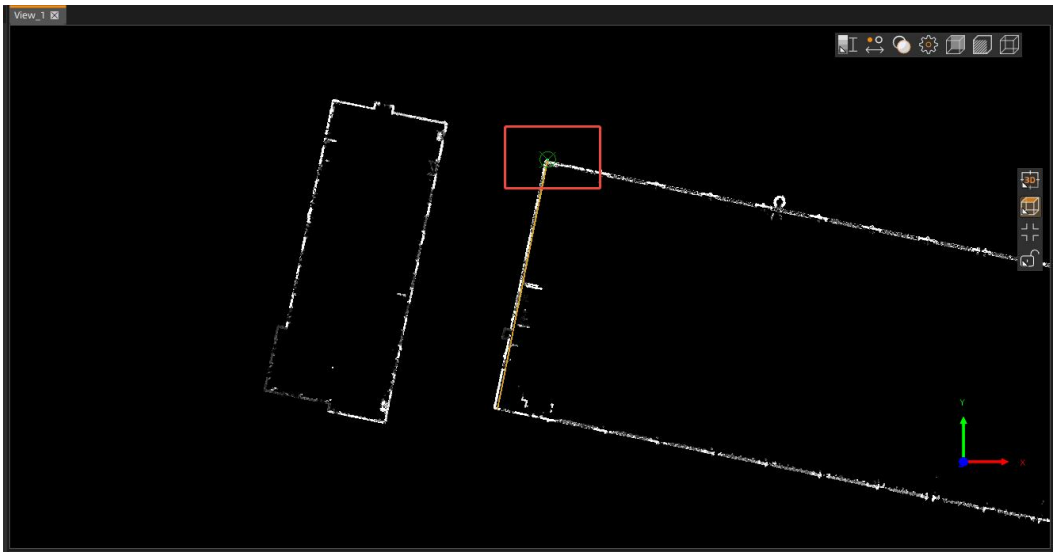


Figure: Vertex Mode

If you need to switch drawing modes during the process, right-click and select the mode, e.g., switch from Vertex Mode to Arc Mode to draw an arc, completing the window drawing.

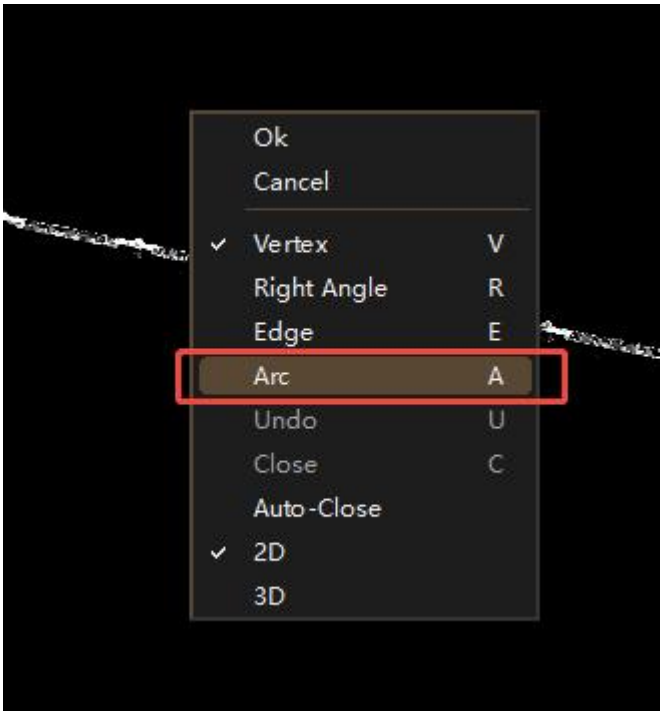


Figure: Switch to Arc Mode

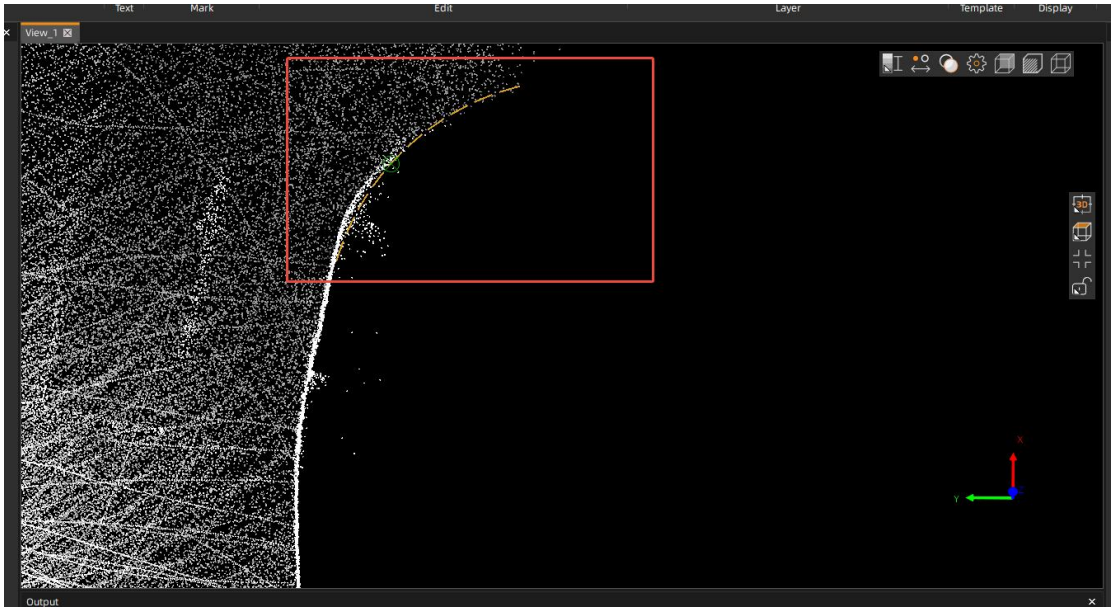


Figure: Arc Mode

Door Feature Representation: In the Vector menu, click Block under Templa te. Select a door template. After selecting the appropriate door, confirm its position with three clicks.

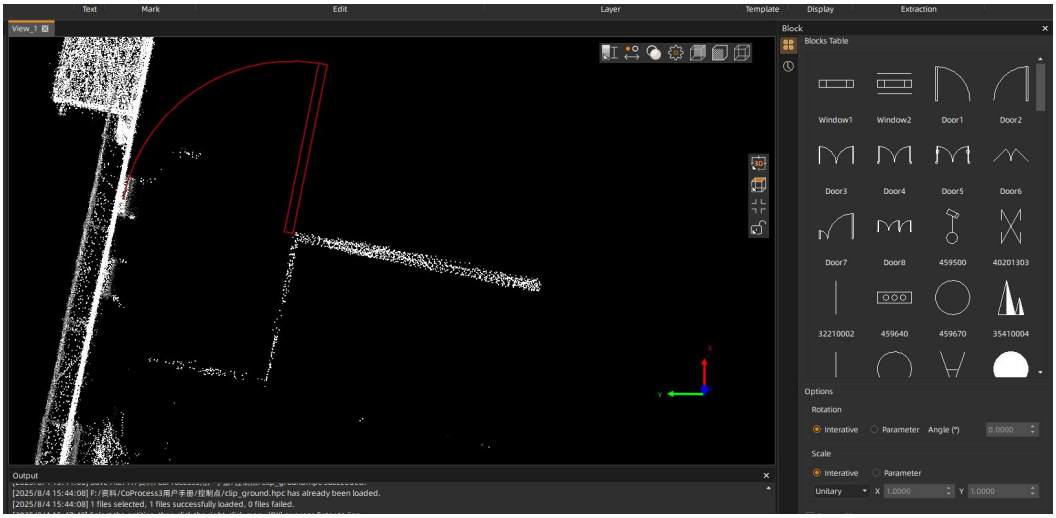


Figure: Drawing door

3.2.5 Adding Dimension Features

Adding Dimension Features:

Before dimensioning, you can set the dimension style, including text, units,

precision, etc. Set the precision to 2 decimal places here. Click Apply.

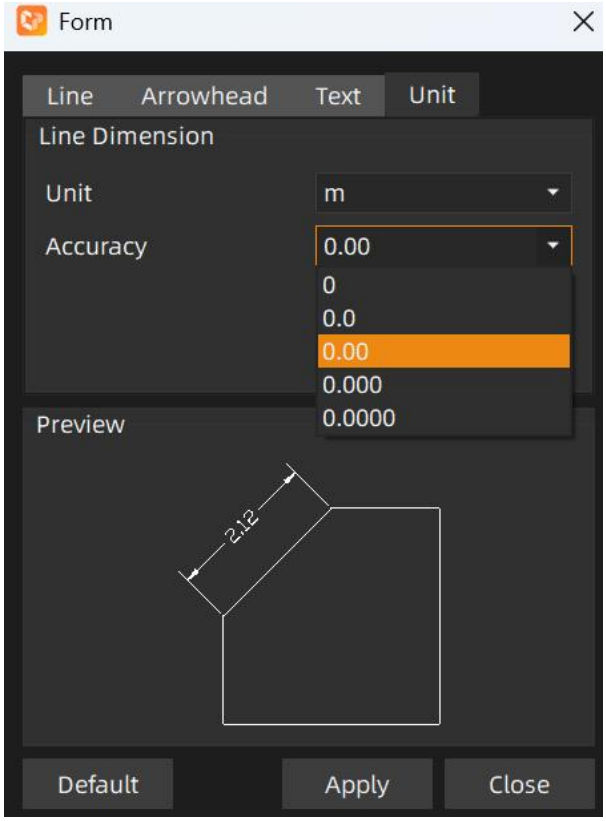


Figure: Set dimension style

Aligned Dimension: Click the Dimension dropdown button, select Aligned Di mension, and start dimensioning on the drawn features.

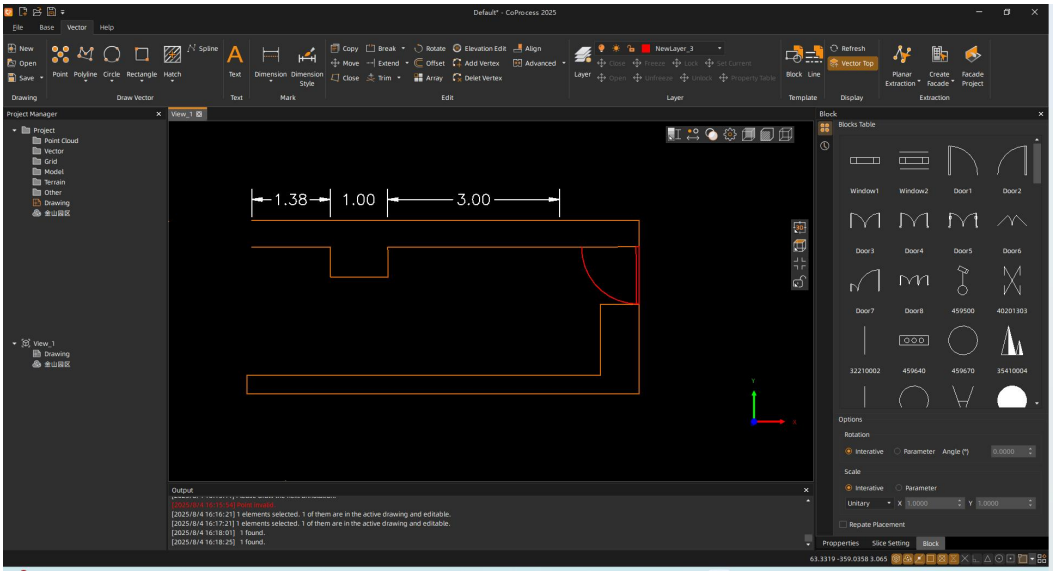


Figure: Drawing Align-Dimension

Area Dimension: For closed 2D areas, you can directly click inside the close d area to calculate the area.

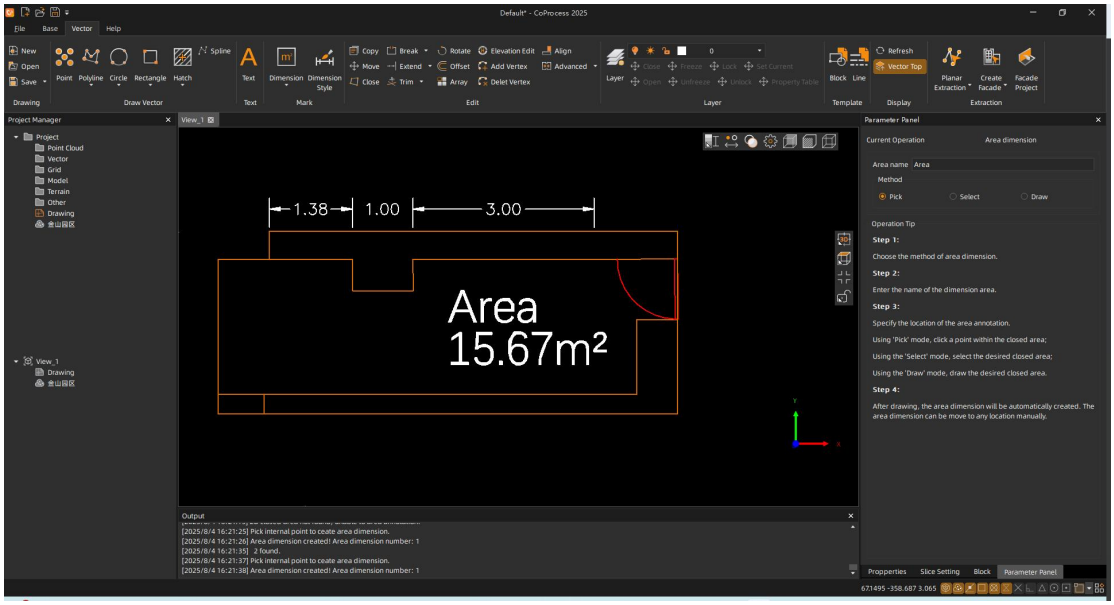


Figure: Drawing Area Dimension

3.2.6 Drawing Arrangement

After feature drawing is complete, finalize the drawing, including creating ta bles, outputting files, and creating title blocks.

Drawing a Table: First, determine the number of rows and columns needed for the table content. Use lines and offset commands in the software to d raw the table.

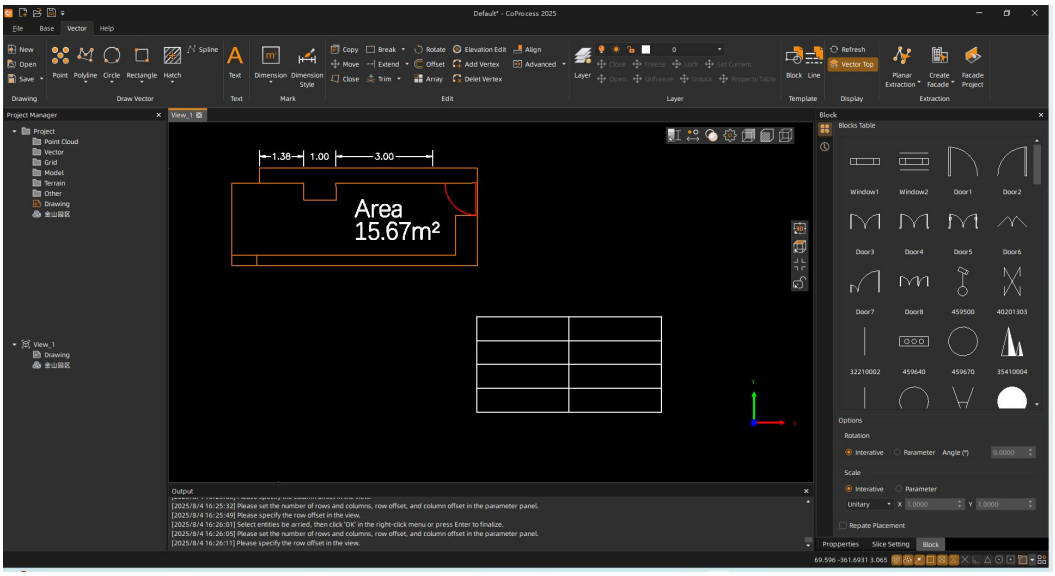


Figure: Drawing Table

Filling Table Content: Use the Text function to fill in the corresponding info rmation in the table.

Click the Text function. Use three clicks to define the start point, direction, and size of the text. Then enter the text.



Figure: Drawing Text

Name	Plane Outline
Area	17.37
Time	2025
Author	XXX

Figure: Fill Table

Creating a Title Block: Use the Rectangle drawing function to draw a rectangle around the drawn content and the title block. Then use the Offset function to offset the rectangle, creating the title block.

3.3 Facad Drawing

Elevation drawing is typically used to draw building elevation information, including walls, windows, doors, steps, dimensions, and other features.

The data processing workflow is as follows:

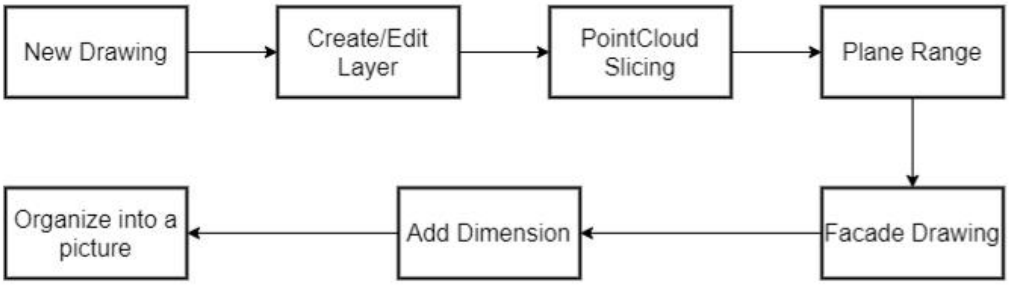


Figure: Facade Drawing Process

3.3.1 New Drawing

Before formally drawing elevation features, you need to create a new drawing. The purpose is to store all drawn features in this drawing.

Click "New Drawing" in the Vector menu, choose a save path, name the drawing, and click OK to create it.

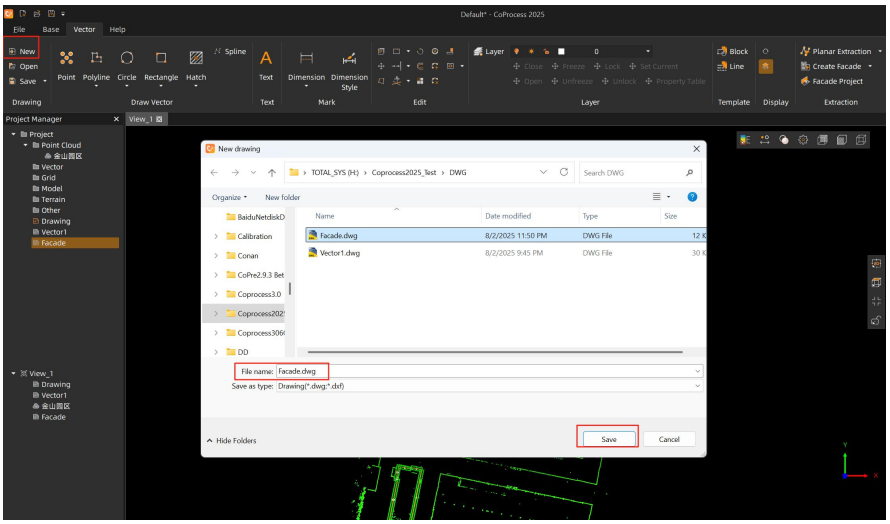


Figure: New Drawing

After creating the drawing, it appears in the Project Management list and View 1 list. Initially, the icon before its name is gray, indicating it is inactive.

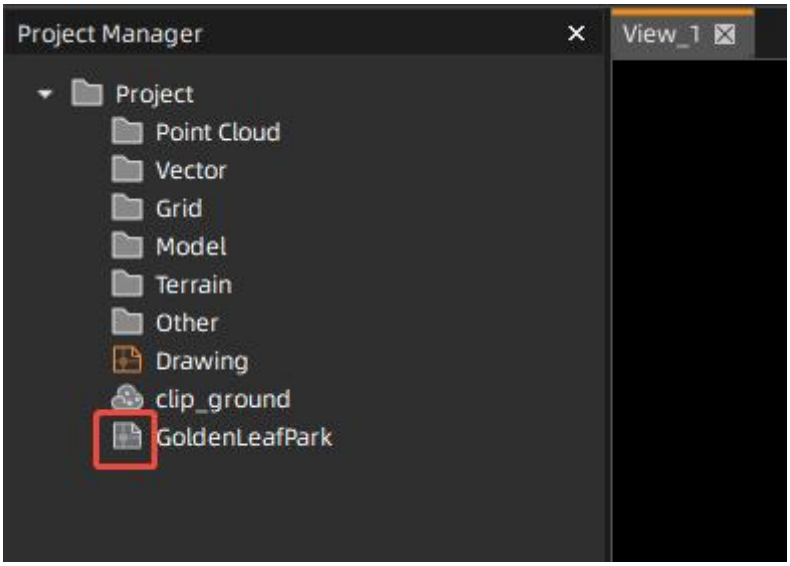


Figure: Drawing-unactived

Activate the Drawing: After creating a new drawing, you need to activate it. Features drawn afterwards will be saved to this active drawing.

In the Project Management panel, right-click and select Activate Drawing. Th e icon before the drawing name becomes highlighted, indicating it is active.

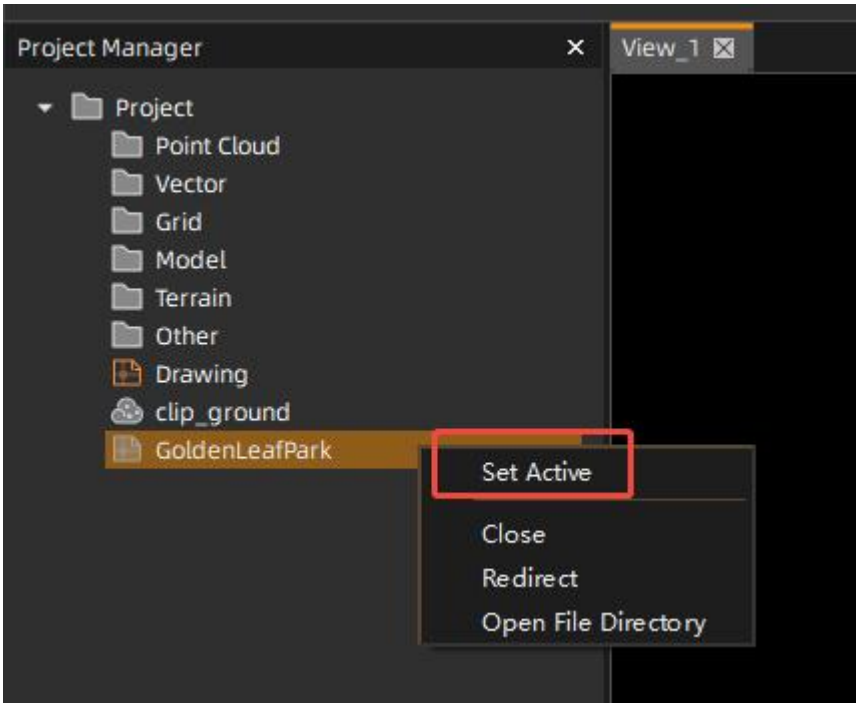


Figure: Set drawing active

3.3.2 Create Layers

After creating the drawing, you need to create different feature layers base d on the elements to be collected from the current data, such as Walls, Wi ndows, Doors, Steps, Dimensions, etc.

Click the Layer button in the Vector menu, then click New Layer in the Lay er Manager panel.

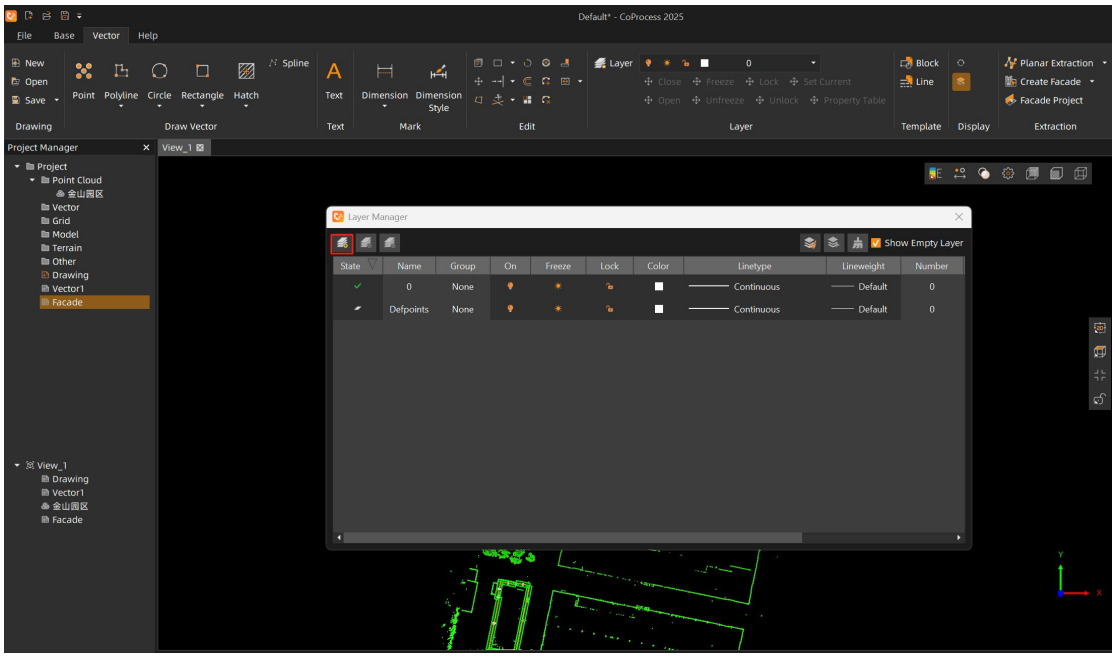


Figure: Create New Layer

After creating a new layer, double-click the layer name to modify it, and cli ck the color box to change the layer color for distinguishing different featu res.

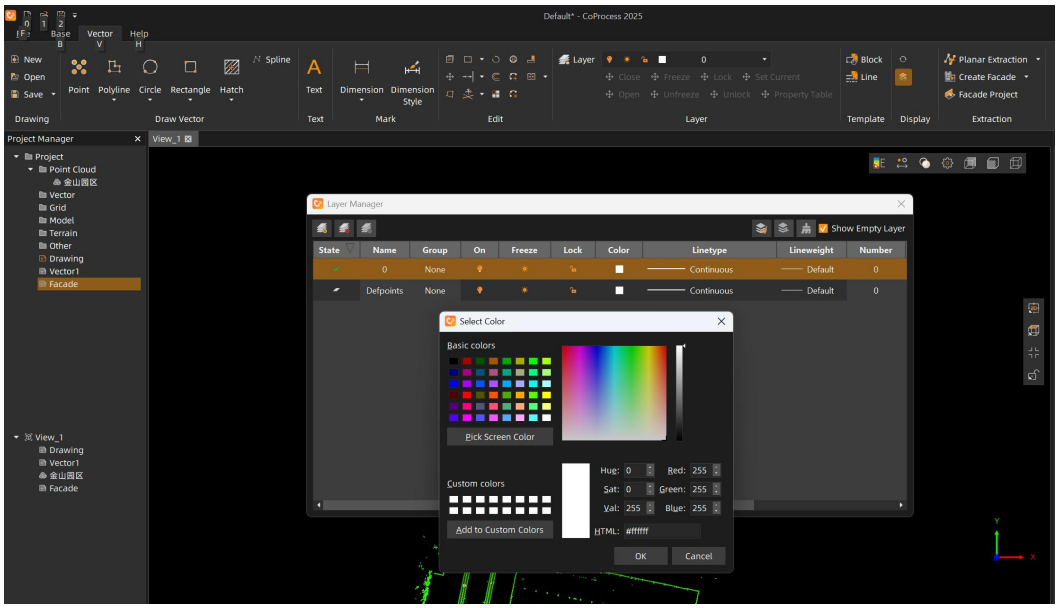


Figure: Modify Layer Color

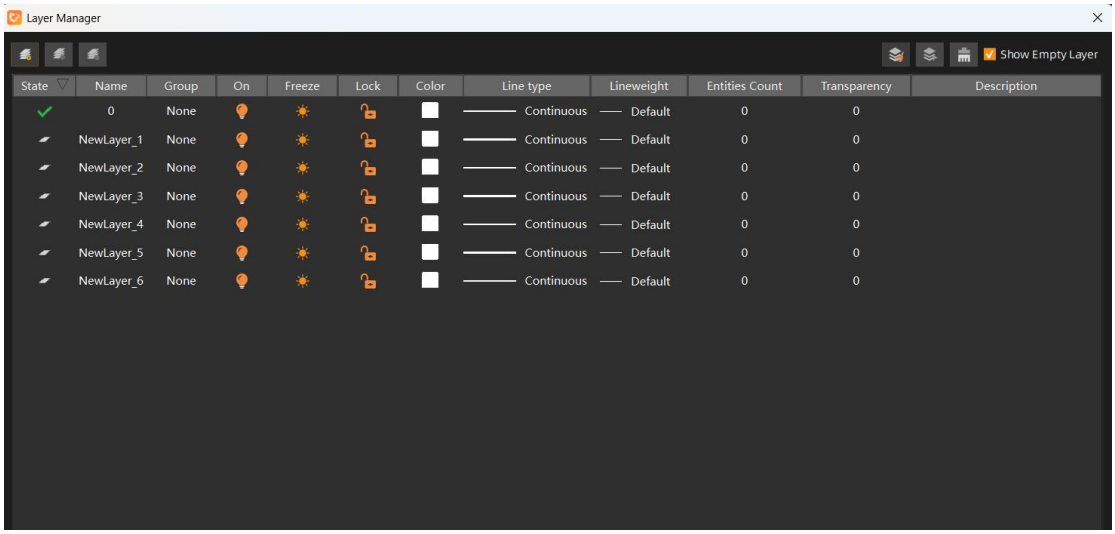


Figure: Create Different Feature Layers

3.3.3 Point Cloud Slicing

Before formally collecting planar features, you need to slice the added poin t cloud data for better viewing and reference during planar feature drawin g.

In the Basic menu, click the Horizontal Slice function. The cursor changes t o a knife shape, indicating the function is active. Left-click on the point clo ud data where you want the horizontal slice to create it.

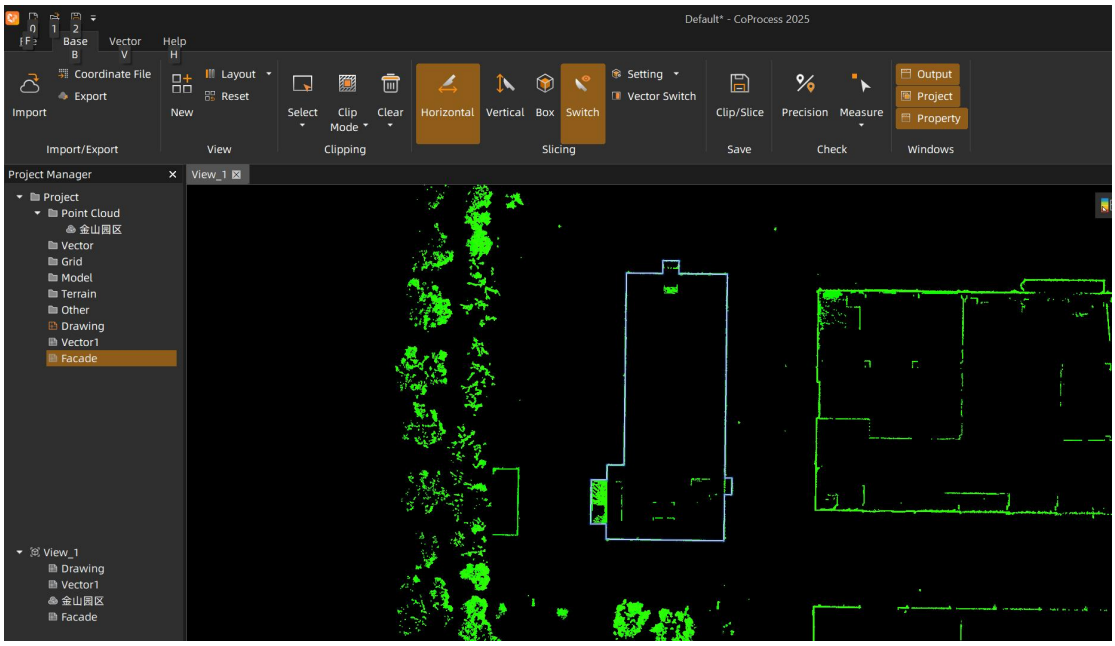


Figure: Horizontal Slice

Slice Adjustment: Hold the left mouse button and scroll the wheel to adjust

the slice height. Hold the Shift key and scroll the wheel to adjust the slice thickness. Alternatively, adjust the slice's max/min values and thickness in the slice settings panel.

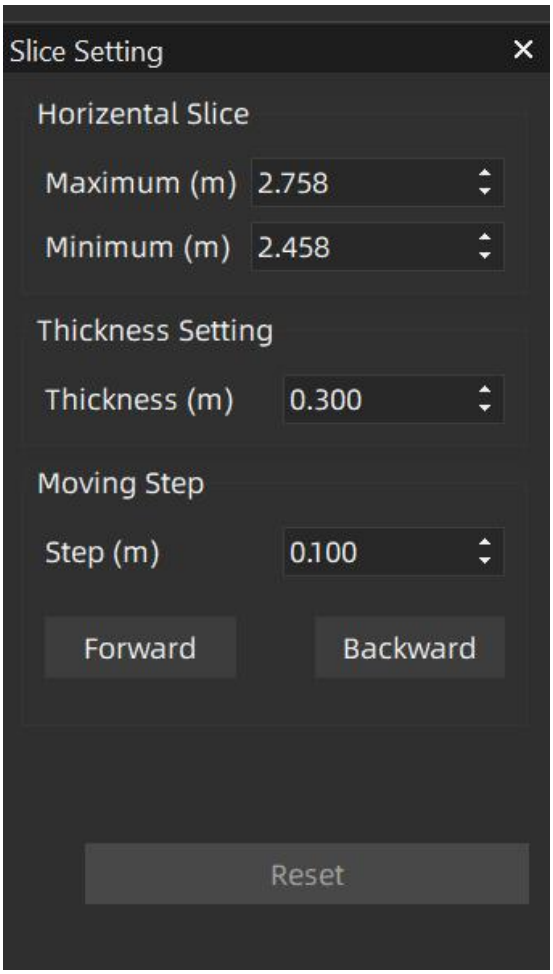


Figure: Slice Setting

The main purpose of slice adjustment is to obtain a clear planar outline of the point cloud, facilitating feature collection. Adjustments can be made dynamically during collection, with the ultimate goal of making feature drawing easier.

3.3.4 Planar Extent

Before drawing elevation features, you need to draw a planar extent. The software will automatically generate elevation data based on this planar extent, facilitating elevation feature drawing.

Set the layer to Planar before drawing.

After horizontal slicing, click the Polyline dropdown button in the Vector menu and select Right Angle Mode (for regular buildings) to draw the planar extent.

During drawing, you can turn off Point Cloud Snap in the bottom right corner to help draw along the center of the sliced point cloud. When drawing area features, you can enable Auto Close.



Figure: Rigjt Menu

3.3.5 Facade Element Drawing

After drawing the plane, click the Create Facade function in the Vector menu bar to generate facade point clouds. After clicking "Create Facade", select an edge on the vector as front view

For buildings with regular structures, you can select Four-View; for buildings with complex structures, you can select Multi-View.Click "Ok", and then select a edge of the vector as the front view.

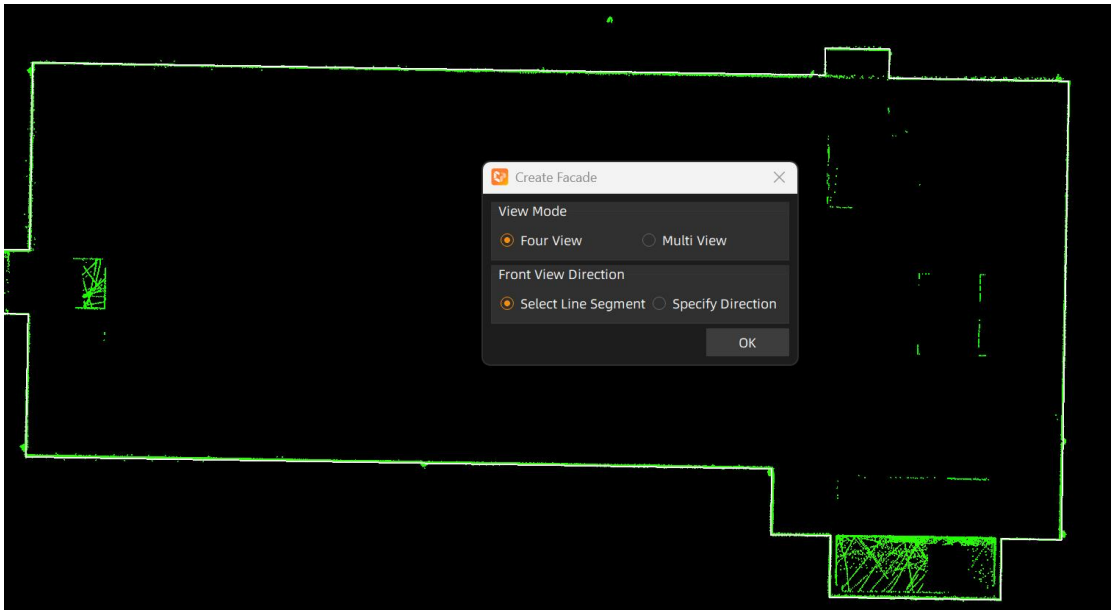


Figure: Right-Angle Mode

After creating the facade view, the software automatically loads the front view facade point cloud into the facade view.

Adjustment of the point cloud range in the facade view: The yellow part displayed in the planar range contour is the range cut by the current view. You can adjust the cutting thickness in the facade view to adjust the slice range to ensure that the complete point cloud data is displayed in the facade view.

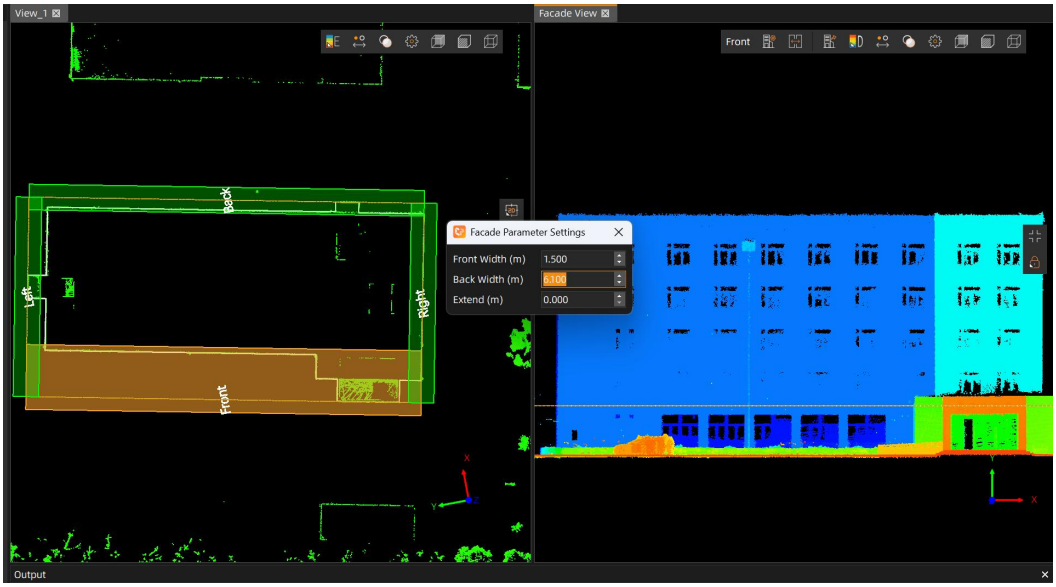


Figure: Four View

After the facade view point cloud slicing is set appropriately, start drawing

facade elements.

First, switch the layer to Wall, and then start drawing wall elements.

In the Vector menu bar, click the drop-down button of Polyline and select Right Angle Mode to start drawing the facade range. The starting point of t he drawing can start snapping from the endpoint of the planar range.

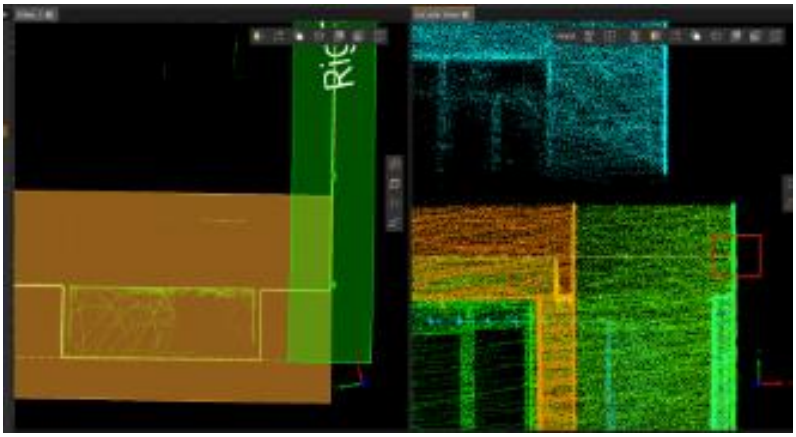


Figure: Facade View

Window drawing: After drawing the wall, you can draw window elements.

In the Vector menu bar, select Rectangle Drawing, and draw rectangles in t wo-point or three-point mode to represent windows.

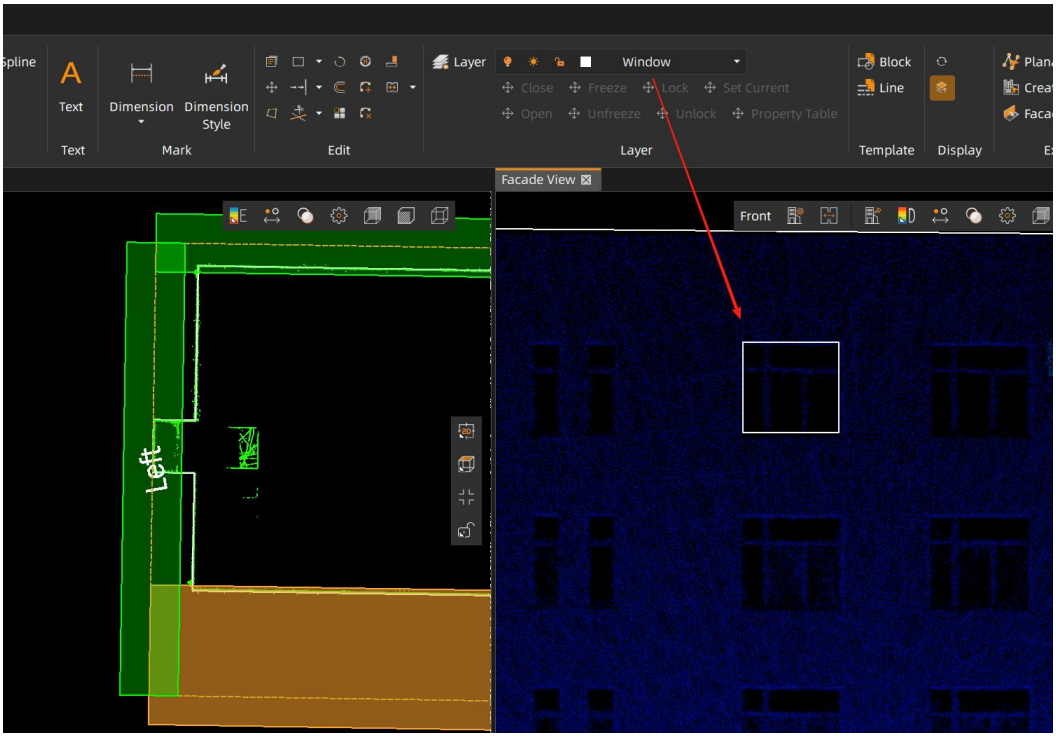


Figure: Set window-layer as current layer

Window array, batch processing: For identical windows, you can use the arr ay function to generate other windows in batches.

After drawing one window element, select the current window and click the Array function.

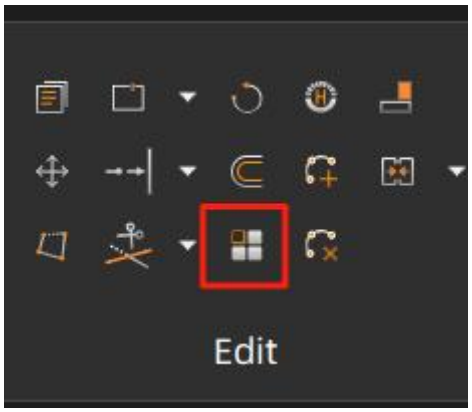


Figure: Window-Array

Modify the row spacing, column spacing, and number of rows and columns in the parameter panel.

Modify the row spacing: manually adjust the plus and minus buttons of the row spacing to adjust the row spacing until it is in the appropriate positio n on the graph. Or click the adjustment button to manually adjust the row

spacing.

Modify the column spacing: The modification of column spacing is the same as that of row spacing, which can be adjusted manually by plus or minus or by manual translation.

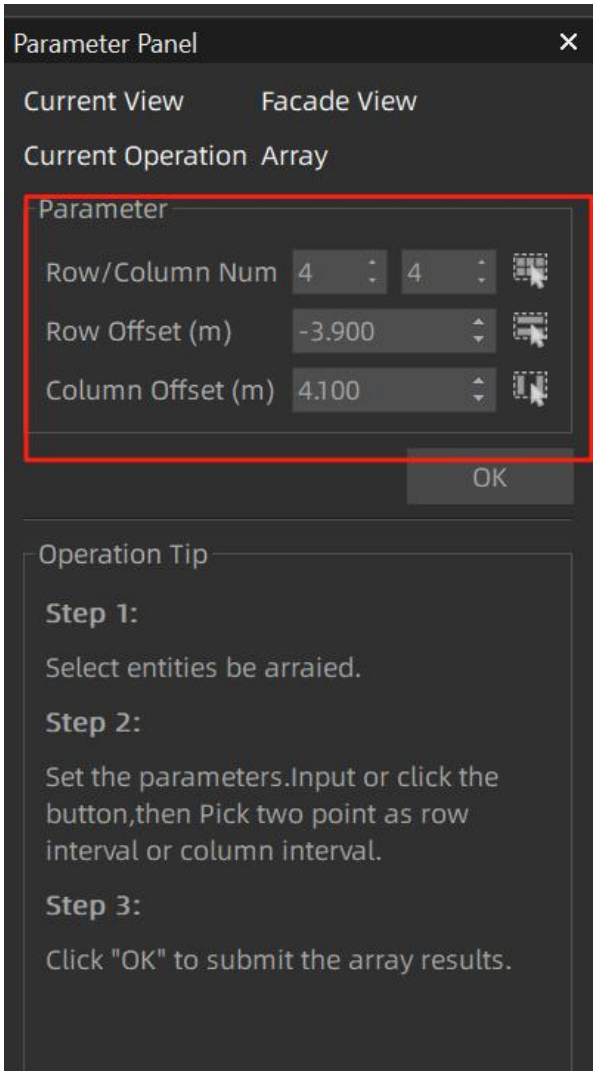


Figure: Set array parameter

After setting the row and column spacing reasonably, set the corresponding number of rows and columns. You can manually enter the corresponding number of rows and columns in the parameter panel, or manually pull the diagonal to confirm the number of rows and columns.

Click Confirm after setting to complete the array processing of window elements.

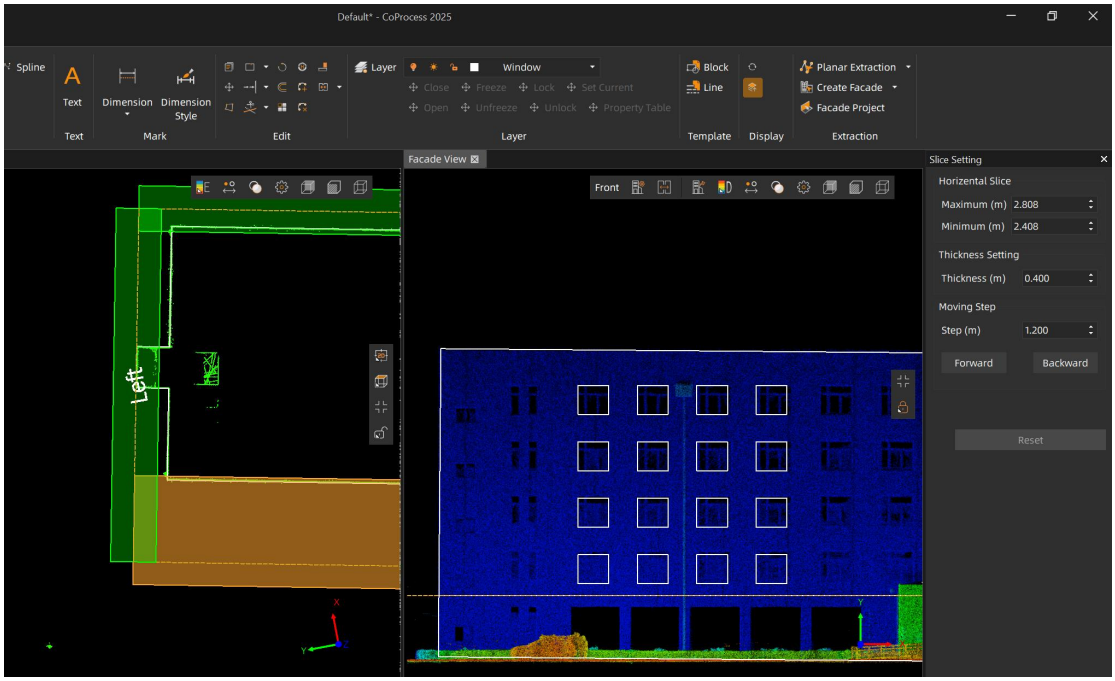


Figure: Set array parameter

Step elements: Switch the layer to Step, and then use Right Angle Mode to start drawing steps.

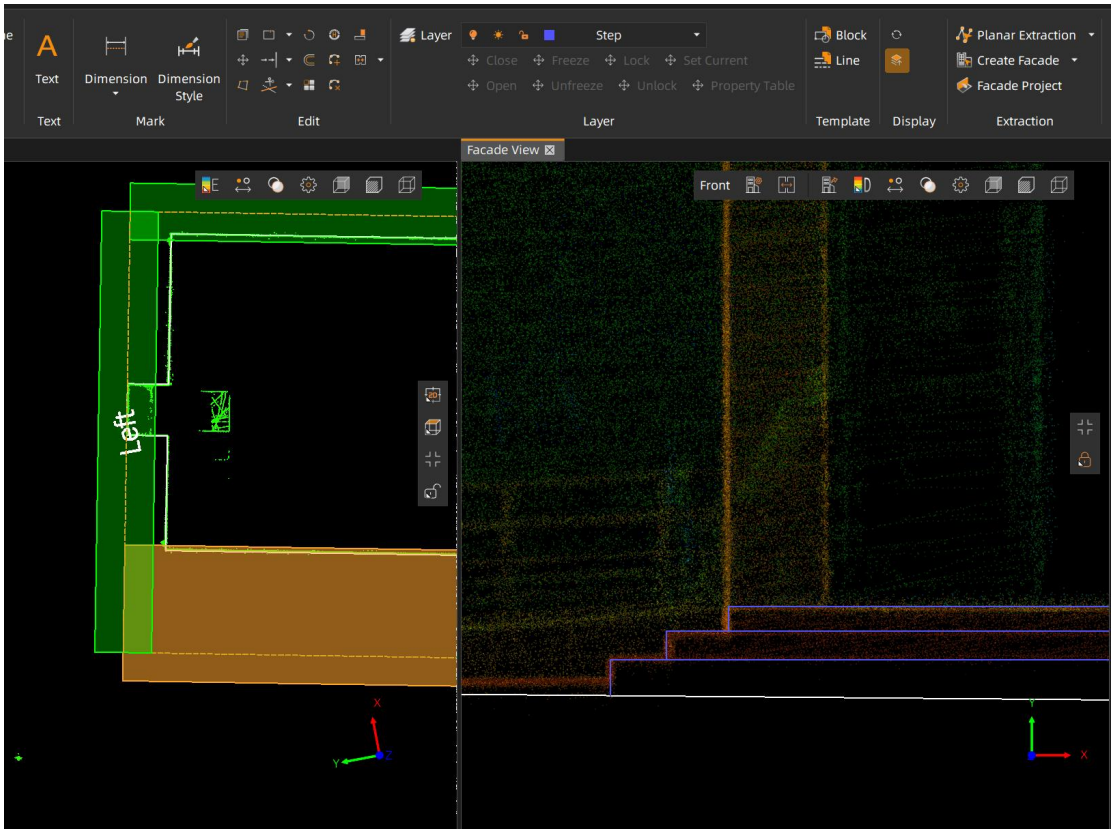


Figure: Right Angle Mode

Door element drawing: Switch the layer to door, and then use Rectangle to

start drawing doors.

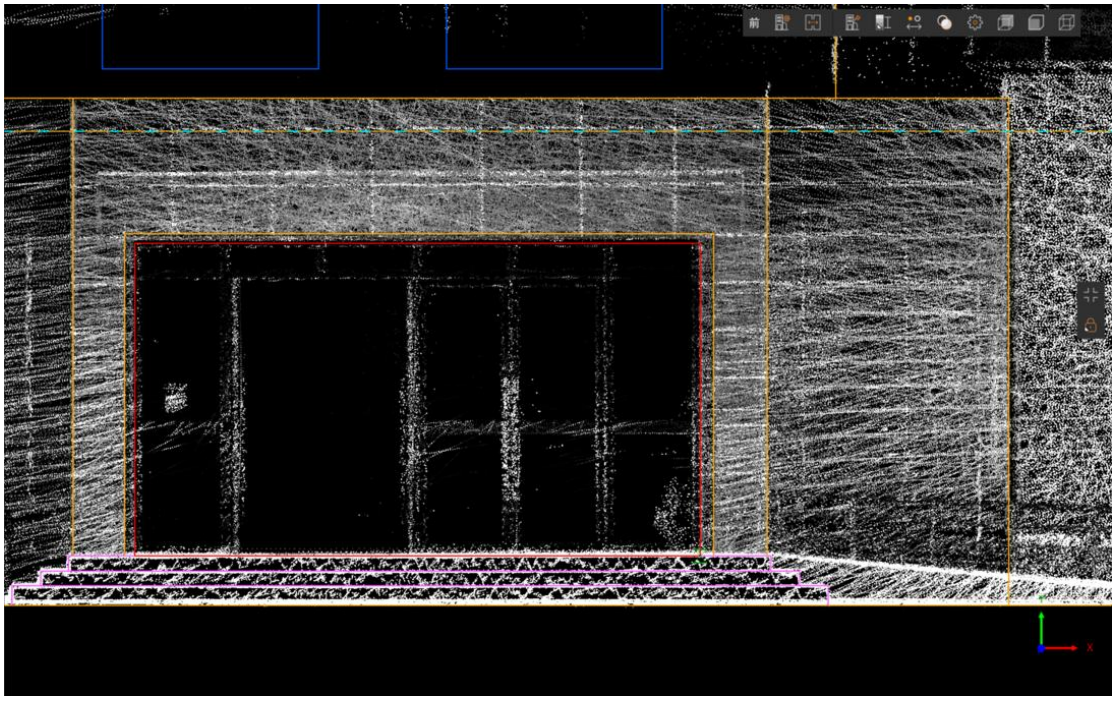


Figure: Drawing door

Drawing of adjacent facade: After drawing the elements of one facade, you can click the view selection in the facade view to switch to other views and repeat the element collection work.

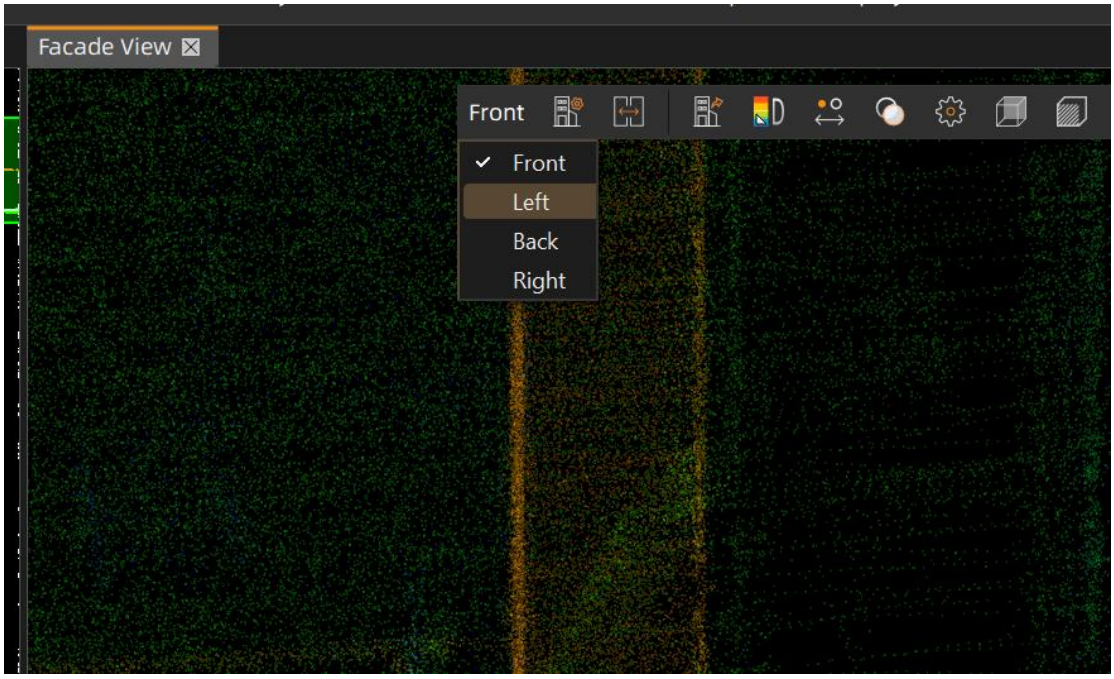


Figure: Choose View

You can also adjust the slice thickness to ensure that the completed point

cloud data is displayed in the facade view.

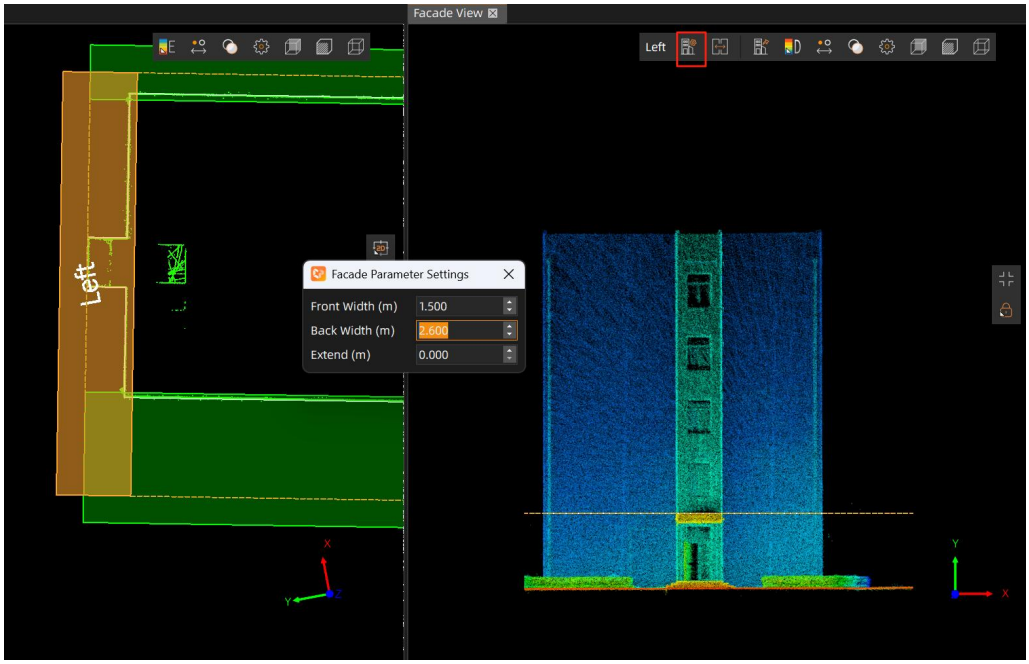


Figure: Set facade-view options

At the same time, you can also display the elements of adjacent facade in the current view to facilitate snapping during drawing and ensure data con sistency.

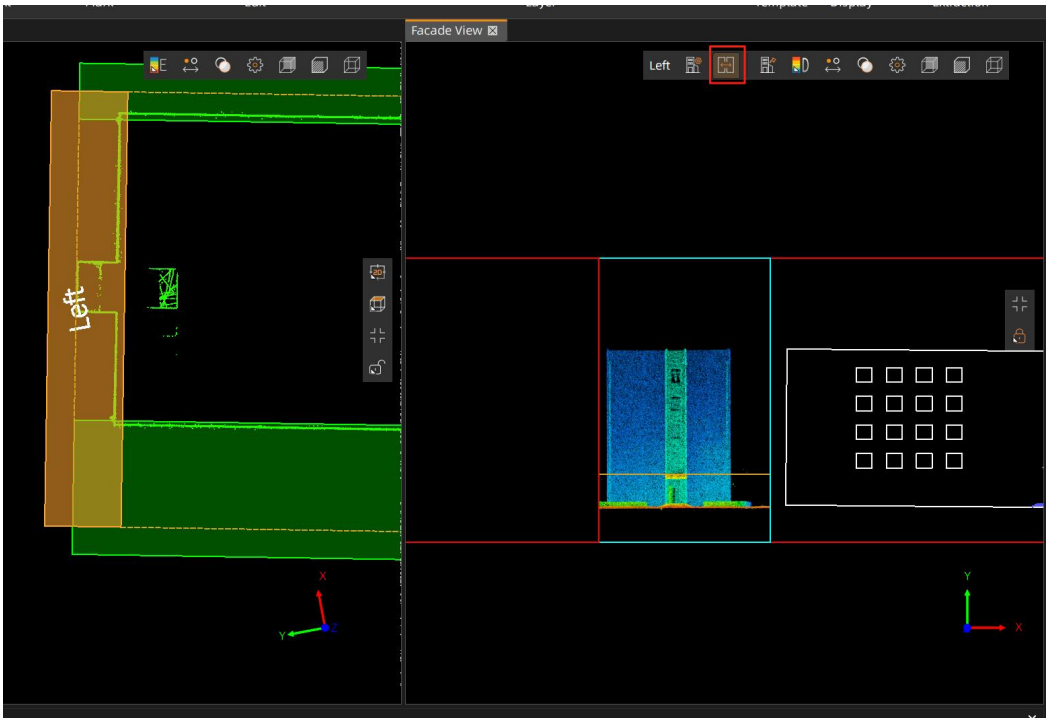


Figure: Facade unfolding

3.3.6 Adding Dimension Information

After drawing elevation features, you can flatten them onto the plane, then add dimensions, hatches, etc.

Flatten Elevation: After completing elevation features, close the elevation view. Click the Flatten Elevation function in the menu. Select the elevation proxy line to flatten, then choose a location to place the flattened elevation view.

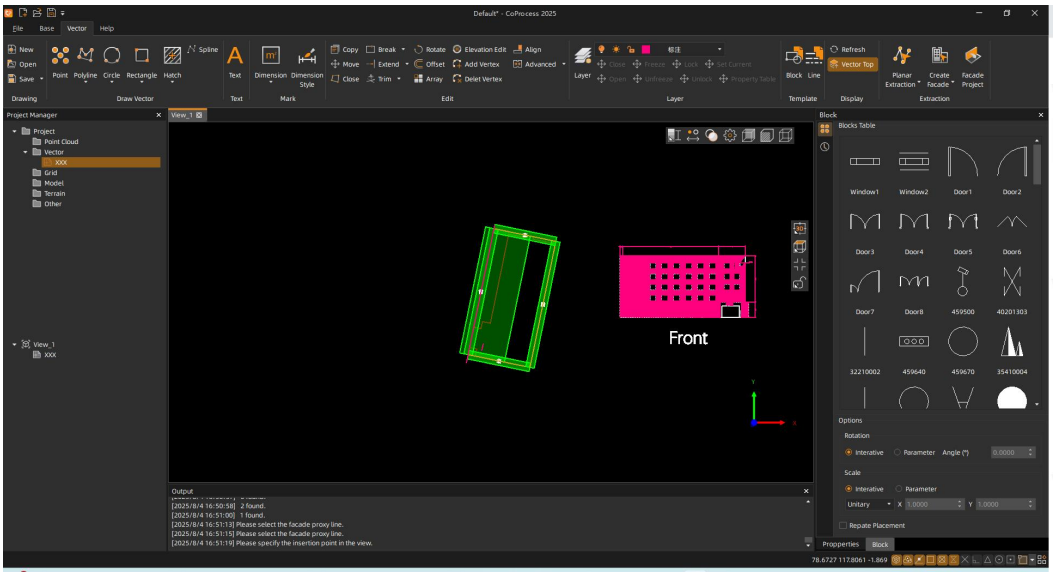


Figure: Facade Flat

Add Dimensions: You can add aligned dimensions, area dimensions, etc.

Before dimensioning, set the dimension style, including text, units, precision, etc. Set the precision to 2 decimal places here. Click Apply.

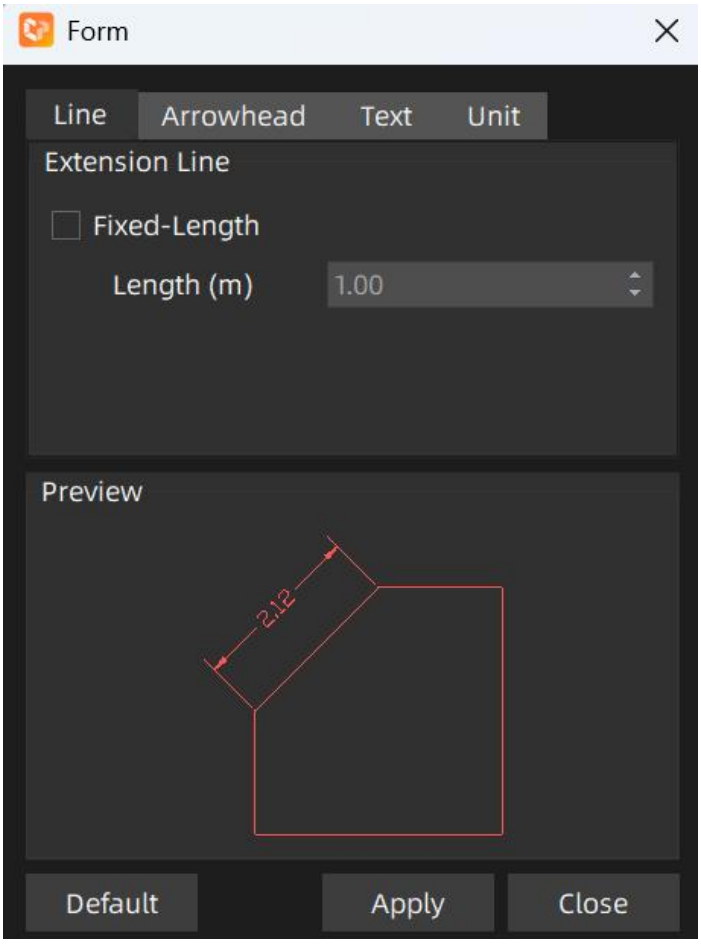


Figure: Dimension Style

Aligned Dimension: Click the Dimension dropdown button, select Aligned Dimension, and start dimensioning on the drawn features.

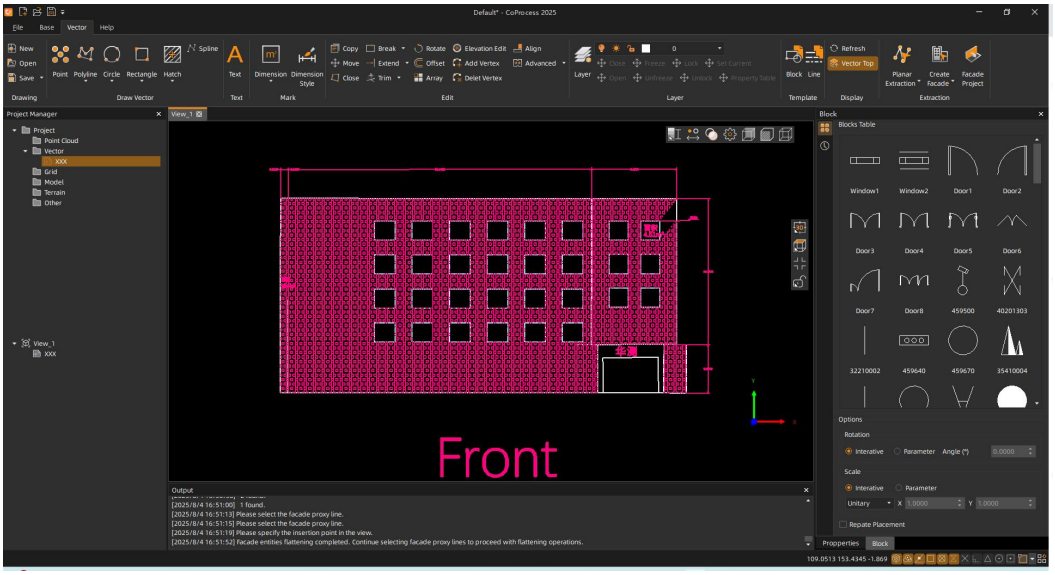


Figure: Drawing Align-Dimension

Area Dimension: For closed 2D areas, you can directly click inside the close d area to calculate the area. Simply click inside the closed 2D region to ad d the area dimension.

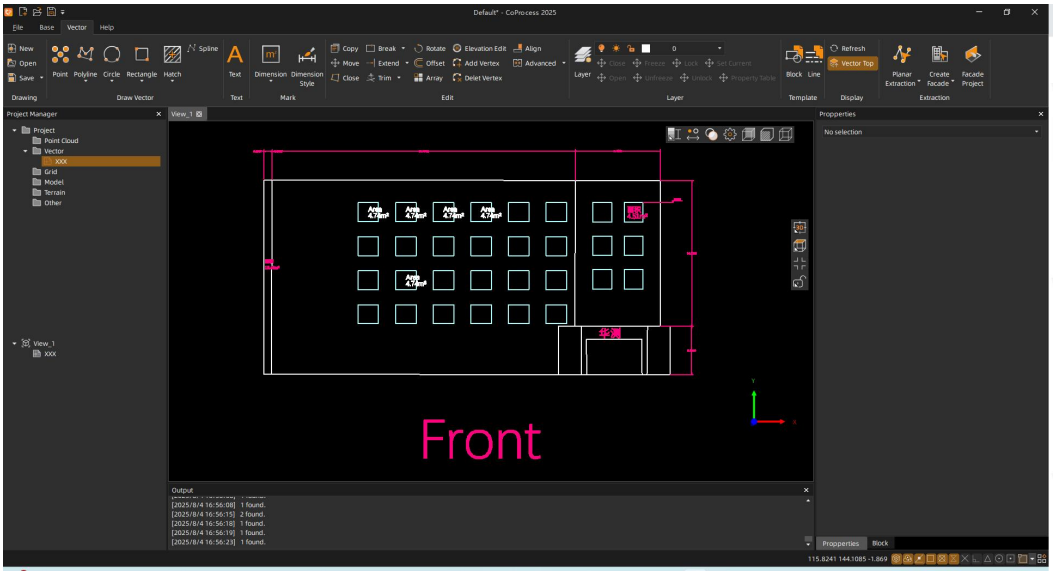


Figure: Drawing Area-Dimension

Hatch Filling: For features like walls, you can apply hatches for easier identi fication. Click the Hatch function in the menu, select Pick Internal Point, ch oose a hatch pattern, and click inside the feature to be hatched.

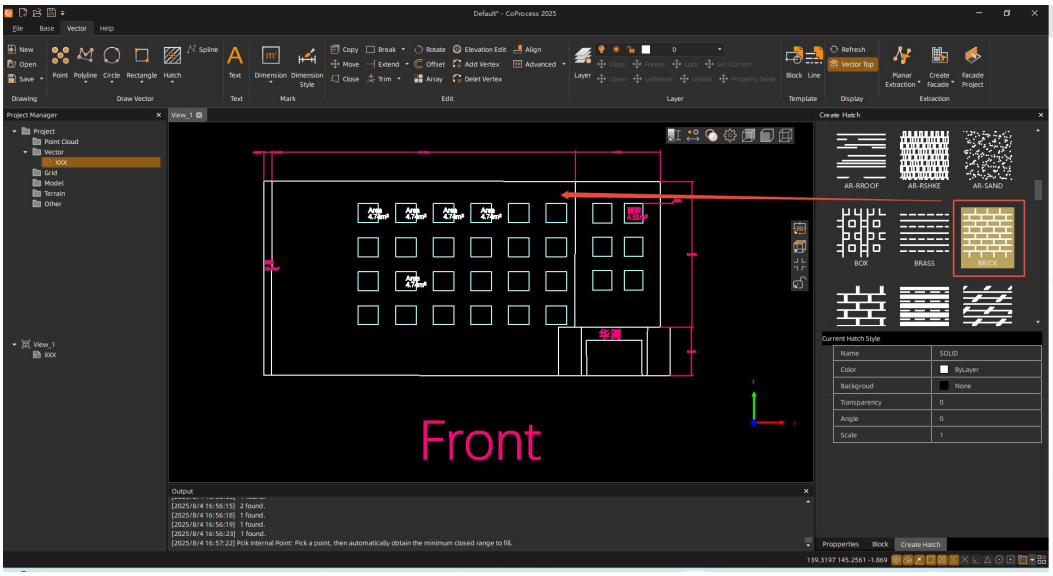


Figure: Facade Flat

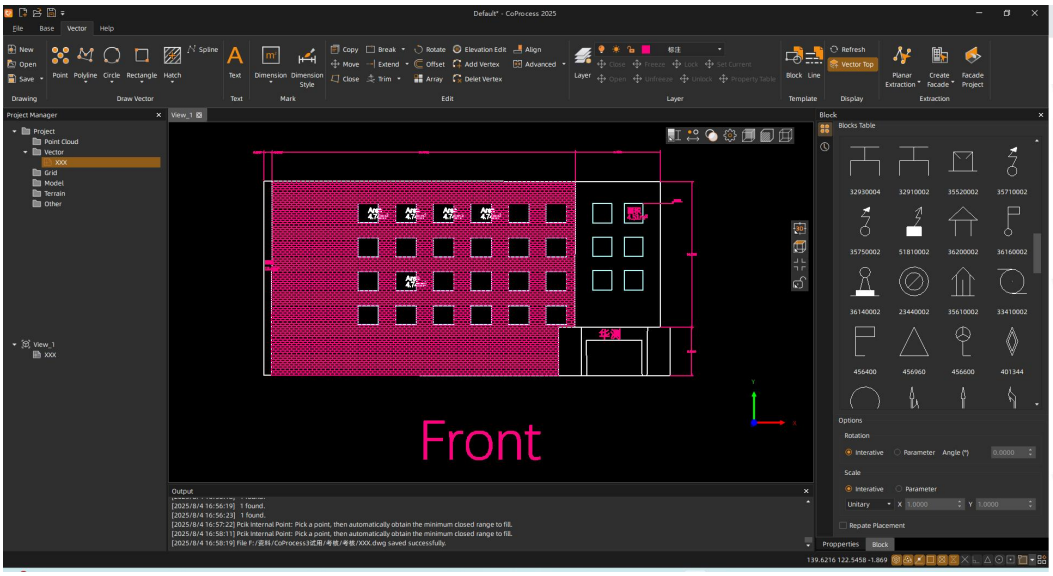


Figure: Drawing fill pattern

If the displayed hatch style is not suitable, adjust the Hatch Pattern Scale i n the Properties panel until it looks appropriate.

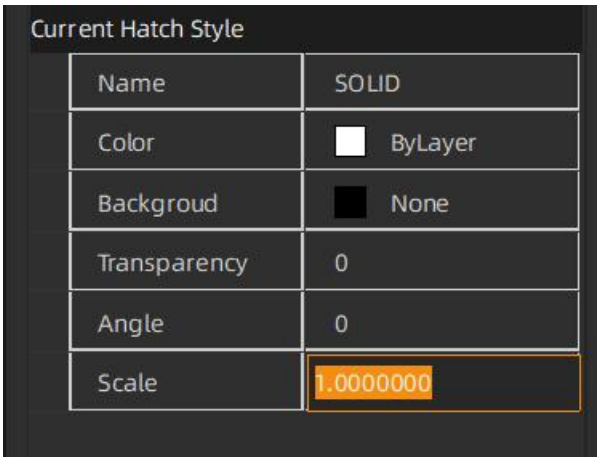


Figure: Scale

3.3.7 Drawing Arrangement

After feature drawing is complete, finalize the drawing, including creating ta bles, outputting files, and creating title blocks.

Drawing a Table: First, determine the number of rows and columns needed for the table content. Use lines and offset commands in the software to d raw the table.

Filling Table Content: Use the Text function to fill in the corresponding info rmation in the table.

Click the Text function. Use three clicks to define the start point, direction, and size of the text. Then enter the text.



Figure: Create Text

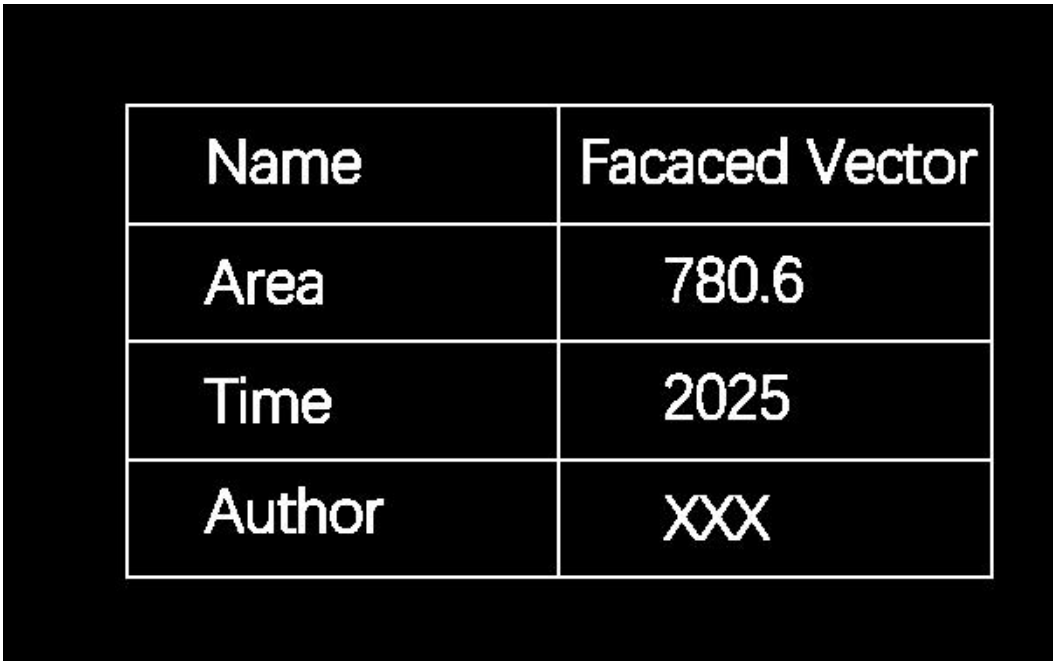


Figure: Fill Table

Creating a Title Block: Use the Rectangle drawing function to draw a rectan gle around the drawn content and the title block. Then use the Offset func tion to offset the rectangle, creating the title block.

3.4 Terrain Production

This section describes how to use CoProcess for terrain production, involving the Terrain module and the Classification module.

During terrain production, many products are generated, such as ground points, DEM/DSM, contours, elevation points. Using CoProcess, these products can be generated through simple operations while ensuring quality. For clients with stricter requirements requiring manual editing, CoProcess also provides professional editing tools to improve editing efficiency.

This section will start by introducing the main production workflow, explaining how to generate various products, then describe how to manually edit point cloud classification, DEM, and contours for refinement.

3.4.1 Production Workflow

This section introduces the workflow for producing terrain products.

CoProcess supports generating ground point classification, DEM/DSM generation, and contour/elevation point generation.

Enter the Terrain module and click the Quick Generate button. The Quick Generate interface appears.

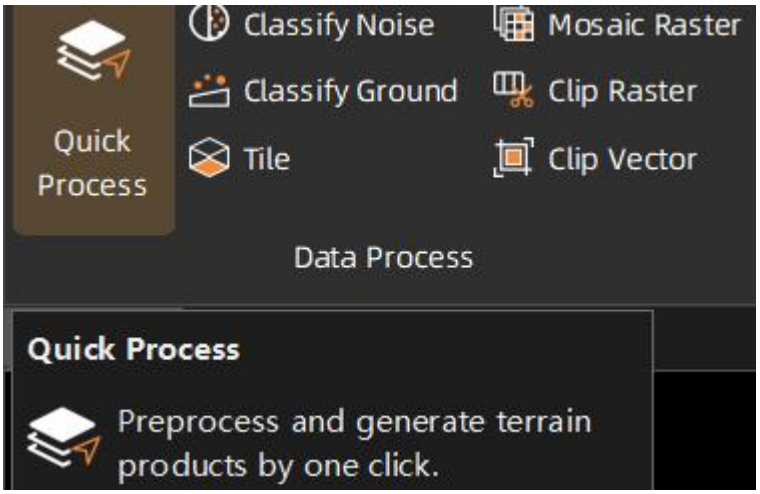


Figure: Quick process

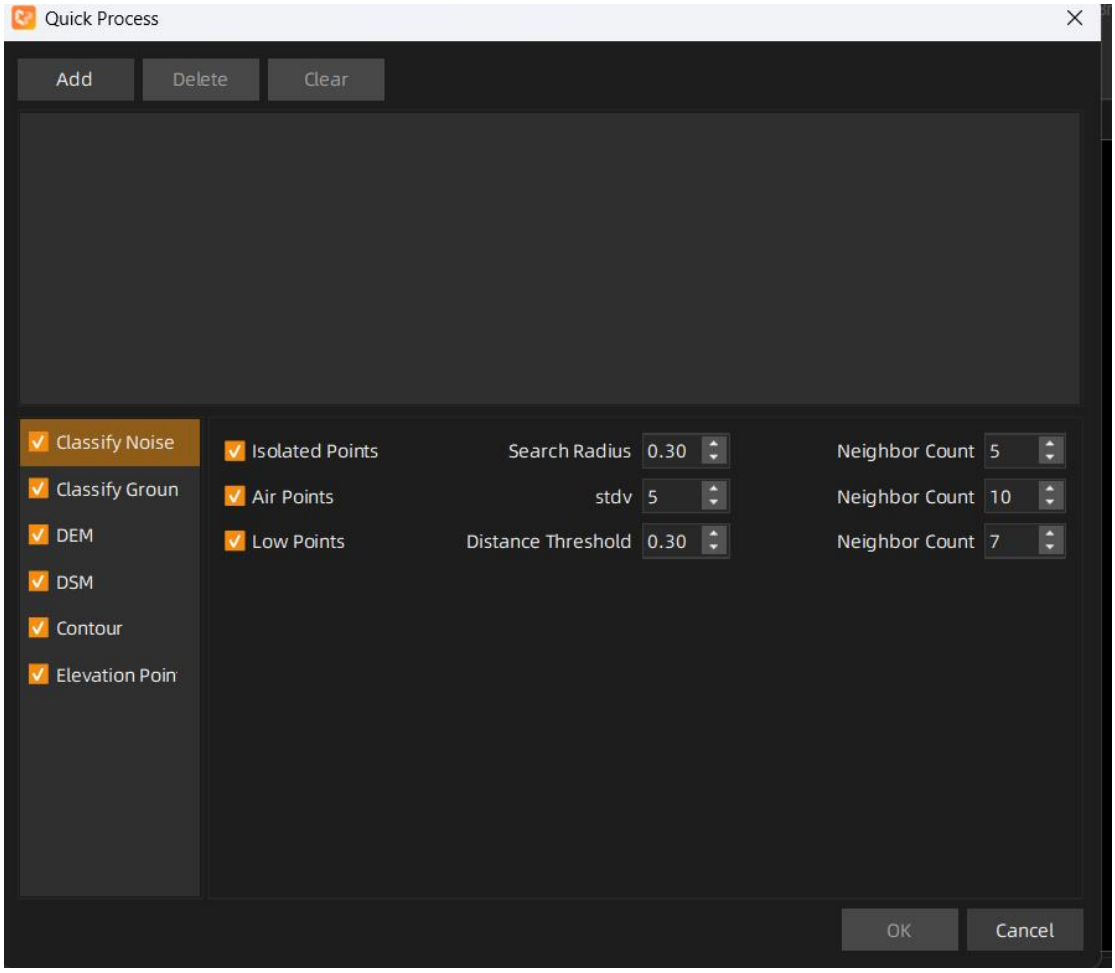


Figure: Quick process

In the Quick Generate interface (left side), you can see 6 processes: Noise Classification, Ground Point Classification, DEM, DSM, Contour, Elevation Poi nts. You can process the point cloud data according to your actual needs.

For example, in a surveying and mapping terrain project requiring DEM, co ntours, and elevation points, you would check Noise Classification, Ground Point Classification, DEM, Contour, and Elevation Points. If DSM is not requi red, uncheck it, and it will not be included in the final output.
For general users (non-experts), many parameters might be difficult to und erstand. Therefore, the software provides parameters with wide applicability that can be used without adjustment by simply clicking OK.

For professional users, parameters can be adjusted by reading the manual and applying surveying knowledge to meet project requirements.

3.4.1.1 Noise Classification

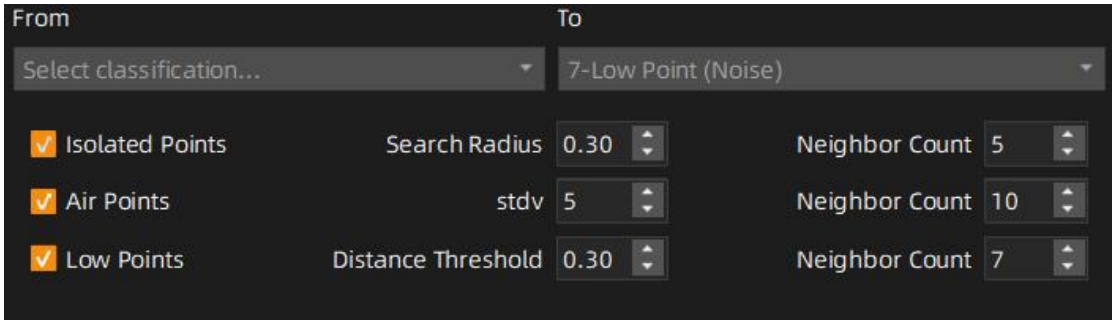


Figure: Classify noise

Function Description:

Removes noise points (isolated points, airborne points, low points) from the current point cloud file.

Operation Suggestions:

Use the default parameters.
Detailed Description:

Look at the Noise Classification section. It includes three types of noise: Isolated Points, Airborne Points, Low Points. Isolated points deviate from the main point cloud. Airborne points are meaningless points in the air. Low points are significantly below the normal ground level.

Generally, use the default parameters by checking all three noise types without modification.

3.4.1.2 Ground Point Classification

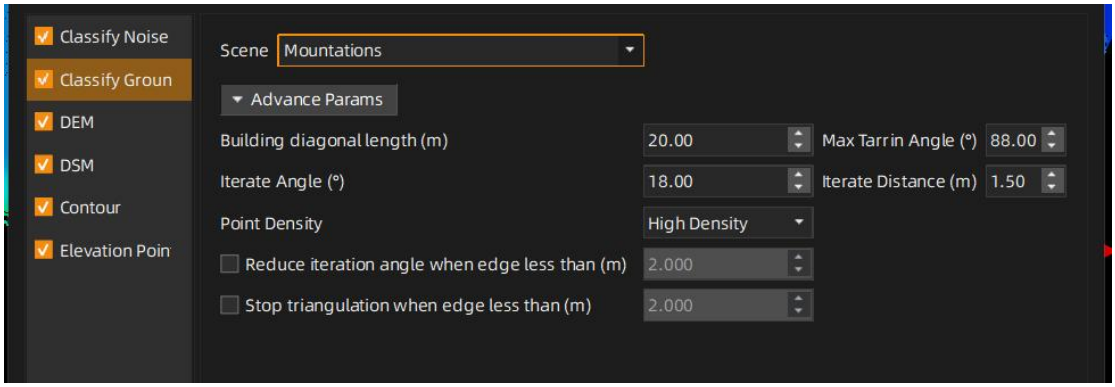


Figure: Ground Point Classification

Function Description:

Filter ground points from the current point cloud.

Operation Suggestions:

Use the general scene, or according to the point cloud survey scene, Select flat terrain, hills, or mountains. Advanced parameters do not need adjustment.

Detailed Description:

First look at Classify Noise. It includes three types of noise points: isolated points, aerial points, and low points. As the names suggest, isolated points are portions that deviate from the main point cloud, aerial points are meaningless points in the air, and low points are points obviously lower than t

he normal ground surface.

In most cases, use the default parameters. Simply keep all three types of noise checked without making any changes.

In Classify Ground, the software divides scenes into four types: General, Flat, Hilly, and Mountainous. General means the software automatically adjusts Classify parameters using an intelligent algorithm according to the point cloud conditions, and then performs Classify. In general, the General parameter set is sufficient. However, if the user can clearly identify the point cloud scene as flat terrain, hills, or mountainous terrain, it is also possible to manually Switch to the corresponding scene.

Click Advanced Settings to view the specific Classify Ground parameters. The default Classify parameters in the software are sufficient for most scenes, so changes are generally not recommended. Just use the defaults. Professional surveyors with knowledge of the algorithm may adjust them as needed.

3.4.1.3 DEM Generation

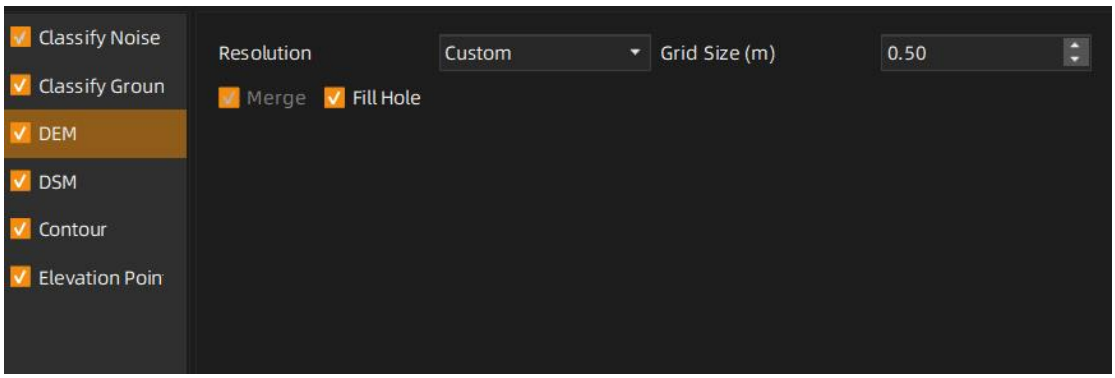


Figure: DEM

Function Description:

Generates a DEM in TIFF format based on the classified ground points.

Operation Suggestions:

Select the appropriate scale based on project requirements (e.g., 1:500). Ke ep the Merge and Hole Filling options checked by default.

Detailed Description:

Switch to the DEM interface. First, select the appropriate resolution by choo sing the corresponding scale based on mapping requirements. Alternatively, select "Custom" and manually enter the grid cell size.

Merge and Hole Filling are checked by default. Merge combines generated DEMs into a single TIFF file. Hole Filling automatically fills holes in the DEM. Generally, keep these default unless there are specific project requirement s.

3.4.1.4 DSM Generati

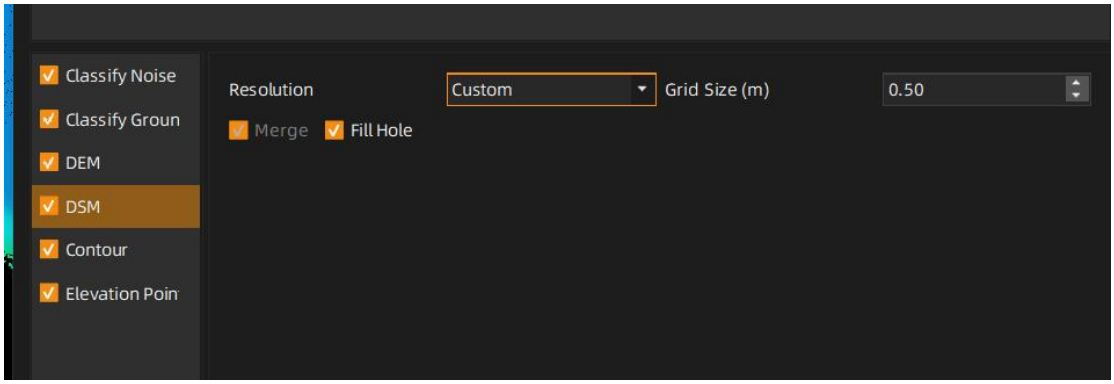


Figure: DSM

Function Description:

Generates a DSM in TIFF format based on point cloud data (typically exclud

ing noise points).

Operation Suggestions:

Select the appropriate scale based on project requirements (e.g., 1:500). Ke ep the Merge and Hole Filling options checked by default.

Detailed Description:

Switch to the DSM interface. First, select the appropriate resolution by choo sing the corresponding scale based on mapping requirements. Alternatively, select "Custom" and manually enter the grid cell size.

Merge and Hole Filling are checked by default. Merge combines generated DSMs into a single TIFF file. Hole Filling automatically fills holes in the DSM. Generally, keep these default unless there are specific project requirement s.

3.4.1.5 Contour Generation

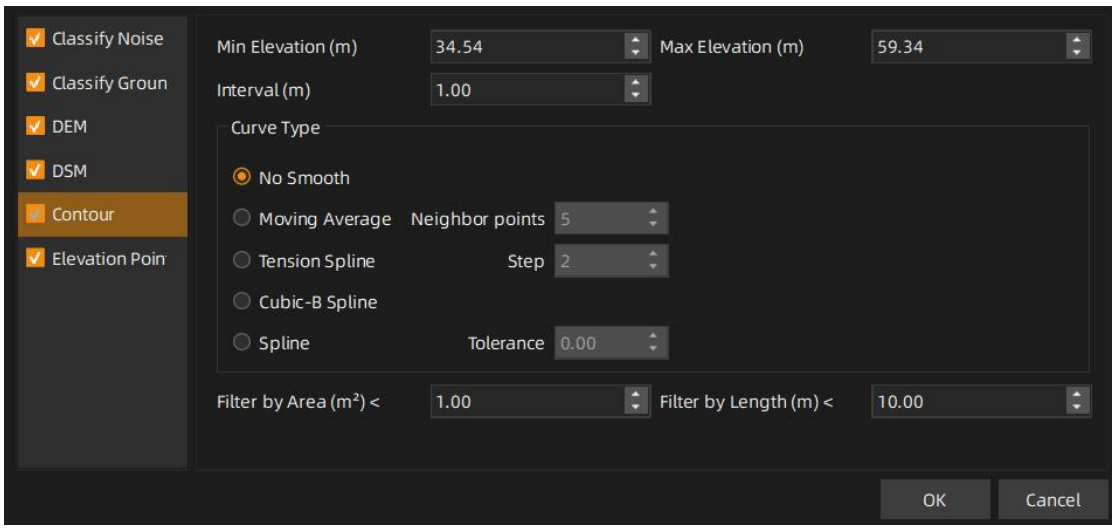


Figure: Contour Generation

Function Description:

Generates contour data in DWG/DXF format based on point cloud data.

Operation Suggestions:

Select the contour interval based on project requirements. Choose Moving Average for smoothing, set the Number of Neighbors to 9.

Detailed Description:

Switch to the Contour interface. The software intelligently calculates the minimum and maximum elevations. You can also adjust them based on project requirements.

The contour interval is a core parameter, also set based on requirements. The default here is 1.

The curve type (smoothing method) determines the final smoothness of contours. Based on experience, we recommend choosing Moving Average with 9 neighbors. This ensures contours are smooth and aesthetically pleasing without losing terrain feature information. Other smoothing methods can be selected if the result needs improvement.

3.4.1.6 Elevation Point Generation

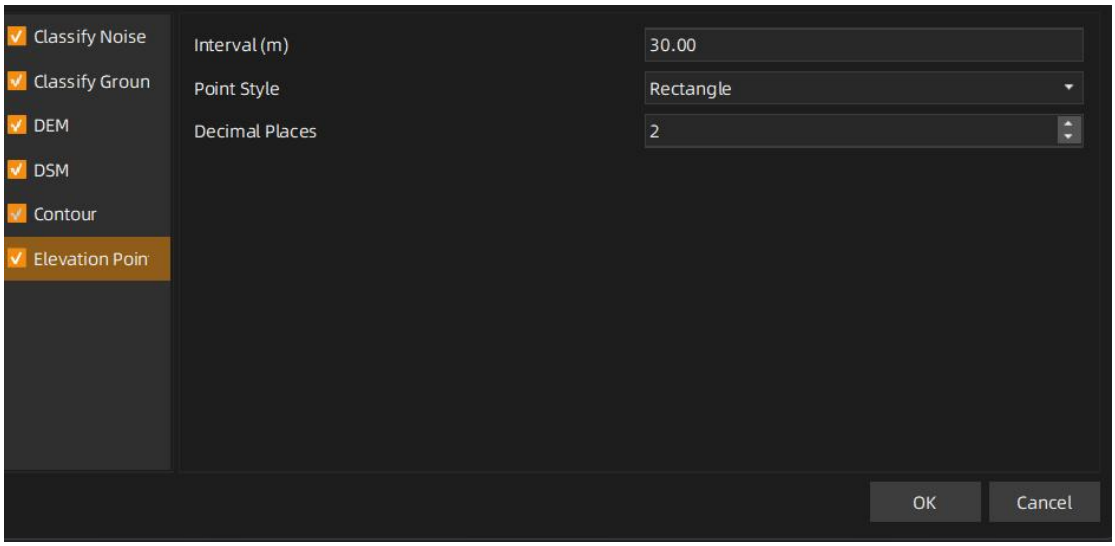


Figure: Elevation Point Generation

Function Description:

Generates elevation point DWG results based on point cloud data, arranged in a grid or diamond pattern.

Operation Suggestions:

Select the appropriate point spacing based on project requirements. Use other parameters as default.

Detailed Description:

Switch to the Elevation Points interface. There are three parameters: Point Spacing, Point Style, and Decimal Places. Point spacing determines the density of generated elevation points, usually dictated by project requirements. Point style determines the shape of elevation points (e.g., rectangle). Decimal places determine the number of decimal places for the elevation values, also based on project requirements.

3.4.2 Point Cloud Classification Result Inspection

How to judge the quality of the point cloud classification results after softw are processing? This can be done in the following steps: overall point cloud observation, special terrain inspection, and profile inspection.

3.4.2.1 Overall Point Cloud Observation

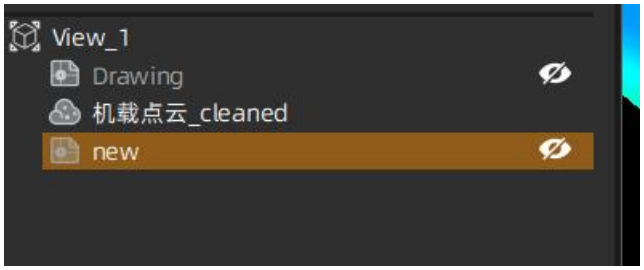


Figure: only the point

Display only the point cloud result in the view. Switch rendering to "Class Rendering". Open settings and display only ground points. Add the original point cloud to a second view using Elevation Rendering. Link the two views for window synchronization. Check for obvious under-classification or miscl assification in the point cloud.

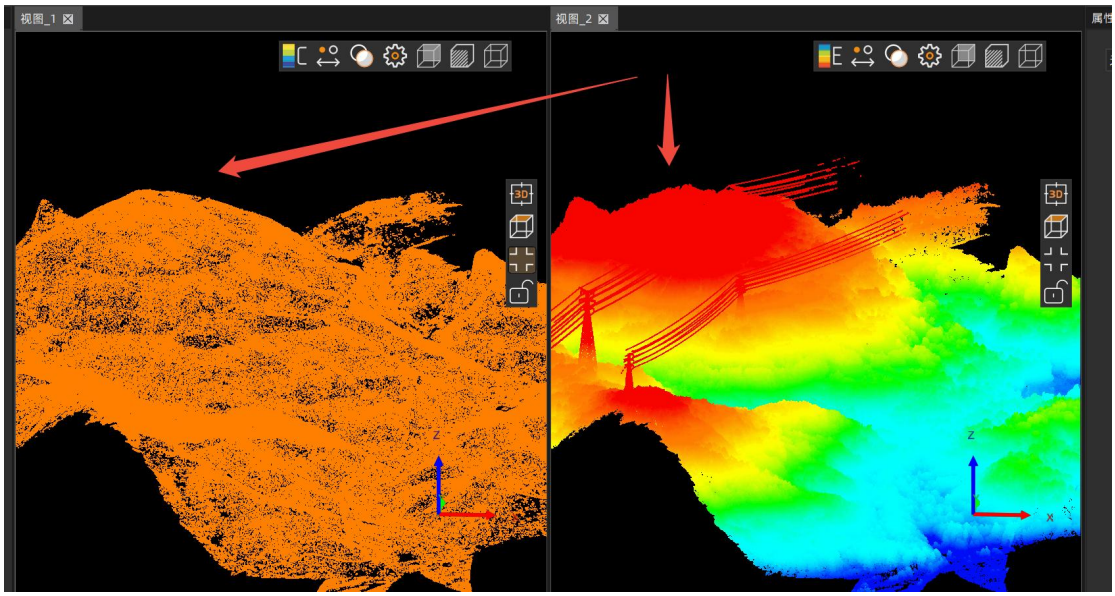


Figure: Overall Classification Result Com

parisonBy displaying only ground points in one view and comparing with t he original point cloud in another, you can see that the software has not missed major terrain features in the overall effect.

3.4.2.2 Special Terrain Inspection

If no major issues are found during the overall point cloud inspection, proc eed to inspect special terrains such as steep slopes, embankments, and de nse forest areas.

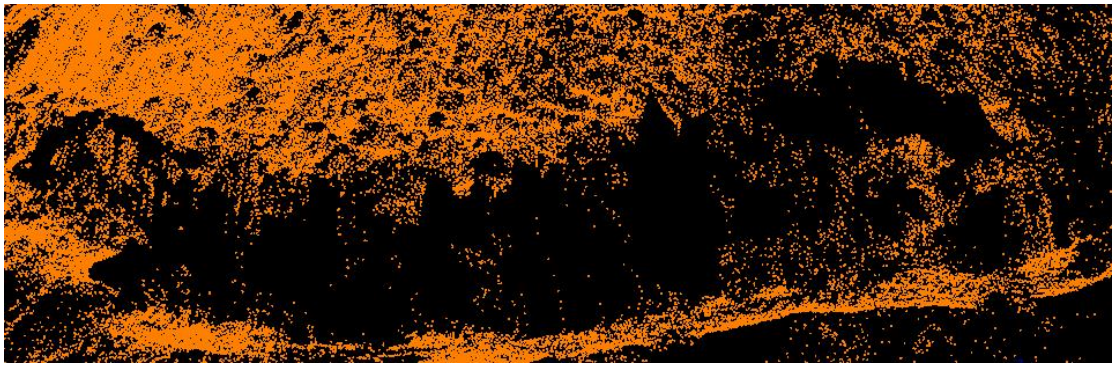


Figure: Example: Missing Point Cloud Data in Steep Slope Terrain

As shown above, the point cloud at the steep slope is sparse, making it dif ficult to reconstruct the complete steep slope terrain from the point cloud. Therefore, the ground point classification here might be problematic. If thi s affects the result, subsequent manual processing may be required.

3.4.2.3 Profile Inspection

In the Classification module, enable "Start Editing", then use the Profile fun ction. Draw a profile in the point cloud.

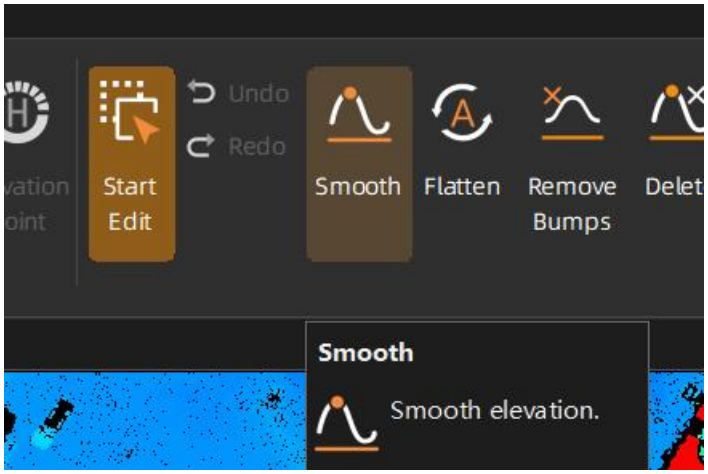


Figure: Smooth elevation

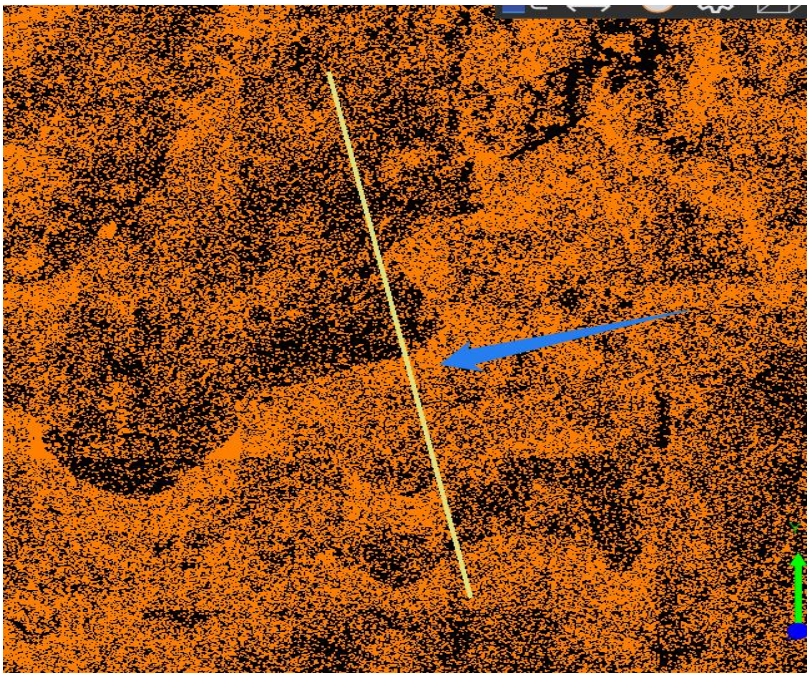


Figure: Draw Profile

After drawing the profile, the classification effect for that profile is shown in the profile view. For example, in the figure, the orange part represents ground points. The classification algorithm successfully separates trees from ground points, indicating a good classification effect. Repeat this process at multiple locations to verify the effect.

Similarly, if anomalies were detected in the previous sections, use the profile inspection to analyze the cause. For instance, if missing ground points ar

e found and inspection reveals dense vegetation preventing the LiDAR from penetrating, resulting in no raw point cloud on the ground, then the poor ground point result is due to hardware limitations, not a software algorithm issue.

3.4.3 Point Cloud Classification Editing

If the point cloud classification results in certain areas are unsatisfactory after software processing, use point cloud classification editing.

3.4.3.1 Dynamic DEM

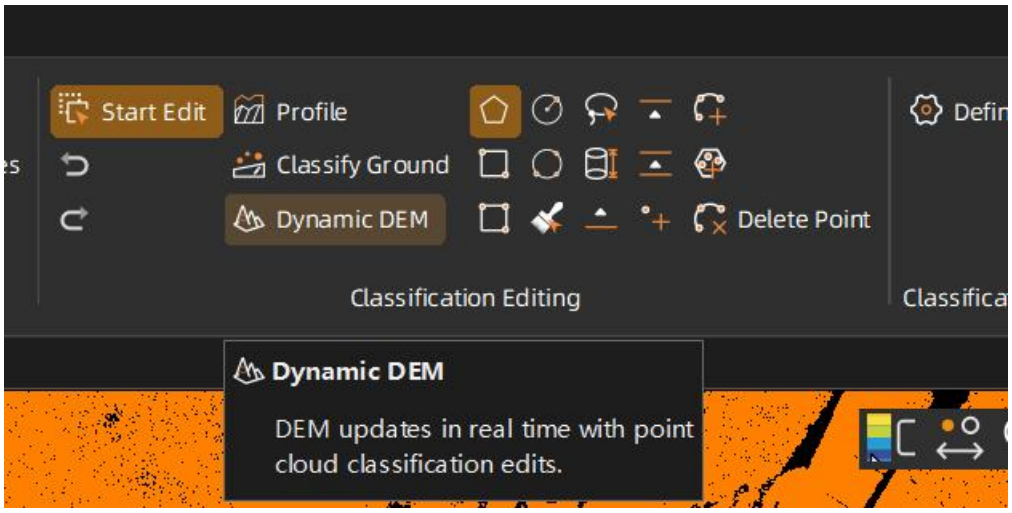


Figure: Dynamic DEM

When editing the point cloud, use Dynamic DEM for comparative analysis. Each change made to the point cloud is reflected in the DEM in real-time, facilitating observation.

3.4.3.2 Main View Editing

First, edit large areas of the point cloud in the main view, such as editing

power lines.

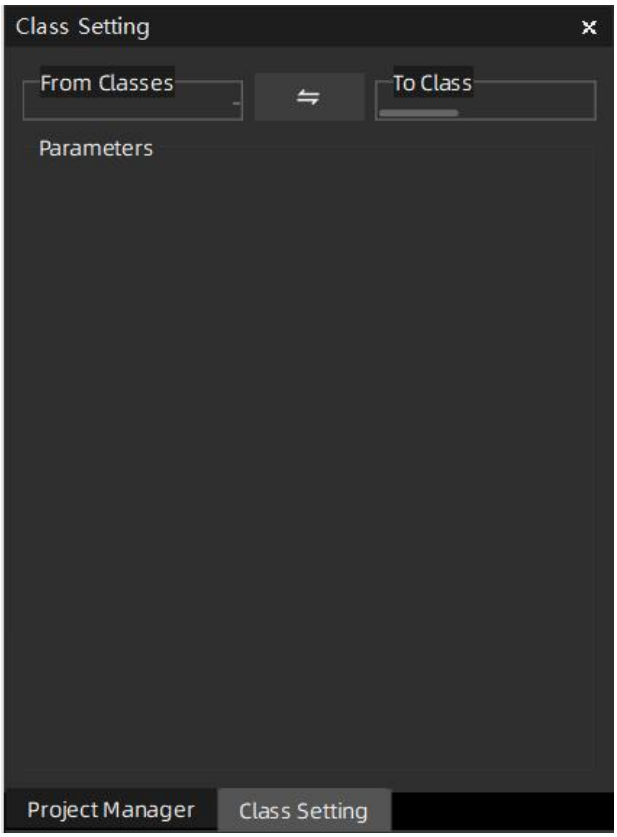


Figure: Class setting

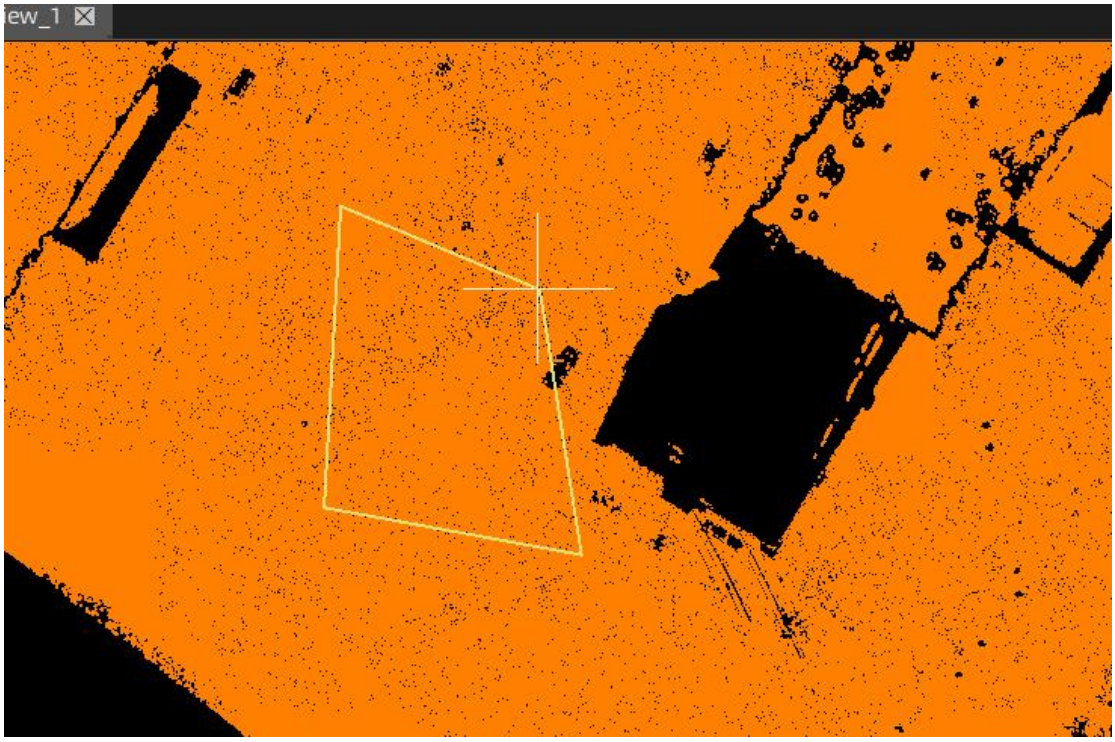
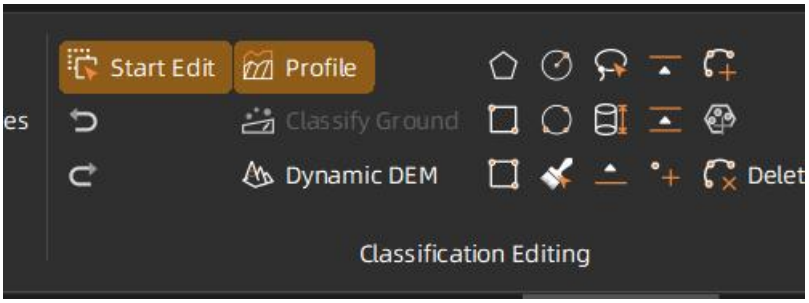


Figure:Selection Range

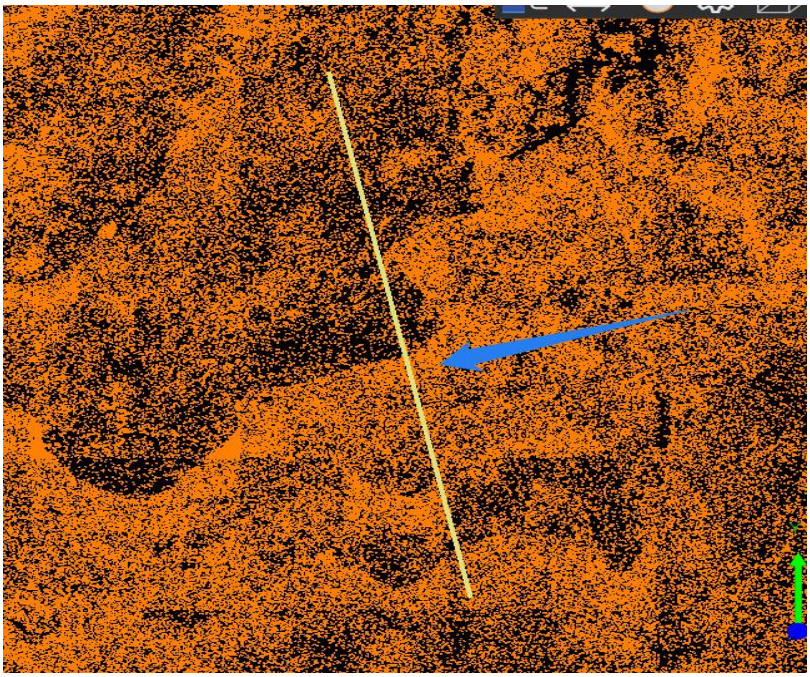
Set the target class to Power Line in the class settings. Draw a polygon in

the main view. Points within the polygon area will have their class converte d to Power Line (turning red).

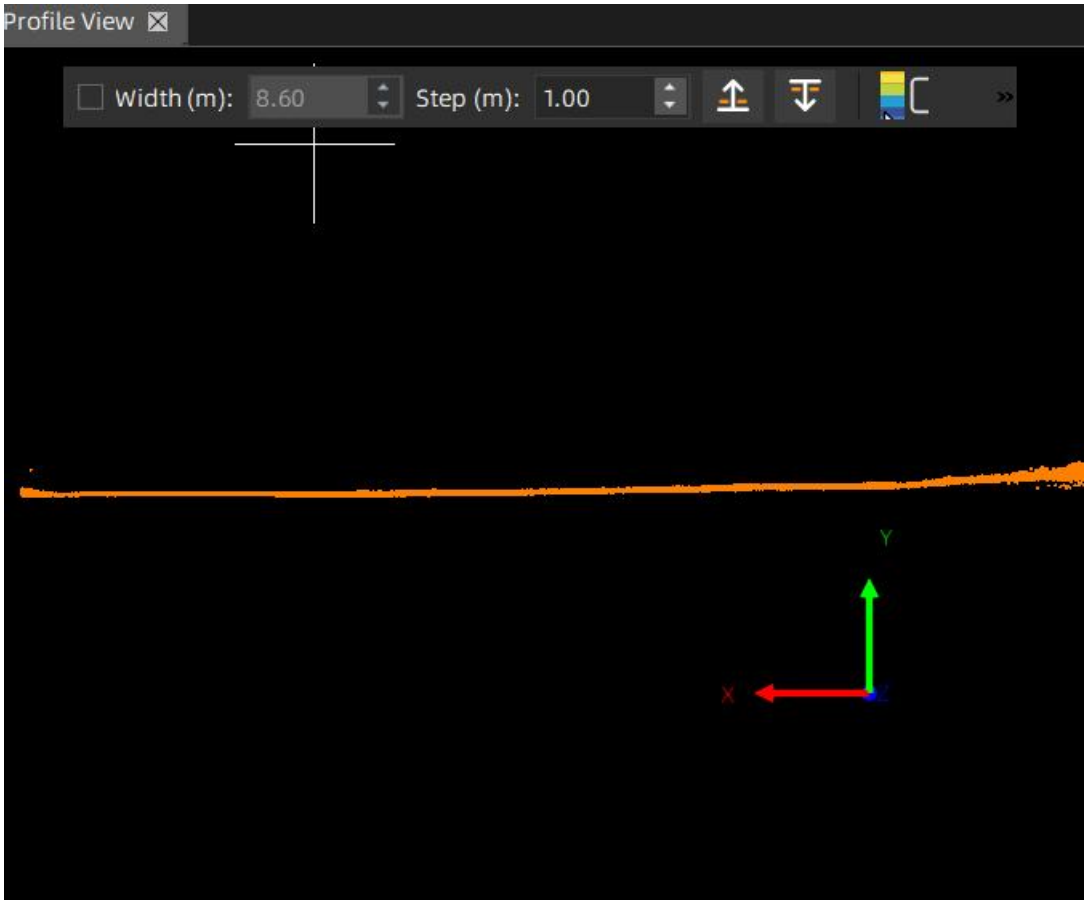
3.4.3.3 Profile Editing



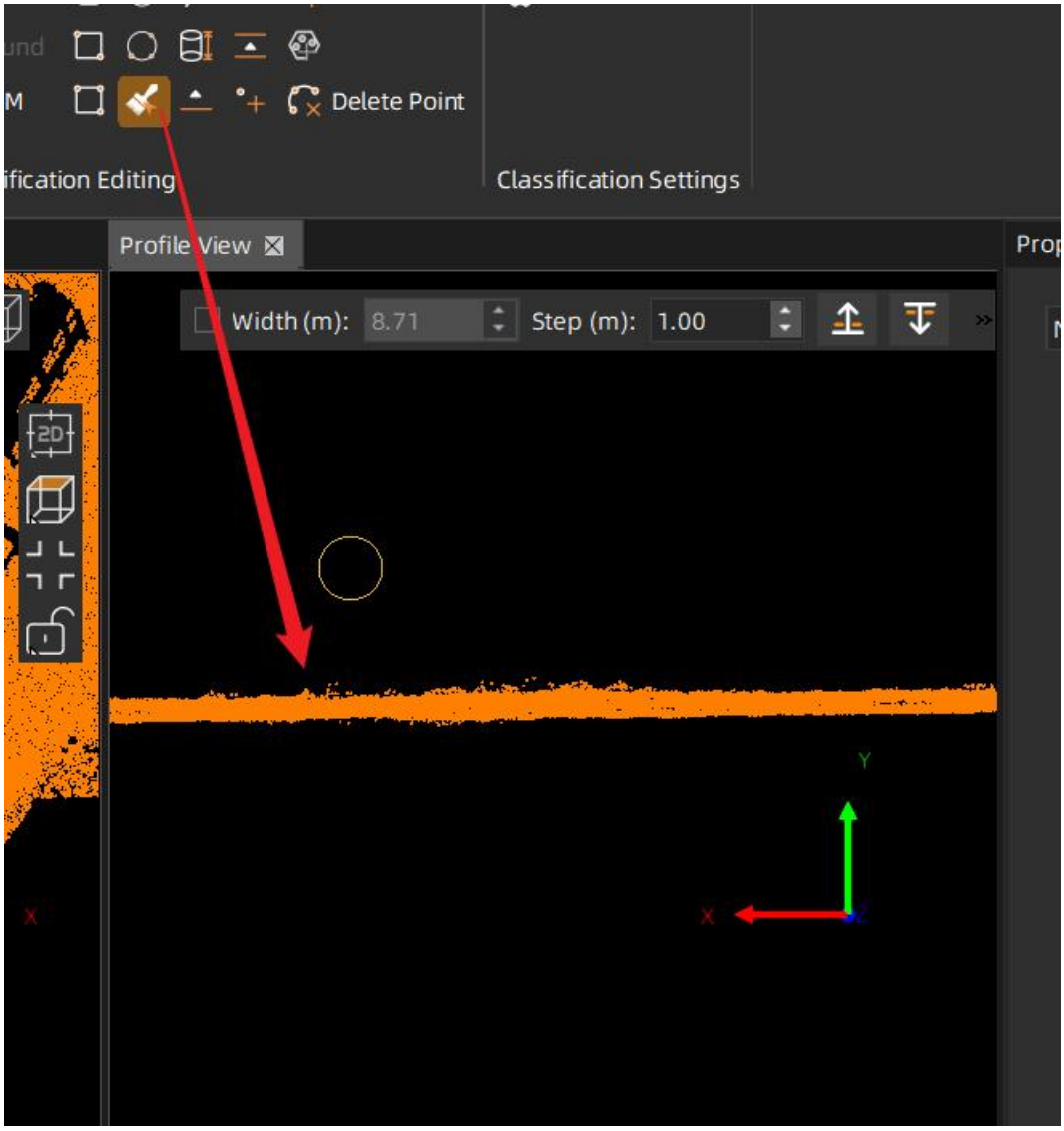
Figure： Profile Editing



Figure：Draw Profile



Figure：Draw Profile



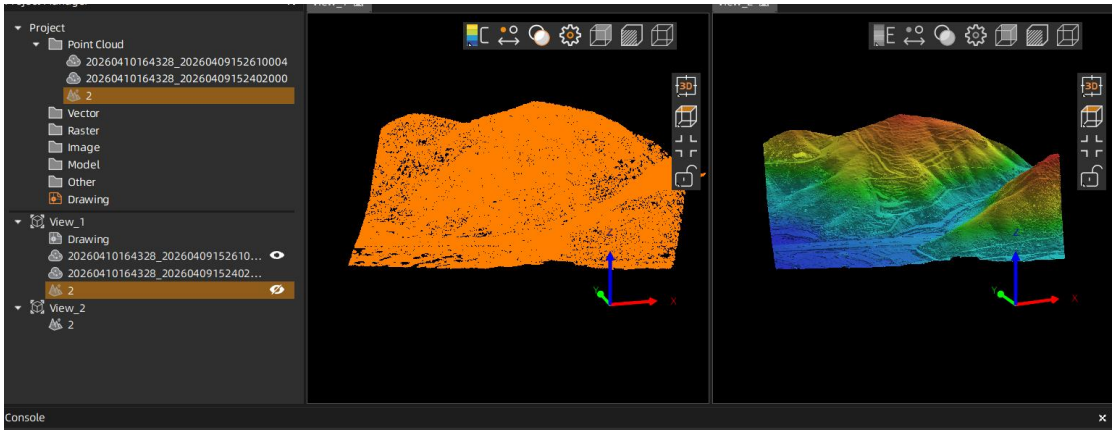
Figure：Brush

Click the Brush, draw a range at a specified location. Points within the ran ge are classified into the corresponding class. Using the profile function allo ws for fine-grained point cloud editing.

3.4.4 Manual DEM Editing

Before editing a DEM, it is crucial to determine whether the anomaly is ca used by the DEM itself or by the ground points. If caused by ground point s, edit the ground points first, not the DEM directly.

3.4.4.1 DEM Effect Inspection



Figure：Check DEM Results

Open a new view, load the DEM, and link the two views for synchronization. Compare the ground points with the DEM to see if the DEM conforms to the main terrain features shown in the point cloud, such as valleys, ridges, peaks, saddles.

If parts of the DEM appear misshapen, first compare them with the ground points. In the example above, due to missing ground points, the DEM would originally have a hole. The software's automatic hole-filling algorithm resulted in large triangular facets, which is not an issue with the DEM algorithm itself.

3.4.4.2 Manual DEM Editing

DEM repair can only fix issues that ground points cannot solve to make the result look more aesthetically pleasing. It cannot approximate real terrain through DEM editing alone; real terrain restoration requires editing ground points.

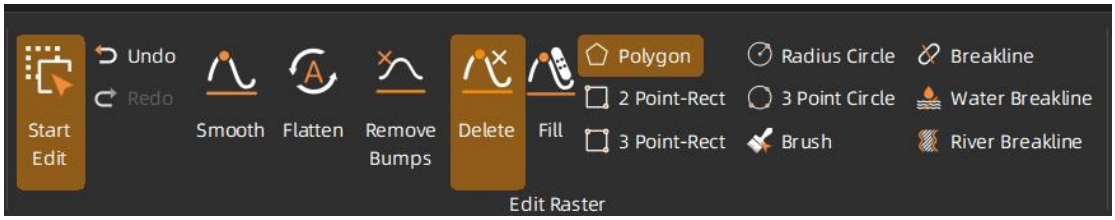


Figure : fix

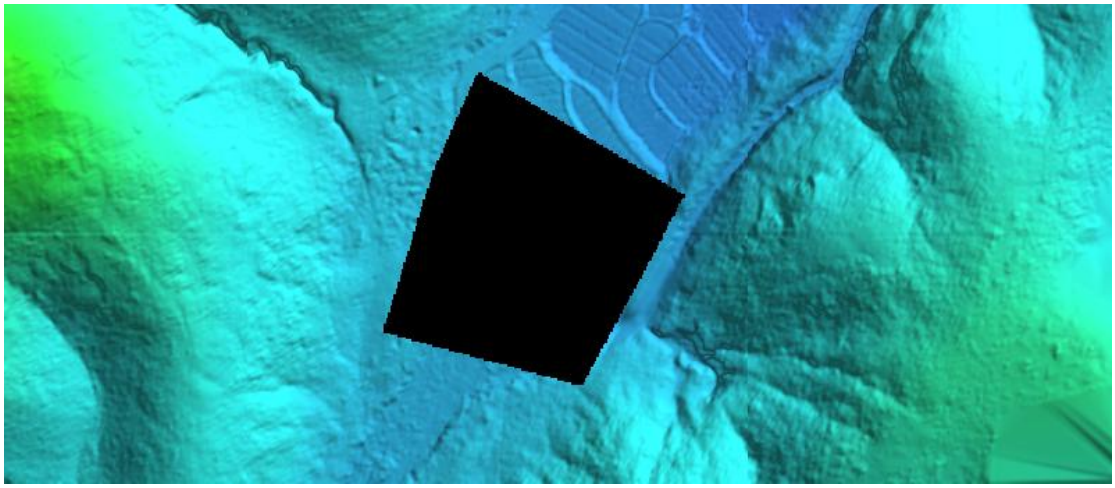
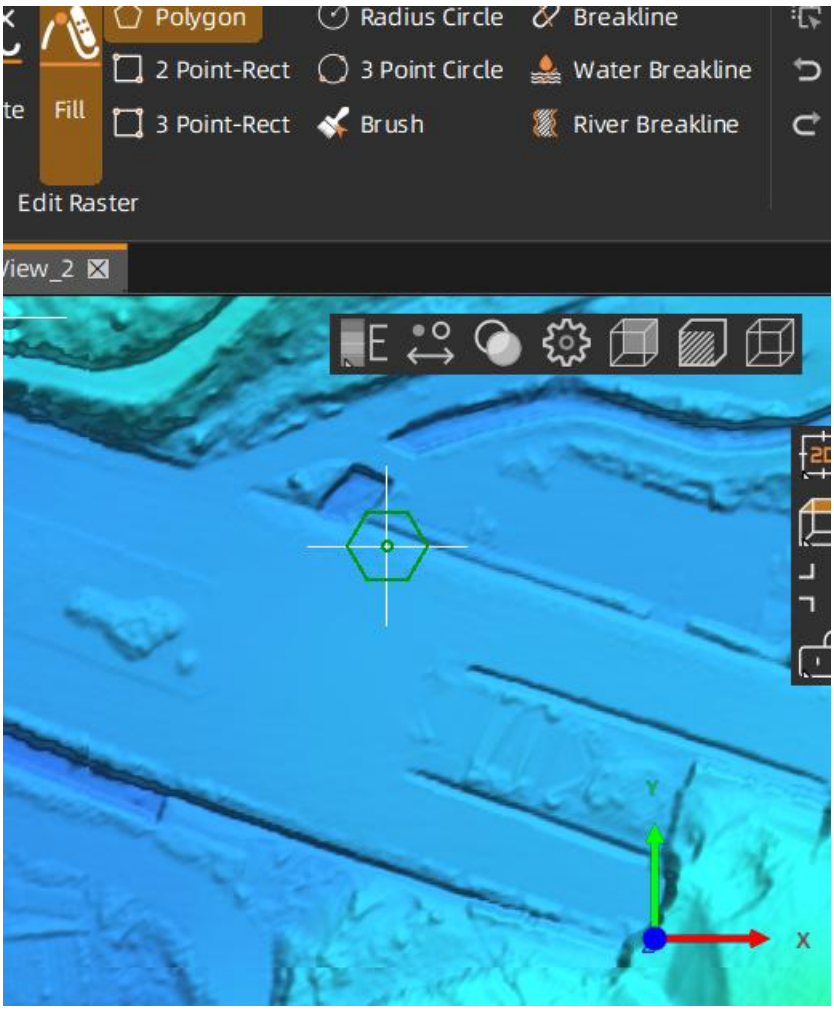


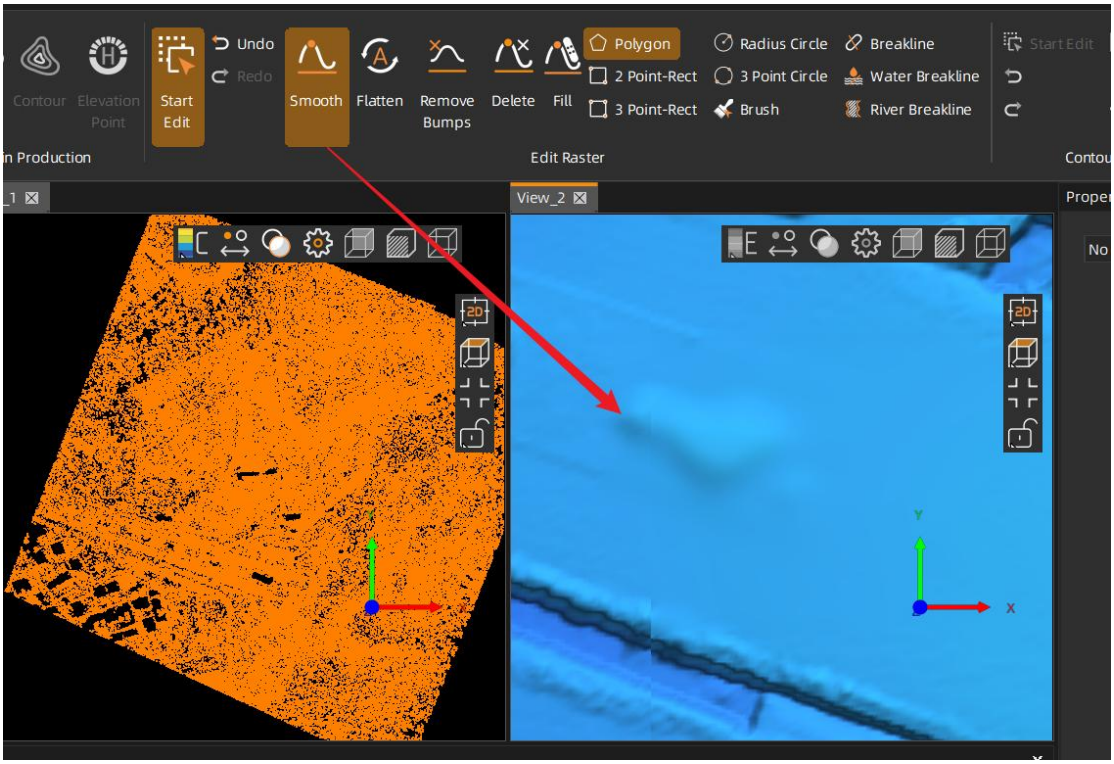
Figure : fix

DEM editing generally targets anomalies like abnormal bumps, rough surfaces, holes, and clearly incorrect elevation values. In the example above, the DEM has a hole. First, use the "Fill Elevation" function to fill the hole.



Figure：Fill Elevation

After filling the hole, the surrounding area might appear blurred. Use the Smooth Elevation function with the Brush to smooth the blurred area, making the filled area look more natural.

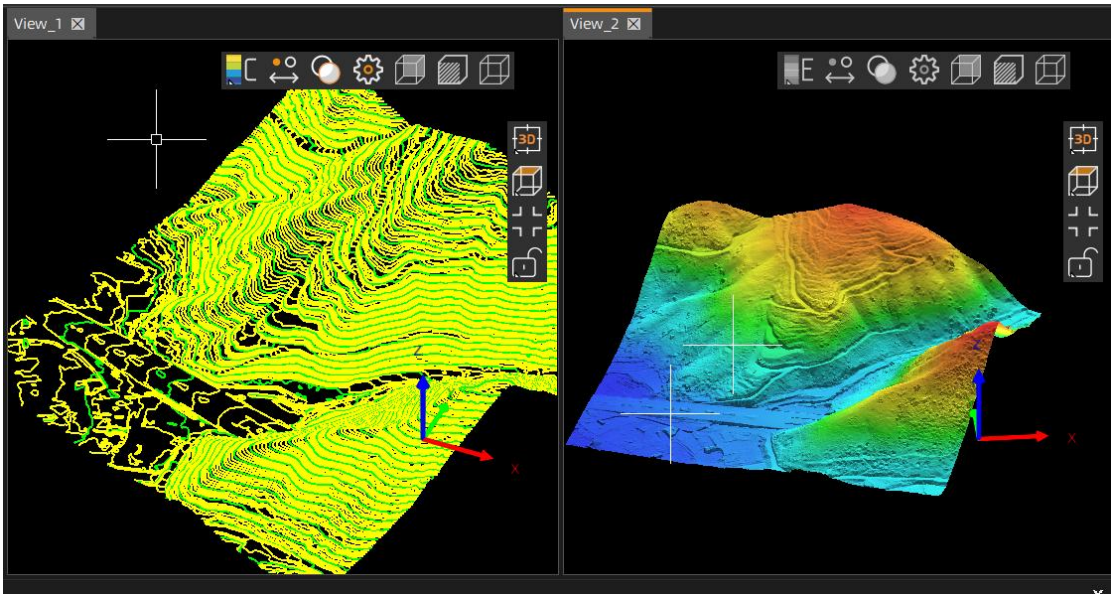


Figure：Fill Elevation

3.4.5 Manual Contour Editing

3.4.5.1 Contour Effect Inspection

Before editing contours, it is crucial to determine whether the anomaly is caused by the contour itself or by the ground points. If caused by ground points, edit the ground points first, not the contour directly.

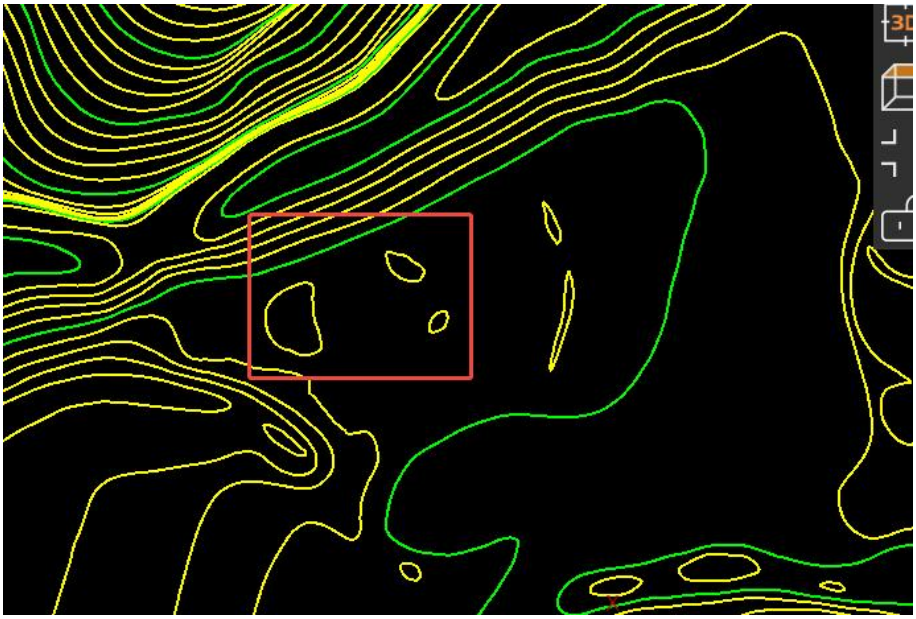


Figure：Linked Window View for Observing Contour Results

Link the DEM and contours for window synchronization. Observe whether t he contours exhibit the main terrain features, such as peaks, valleys, ridges, saddles. If the main terrain features are correct, inspect the smoothness a nd aesthetics of the contours. Contours don't need to represent terrain wit h pinpoint accuracy but should look aesthetically pleasing.

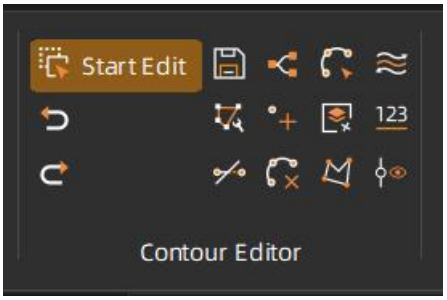
3.4.5.2 Manual Contour Editing

For short, broken contour lines, select them and press the Delete key to re move them. Overly short contours are generally not helpful for expressing terrain and detract from aesthetics.



Figure：Short line

For unsmooth contours, you don't need to make drastic changes, but you can manually smooth them for better aesthetics. For example, use the Refine function. Click on the ends of the unsmooth contour segment, defining the ideal path. The contour will automatically fit to the smoother path.



Figure：Contour editor

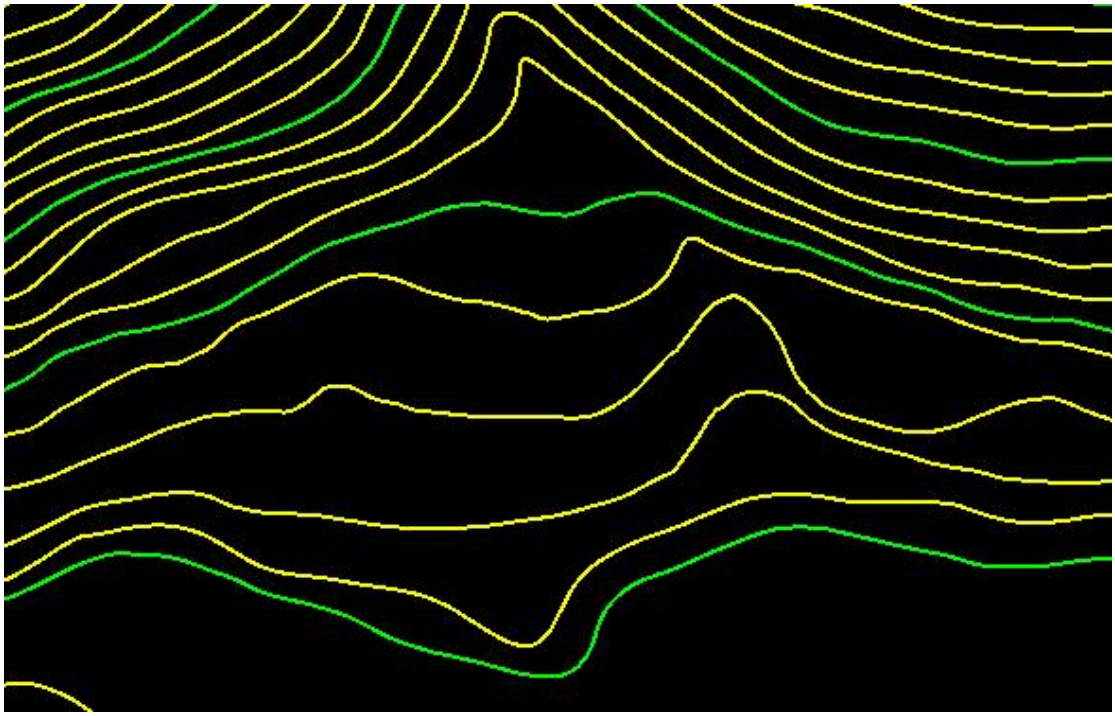


Figure:Figure: Refined Contour